МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
Федеральное государственное автономное образовательное
учреждение высшего образования
«СЕВЕРО-КАВКАЗСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»
Пятигорский институт (филиал) СКФУ

Guidelines

for laboratory work in the discipline " **Пищевые и биологически активные добавки / FOOD AND BIOLOGICALLY ACTIVE ADDITIVES** "

for students of the direction of preparation

19.03.04 “ Product Technology and Catering Organization ”

Orientation (profile): “ **Restaurant management** ”

(ЭЛЕКТРОННЫЙ ДОКУМЕНТ)

Pyatigorsk, 2021

Guidelines are intended for carrying out laboratory works on discipline " Nutritional and dietary supplements / Food Food and additives Biologically active A » students n The direction I prepare: 19.0 3 .04 Product technology and catering . Etc. ofil preparation : Restaurant Management . Graduate Qualification : Bachelor

The guidelines contain the necessary theoretical material on the topic being studied, tasks for performing work, and a list of recommended literature.

Compiled by: Shchedrina T.V.

Reviewer: Kholodova E.N.

Guidelines were reviewed and approved at a meeting of the Department of Technology of Food and Commodity Science

Protocol № 2 from " 0 2 " September 201 9 g .

Head of Technology Department
foodstuffs I Commodity EN Kholodova

CONTENT

INTRODUCTION

Methodological guidelines have been developed for laboratory work in the discipline " Food and biologically active additives / Food and biologically active additives " for bachelors studying in the field of preparation 03/19/04 Product technology and catering (training profile: technology and organization of restaurant business)

The guidelines set out a list of laboratory work, during which bachelors receive practical skills on the scientific basis of food production . Bachelors determine the organoleptic and physico-chemical quality indicators of new types of products, compare them with regulatory documents and give an opinion on the quality and safety of products.

Each lesson has a unified structure, including the definition of its goals, the theoretical preparatory work of the student to it, teaching aids, assignments, work, writing the material in tabular form and a conclusion on the results.

When performing laboratory work, the main teaching method is the student's independent work with the individualization of tasks under the guidance of a teacher. Individualization of training is achieved through the issuance of individual tasks to students, the diversity of which is achieved through the selection of multivariate complexes of standards, natural samples, situational tasks and other teaching aids. In laboratory classes, students answer control questions on the topic, including learning to correctly understand the norms of the current legislation on the issues under consideration and apply them to relevant situations.

Laboratory studies should be preceded by independent work of students with the recommended literature, given guidelines and lecture notes. Before the start of classes, the teacher checks the theoretical preparation of the student on the topic of the laboratory lesson and explains the tasks for the upcoming work. In the process of doing the work, it is necessary to carry out the studies required by the assignment and draw up a report according to the assignment, draw conclusions about the materials being studied, and compare their experimental data with the theoretical provisions of this issue.

At the end of the work, the teacher checks the student's assimilation of the essence of the methods, processing and interpretation of the results, checks the entries in the workbook, comprehensively evaluates the student's practical work and knowledge on the topic.

The report is carried out in a separate notebook for laboratory work, which students save and provide when passing the exam. The report shall indicate the date, number of laboratory work, purpose of work, progress of work and its results. All figures, tables, diagrams are also included in the report in accordance with the designations adopted in the scientific and technical documentation. Without drawing up the results of laboratory work and submitting a report, the student is not allowed to perform the following work.

Content of the report : the title page of the laboratory work should be drawn up in accordance with the requirements of Appendix 1.

The text of the laboratory work should be carried out using a computer on one side of a sheet of white paper, A4 format, font - Times New Roman of the 14th size, line spacing - 1.5.

When performing laboratory classes, the student must carefully treat samples of goods, teaching aids, laboratory equipment and devices. In case of damage, the student is obliged to reimburse the cost or repair of devices.

Before doing work, the student should carefully read the operating rules and safety procedures for the operation of equipment and devices.

The list of laboratory classes in the discipline

" Food and biologically active additives / Food and biologically active additives "

Job title	The form carrying out
Lab number 1 Basic regulations the use of food additives in industrial food production . Food Additive Classification	Scientific Laboratory Meeting
Laboratory work No. 2 Food dyes .	Laboratory Job
Laboratory work No. 3. Study of the action of color-regulating reagents	Laboratory Job
Laboratory work No. 4. The study of the properties of pectin	Laboratory Job
Laboratory work No. 5. The study of the foaming ability of food cellulose ethers	Laboratory Job
Laboratory work No. 6 . BY onservanty food. Determination of nitrates and nitrites in meat and meat products	Laboratory Job
Lab No. 7 Food Flavors	Laboratory Job
Laboratory work No. 8. The effect of antioxidants on the physicochemical parameters of vegetable oils and fats	Laboratory Job
Laboratory work No. 9. Modern approaches to the use of biologically active additives	Scientific Laboratory Meeting

GENERAL SAFETY PRECAUTIONS IN THE LABORATORY IN THE LESSONS

Work in the laboratory is necessary in a dressing gown, protecting clothes and skin from ingestion and corrosion by reagents and contamination by microorganisms.

1. Everyone should work in the workplace assigned to him. Moving to another place without the permission of the teacher is not allowed.
2. The workplace should be kept clean, not cluttered with utensils and side things.
3. Students are prohibited from working in the laboratory without the presence of a teacher or laboratory assistant, as well as at an unspecified time without the permission of the teacher.

4. Before each laboratory work is completed, you can start only after receiving a safety instruction and the permission of the teacher.
5. Getting started, it is necessary: to understand the methodology of work, the rules for its safe implementation; check the compliance of the substances taken with those substances that are indicated in the method of work.
6. The experiment must be carried out in strict accordance with its description in the guidelines, especially adhere to the order of addition of reagents.
7. To perform the experiment, use only clean, dry laboratory glassware; To measure each reagent, you need to have measuring dishes (pipettes, burettes, a beaker, measuring cylinder or measuring cup); do not pour excess reagent poured into a test tube back into the container so as not to spoil the reagent.
8. If during the experiment heating of the reaction mixture is required, it is necessary to follow the stipulated methodological instructions for the heating method: in a water bath, on an electric stove or on a gas burner, etc. It is dangerous to heat highly volatile combustible substances on an open fire.
9. Chemicals spilled on the floor and table are neutralized and cleaned under the supervision of a laboratory assistant (teacher) in accordance with the rules.
10. When working in the laboratory, the following requirements should be observed: the work must be done carefully, conscientiously, carefully, economically, to be observant, rationally and correctly use the time allotted for work.
11. At the end of the work, you should tidy up your workplace: wash the dishes, wipe the surface of the working laboratory bench, close the water taps, turn off the electrical appliances.

Safety rules in the lab while working with the reagents

1. If the work does not give instructions regarding the dosage of the reagents, then it is necessary to take them for experiments as little as possible (saving materials and time spent on the experiment).

2. Excess reagent cannot be emptied and poured back into the vessel from which it was taken.
3. After spending the reagent, the jar or glass must be immediately closed with a stopper and put in place.
4. Take dry reagents with the help of shovels, plastic or metal spatulas. The putty knife should always be dry and clean. After spending it should be thoroughly wiped.
5. When the reagent is taken with a pipette, in no case can you take the reagent from another container without using the same pipette.
6. When pouring reagents, do not bend over the vessel, preventing splashes on your face or clothing.
7. You can't keep a jar or a glass of reagent, which you need to open while holding it, you need to put it on the laboratory table and only then open it.

Laboratory work No. 1

Theme of the lesson: Basic regulatory documents on the use of food additives in industrial nutrition products. Food Additive Classification

Learning Objectives: to acquire knowledge and skills in the field of production of public power, to justify the adoption of specific technical solutions in the development of new technological processes of manufacture of food products; choose technical means and technologies taking into account the environmental consequences of their application . To study the basic regulatory acts of the use of food additives in food production .

As a result of studying the topic, students should :

Know: the main regulatory legal acts of the use of food additives in food production . Priorities in the area of food production , the main tasks in the area of food bezop with Nost of the country , about careless Ia population Ba in GOVERNMENTAL nutrients .

To be able to accepted s specific e TECHNICAL e solution is, in the development of new technological processes of manufacture of food products; choose the technical means and technologies, taking into account the environmental consequences of their use , be evidence-based formulations and technologies for the safe and production healthy fo about Vågå power;

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution when developing new technological processes for food production .

1. The theoretical part

Modern food production involves wide on some use of food Doba in approx.

Food Additives - a natural or artificial substance or their compounds, especially incorporated in foodstuffs in their process Manuf in Lenia in order to impart certain properties of food products and (or) with a storage of food quality.

Nutritional supplements are usually not eaten as vehi e Vågå product, and intentionally introduced into it in order to preserve food or impart certain appearance, taste, color, konsiste n tion; produ increase resistance to comrade to various types of damage; ease and with indigenous processes.

In the present conditions are considered as dietary supplements amounted to Nye portion of the food product and included in the definition of "food pr about ucts."

There are many approaches to the classification of food additives.

Technological destination all supplements Subpart I are into 3 groups:

- providing the desired appearance and organoleptic properties (texture improvers, colorants, flav as tori and flavorings);
- preventing microbial or oxidative and body spoilage of the product (preservatives - antimicrobial substances and antioxidants);
- accelerating and facilitating maintenance etc. technological processes of duction of food products (process accelerators, fix and myoglobin tori, disintegrants, gelling, n e noobrazovateli etc.).

Basic hygiene requirements for food additives

Hygiene requirements for food additives include the following:

1. The content of food additives in the food product should not straight e Witzlaus maximum (acceptable) levels. Dietary supplements should g of bavlyatsya in food pr about ucts in the minimum amount necessary to achieve the technological effect, but not more established Maximal s levels of a.

2. For the production of foodstuffs are allowed food Doba in ki, not rendering (based on established regulations) according to moder n GOVERNMENTAL research harmful vozdeys tons Wii to life and human health and future generations.

3. The use of nutritional supplements should not deteriorate organoleptich e skie properties of the products as well as reduce their nutritional value (excl e Niemi certain products and special dietary desig and cheniya).

4. Do not use supplements to conceal corruption and poor quality of raw materials or the finished food etc. on THE PRODUCT.

5. Allowed to use food additives to form the finished composite and tions - multicomponent mixtures (complex nutritional d of bavki).

6. For retail use only a certain list of food additives is used.

7. New types of food additives not regulated by applicable sanitary rules shall be settled in installed n particular order.

8. Food products, which come with a feed supplements or meal (secondary flow) should meet the requirements set for the final product (the food is considered the total amount ADD and application of all Incoming sources).

9. For food additives that do not pose a risk to healthy fo of human Vias and the excess of which may cause tech f tion product spoilage, the maximum level of incorporation in the foods to l wives of claim redelyatsya technological instructions ("according TI").

This rule is not applicable to the following products: neobrabota n nye foodstuffs; honey; wine emulsified oils and fats of animal on the first and vegetable origin; cow butter; pasteurized and sterilized and bound milk and cream; natural mineral waters; coffee (except sol of rimogo flavored) and coffee extracts; unscented sheet of howling tea; Sahara; pasta; natural unflavored buttermilk (except sterilized).

10. Changes in production technology and extension of approx e neniya previously permitted food additive axes y fected during a sanitary-epidemiological findings.

11. By using genetically modified by the manufacturer (enzyme preparations, products from vegetable oils and baa l Cove, starch, etc.) Must declare them in due order.

12. Not allowed to flour processing for retail, etc. on dazhi, flour and bread.

13. Do not use the sweetener in the manufacture etc. of baby food ucts, with the exception of specialized products for children, suffering th boiling diabetes.

14. The sweeteners are used in food products with reduced energy value (not less than 30% compared with tradition N hydrochloric formulation) and special dietary foods intended for persons who are recommended to limit the intake of sugar on honey and Qing dormancy and zaniyam. Normative and technical documentation and recipes for such products are coordinated in the established claim of a row.

Materials for work:

- SanPiN 2.3.2.1293-03 "Hygienic requirements for the use of food additives";
- GOST R 51074-2003 “Food products. Information for the consumer. General treb of Bani. "

2. Tasks for working in class

1. Students are given copies of the sanitary-epidemiological rules and standards 2.3.2.1293-03. It is proposed to get acquainted with the structure of SanPiN, to outline the main provisions of these sanitary rules. When this student necessarily need to note the following anchor points :

- general provisions and the scope of sanitary rules;
- hygiene requirements for the use of food additives;
- food additives and auxiliary agents being cared (with taking into account the established regulations) on the data of modern scientific research of harmful effects on the lives and health of the person and of future generations;
- food additives permitted for retail sale;

- hygienic regulations for the use of food additives in the production of baby food.

2. Students are given copies of GOST 51014-2003. It is also suggested that you familiarize yourself with the structure of this state standard. When taking notes, it is additionally necessary to pay attention to the following:

- scope of the standard;
- terms and definitions;
- general requirements for the content of information for the consumer, including those particular indications in the labeling of the composition of the product;
- a list of information on the packaging of flavorings and food additives.

3. Students study the main classes of food additives using the material of the appendices to the methodological instruction.

3. Security questions

1. StrukturaSanPiN 2.3.2.1293-03 common position and area of application.
2. Basic provisions of hygiene requirements for the use of food additives.
3. Functional classes of food additives allowed in the production of baby food .
4. Features of labeling of food products containing food additives.
5. Do nutritional supplements relate to nutrients.
6. What is the purpose of using nutritional supplements.
7. The technological purpose of food additives.
8. Which body regulates the use of food additives.
9. What does the letter "E" and a digit number assigned to a food d , both vkam.
10. Food additives permitted in the territory of the Russian Federation.
11. Food additives prohibited in the Russian Federation.

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects:

- Nutritional Supplements and Food Security of Russia.
- Normative legal acts of the food without a pasnosti page as us.

Tasks for an additional bonus on the ball - rating system:

- Food additives in the production of foreign food

Laboratory work No. 2

Theme of the lesson: P search dyes.

Learning objectives: to study the properties of the natural pigment of betanin; factors affecting the safety of this pigment . Familiarize yourself with the basic requirements for the use of dyes in food production.

As a result of studying the topic, students should :

Know: the properties of the natural pigment of betanin; factors affecting the safety of this pigment . Priorities in the field of food production .

To be able to accepted s specific e TECHNICAL e solution is, in the development of new technological processes of manufacture of food products; choose the technical means and technologies, taking into account the environmental consequences of their use , be evidence-based formulations and technologies for the safe and production healthy fo about Vågå power;

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution when developing new technological processes for food production .

1. The theoretical part

1.1. Characterization and classification of food colors

Among the substances which determine the appearance of food, va w ther place belongs dyes.

Food dyes are brought into direct about ucts to:

- restoration of the natural coloring lost during produc t va and (or) the store;

- coloring colorless products to make them appealing to the first type and color diversity (soft drinks, confectionery and of Delia et al.).

Food coloring additives do not include:

- food products having a secondary coloring effect (Fru to nels and vegetable purees or juices, coffee, cocoa, turmeric, paprika and other vehi e stems etc. for ucts);

- dyes used for staining the inedible outer cha with Tay foodstuff (shell for cheeses and sausages, for branding meat, eggs and labeling s ditch).

As the dyes used are natural, synthetic and m e -sectoral substance.

The list of permitted food colors is presented in SanPiN 2.3.2. 1293-03 “Hygienic requirements for the use of food additives” and Sa n PiN 2.3.2.1078-01 “Hygienic requirements for safety and nutritional value of food products” .

Natural (natural) dyes - coloring substances isolated from natural sources (plant or animal).

Interest in natural food colors lately znach and tion has increased because they contain biologically active, flavoring and aromatic substances that give the products are not only attractive, but also the natural aroma, taste and additional nutritional value.

Of the natural dyes that give a red, orange or yellow color, carotenoids (E160 and E161) are most often used. Most wa w ny of them - ß-carotene (E160a), which is a provitamin A and antioxidant and Dante. Natural yellow colors e lyami are turmeric, turmeric (E100). By the edge of a nym dyes include anthocyanins contained in the black Smorodov and not and red grapes (E163), red beet or betanin (E162), carmine (E120).

Chlorophyll (E140), which is present in all plants, is used as a green natural dye. More stable staining gives chemically mod and chlorinated chlorophyll, where magnesium is replaced by copper (E141).

Natural colorants include sugar color (E150), which is also called caramel dye.

Synthetic coloring agents have great technologist and cal advantage since they are more resistant to technological processing, xp and neniyu and provide bright, legkovosproizvodimye color. Many dyes are highly soluble in water, but some of the b form a insoluble complexes (varnishes) with metal ions, and in such form as pigments used for coloring of powders, tablets, coated tablets, chewing p e Zinck.

Depending on the chemical structure, synthetic dyes according to q are divided into classes:

- azo dyes: tartrazine (E102), yellow "sunset" (E110), ka p muazin (E122), Ponceau (Ponceau) 4 R (E124), black shiny (E151);

- triarylmethane dyes: blue patented V (E131), shiny blue (E133), green S (E142), brown NT (E155);

- quinoline dyes: yellow quinoline dyes (E104);

- indigoid: indigo carmine (E132).

Mineral dyes . Some pigments and metals are used as food coloring substances and with . Thus, iron oxide (E172) gives Th p ny, red and yellow, and titanium dioxide (E171) and calcium carbonate (E170) - White. Of metals, gold (E175) and with e rib (E174) are also used .

1.2. Hygienic requirements for the use of food colors

Coloring of foodstuffs can be separated as an L -GOVERNMENTAL dyes, and combined (mixed) composed I conductive of two or more colors ie Leu.

Do not use food dyes to mask edited e neniya product color caused by its damage, violation of those x technologically modes using defective or materials. In the table. 2 . 1 yk and are attached foods which are not allowed to use colorants (for and with exception of specifically stated Sluch and s).

Table 2 . 1 - Food products that are **not allowed to** add dyes

№	**Food products**
1.	Unprocessed foods
2.	Pasteurized or sterilized milk, chocolate milk
3.	Flour, Grains, Beans
4.	Dairy products, buttermilk not aromatizirova n nye
5.	Milk, canned cream, concentrated, condensed ar not on disaggregated as
6.	Eggs and egg products (for coloring Easter eggshells , I will add certain food colors from tima)
7.	Meat, poultry, game, fish, crustaceans, mollusks whole or in pieces or minced, including minced meat, without the addition of other ingredients, raw
8.	Fruits, vegetables, fresh, dried mushrooms
9.	Fruit and vegetable juices, pastes, mashed potatoes
10.	Vegetables [1] (except olives), fruits, canned mushrooms, including mashed potatoes, pastes
11.	Sugar [2], glucose, fructose
12.	Honey

13.	Cocoa products, chocolate ingredients in confectionery and other ed e liyah
14.	Roasted coffee, chicory, tea, extracts from them
	Spices and mixtures thereof
15.	Salt, salt substitutes
16.	Specialized foods for healthy and sick children (up to 3 years)
17.	Bottled drinking water and in banks

1 In addition to vegetables, production of which allowed only certain colors ie there.

2 In the production of refined sugar is allowed to use the ultra and Rhin.

And investigation of the properties of the natural pigment betanin

1.3. Properties and natural pigment betanin

The pigment is betanin part of the dining dyes SWECO ly (Beta Vuigaris). He is one of the red-purple Crazy teley - betatsianinov.

Red color beets provide:

betalaines, which are divided into two groups of pigments - red (betacyanins) and yellow (betaxanthines). There are more red pigments in beets than yellow ones; their content can reach 95% of the total betalain content.

Betacyanins are represented mainly by betanine (75-95% of the total content of red pigments), as well as betanidine, probetanin and their isomers; betaxanthines - vulgaxanthin I (95% of the total content of yellow pigments) and vulgaxanthin II . The content and ratio of these pigments in beets cause differences in the shades of its color.

Betanine should be considered in more detail, since the change in color of beets during the cooking process is mainly due to a change in this pigment.

Betanine is a monoglycoside whose aglycon is betanidine or isobetanidine.

During thermal cooking of beets, betanin is destroyed to one degree or another, as a result of which the red-violet color becomes less intense, and can also acquire a brownish tint. When cooling and subsequent storage of the finished beets, its color is partially restored due to the regeneration of betanin. This phenomenon is

observed during the storage of semi-finished beets in the form of boiled whole peeled or chopped root crops.

Under the influence of water and heating, betanine is hydrolyzed at the site of the double bond at C-11 to form cyclodioxiphenylalanine and betalamic acid.

The degree of destruction of betanin during heat cooking of beets is quite high. So, in peeled root crops of beets, cooked in water, only about 35% of betanin contained in the semi-finished product is found, in the broth 12-13%. Thus, we can assume that more than half of the betanin contained in beets undergoes thermal degradation.

Steaming beets slightly reduces the loss of betanin compared to cooking in water. However, the degree of thermal degradation of the pigment in the whole peeled beets, in this case, remains quite high - 46%.

When steamed beets, diced, the degree of destruction of the pigment can reach 54%.

The degree of destruction of betanin depends on many factors:

1. heating temperature;
2. pigment concentration;
3. pH of the medium;
4. contact with oxygen;
5. the presence in the cooking medium of metal ions and others.

The higher the heating temperature, the faster the pigment breaks down. The higher the concentration of betanine, the better it is retained. This explains the recommendation to cook or bake beets in the skin. In the latter case, the weakening of the color of beets practically does not occur.

When cooking peeled root vegetables, more betanine passes into the decoction (condensate) than when cooking them in the skin, which prevents the diffusion of pigment. The color of such beets is less intense.

The study of the influence of pH of the medium in the range from 6.2 to 4.8 on the degree of destruction of betanine showed that it is least destroyed at pH = 5.8 (the

half-life of betanine $T_{1/2}$ is 21.7 min). In more acidic environments, betanine breaks down faster (at a pH of 4.8 T ½ = 17.1 min); the same is observed at pH 6.2.

Using spectrophotometry, the dye is tested for its resistance to temperature, organic acids (acetic, benzoic), baking soda (baking powder in cooking), and sulfites (color-regulating agents).

2. The practical part

Experience 1. The effect of temperature on the color of betanin

Reagents:

1. An aqueous solution of beet pigment

Equipment

1. Water bath
2. Hotplate
3. Tripod
4. FEC
5. Flask 500 cm^3
6. Thermometer
7. Pipette

Work order

A flask with 300 cm^3 of an aqueous dye solution was placed in a boiling water bath for 45 minutes. Sampling (20 cm^3) is carried out every 10 minutes and the density of the dye solution is measured on the FEK. The first sample is taken before heating the solution.

Measurements are recorded in a table, build a graph in the coordinates:

density (D) - time (t), draw conclusions.

Experience 2. The effect of organic acid on the color of betanin

Reagents:

1. Acetic acid, 70% solution
2. Benzoic acid, 70% solution
3. An aqueous solution of betanin
4. The indicator is universal

Equipment: 1. The same as in experiment 1, pH meter

Work order

To 300 cm 3 of a dye solution of beetroot, 20 cm 3 of acetic acid are poured and put on a boiling water bath for 45 minutes. Sampling for measuring the density of the dye is performed every 10 minutes. The first sample is taken before adding acid, the second - before heating. In each sample, the pH of the solutions is measured.

Build a graph in the coordinates: density (D) - time (t), draw conclusions.

Do the same experiment with benzoic acid.

Experience 3 The effect of baking soda on the color of betanin

Reagents:

1. An aqueous solution of betanin
2. Sodium bicarbonate, 30% solution

Equipment:

1. pH meter
2. Flat bottom flasks, 500 cm 3
3. FEC
4. Water bath

Work order

To 300 cm 3 of a dye solution of beetroot, add 30 cm 3 of a solution of baking soda. The flask with dye is placed in a boiling water bath for 45 minutes.

Sampling and measuring the density of the dye solution is performed in the same way as in experiment 1.

At the end of the experiment, build a graph, draw conclusions.

Experience 3. The effect of sulfites on the color of a solution of table beets.

Reagents:

1 . An aqueous solution of dye beetroot
2. Sodium sulfite, 10% solution

Equipment: 1. The same as in experiment I

Work order

In a flask with 300 cm 3 of betanine dye solution, 30 cm 3 of sodium sulfite are poured and put in a boiling bath for 45 minutes. Sampling and measuring the density of the dye solution is carried out as in experiment 1.

At the end of the experiment, build a graph, draw conclusions.

Draw conclusions on the work.

Experience No. 4 . Isolation of carotenoids and betanin from root crops

Natural dyes emit physical methods (extraction, simple distillation, sublimation, etc.) Of the plant come SOURCE animals and Cove: berries, flowers, leaves, roots and the like, including waste on KONSER in GOVERNMENTAL and vinodelch e Sgiach plants . Of interest to the consumer are presented w r β -carotene and betanin , which will give you strength w t bo product Lee attractive and eating e governmental ny view. C Vetovo range of β -carotene and varies from light yellow to orange e Vågå , betanin - pink to cherry.

Experimental Procedure: pieces and carrots and beets sized mountains on bus crush in a mortar and place in different tubes , and 10 drops of tetra x lrormetana close the stopper and shake for 20-30 seconds. Note the change n s coloring ekstrage n ta.

Pour the resulting extract into three test tubes, then add a few drops of substances: in the first - 10% hydrochloric acid solution, in the second - 10% solution with sodium hydroxide solution, and the third - 1% potassium permanganate solution. Shake the tubes and note the changes.

Observations:

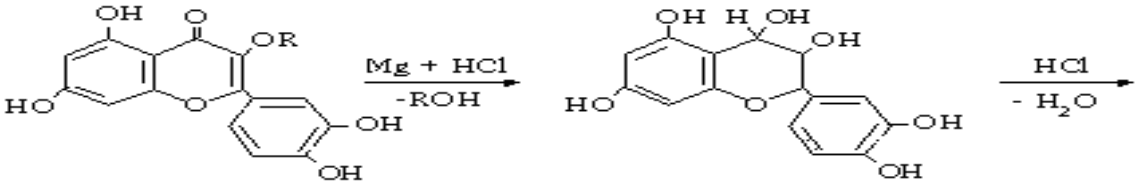
Conclusions *:*

Experience No. 5. The dependence of the color of flavonols, flavonones, flavones on the pH of the medium

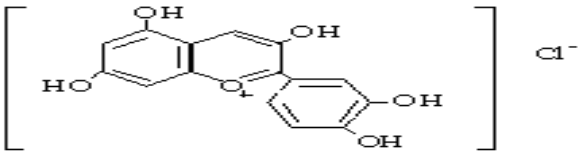
Flavonoids differ in the degree of oxidation or saturation of the heterocyclic fragment, the number and relative position of hydroxyl groups, among which

flavonols, flavonones and flavones, when reduced by magnesium in the presence of hydrochloric acid, give a red or orange-red color due to the formation of anthocyanidins.

Chemism:



rutin (flavonol group)



anthocyanidin

Experimental procedure: Pour 2 ml of a solution of flavo o noides (green tea infusion, rutin, quercetin, etc.) into a test tube, add 5-7 drops of hydrochloric acid and a small amount of magnesium in the form of sawdust (or one grain in Lu zinc), then heat the solution; after 3-5 minutes, staining is observed. The resulting solution was pour off into another vial and add a few drops of 10% sodium hydroxide solution to vary e Nia coloring.

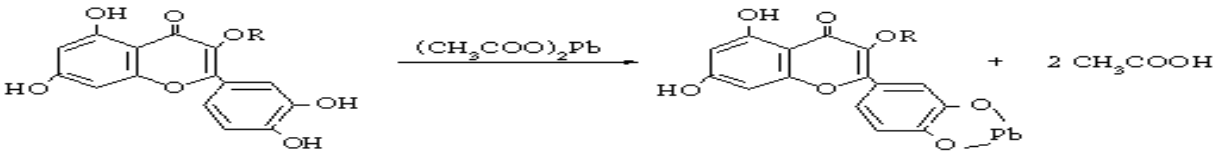
Observations:

Conclusions:

Experience № 6. The interaction of flavonoids with salts of meta l fishing

Flavonoids when dissolved in hard water interact with catty of contact metal (iron, calcium, magnesium , etc.), Are thus formed differently colored precipitates. So, when interacting with lead acetate, flavonoids form precipitates colored in yellow-orange, red or blue.

Chemism:



r utin

Observations:

Conclusions:

Experimental procedure: 1 ml of a solution of flav o noids (infusion of green tea or onion, rutin, quercetin, etc.) is poured into a test tube , 3-5 drops of a 2% solution of lead acetate are added. Precipitation is observed.

3. Security questions

1. What pigments provide red color to beets?
2. What pigments are betacyanins?
3. What pigments are betaxanthines?
4. What is the degree of destruction of betanin?
5. What factors determine the degree of destruction of betanin?
6. At what pH is Betanine pigment more stable?

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects:

- The use of dyes in food production.
- Regulatory legal acts providing free of pasnosti new types of food products .

Tasks for an additional bonus on the ball - rating system:

The use of dyes in the production of baby food, dietetic, therapeutic and prophylactic nutrition.

A aboratornaya job number 3

Subject: And investigation of the action of color-regulating reagents

Learning objectives: to acquire knowledge and practical skills in the field of food production, justify the adoption of a specific technical solution in the

development of new technological processes for food production; choose technical means and technologies taking into account the environmental consequences of their application. To study the effect and properties of color - regulating .

As a result of studying the topic, students should :

Know: Priorities in the field of food production, the main tasks in the area of food bezop with Nost of the country, providing the population Ba in GOVERNMENTAL nutrients.

Be able to make a specific technical decision when developing new technological processes for the production of food products; choose the technical means and technologies, taking into account the environmental consequences of their use, be evidence-based formulations and technologies for the safe and healthy fo production of Vågå power;

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution in the development of new technological processes for food production.

1. The theoretical part

1.1 the formation of new colored substances in the processing of products

When assessing the quality of food products, one of the important indicators is their color. Their complex chemical composition, the presence of significant amounts of L and stably compounds may cause discoloration at different stages of the straight on cession, wherein, some products lose or change the natural color, while others acquire a new one.

The study of the causes and mechanisms of these diverse and complex phenomena that occur when processed food products, offers a choice of optimum modes of the proc e Sgiach processes and prevent a number of undesirable effects, which decrease the nutritional value.

In the process of processing on the surface of the products (cabbage, potatoes, apples, gr and bach), a new color appears (pink, purple, bluish-black, brown, black and greenish-black), which is due to a change in polyphenolic compounds.

The appearance of colored substances during the culinary mechanical processing of certain products is the result of the enzymatic oxidation of tyrosine and polyphenolic compounds.

From a technological point of view, their enzymatic oxidation reactions are of interest, leading to the darkening of plant tissues.

Under certain conditions, it occurs in non-enzymatic oxidizing phenolic compounds e set. Their compounds with metal ions, especially iron and tin, cause a significant color change.

Enzymatic browning is the cause of the accumulation of chemicals painted in various colors - from pink to brown and blue-black. As a result of this, the appearance of the food product worsens, its biological value decreases.

Enzymatic browning is a process that occurs in many fruits and vegetables when sliced, cleaned, with a disease, and after mechanical damage. For its course, the presence of an enzyme, substrate and oxygen of the air is necessary. The browning reaction proceeds very intensively and is expressed in the oxidation of some phenolic compounds to o-quinones, and then to melanins (dark-colored substances).

The enzymatic browning participate specific enzymes: polifenoloksid and PS, phenolase of-difenolazy, oxygenase, peroxidase, catalase.

Some varieties of potatoes have a different tendency to darken. It depends on the content of polyphenols, storage conditions and activity of polyphenol oxidases ($t_{opt} = 20 - 30\ ^0C$).

Polyphenols are concentrated mainly in vacuoles of the plant cell and are separated from cyt about plasma containing enzymes and tonoplasts. Through tonoplasts, a strictly faceted and limited amount of polyphenols enters the cytoplasm , calculated for the enzyme apparatus that is available in the plasma cyt. In this case, they are oxidized to carbon dioxide and water, and some of the intermediate products

of their oxidation are reduced using the appropriate enzymes (dehydrogenases) to the starting products, as a result of which the tissue does not darken.

When cell damage occurs, which occurs during the cleaning and slicing of potatoes, the internal and cellular pressure changes , the tonoplast breaks and the polyphenols enter the cytoplasm, where they undergo irreversible enzymatic oxidation to form melanins.

Formation of such colored substances during storage of potatoes can be purified proish of dit and the oxidation of another substance polyphenol oxidase phenolic character - chlorogenic acid.

It is found that quinones formed from chlorogenic acids are able to communicate with amino acids, proteins and form dark-colored compound, is darker than its own direct on ucts oxidation.

Oxidation of polyphenolic substances and the formation of dark-colored compounds may produ with walking and without the participation of enzymes by the action of metal ions, the corrosion of metal containers.

To protect peeled fruits and vegetables from darkening, methods are applied based on the inactivation of enzymes and limiting the access of oxygen.

Since polyphenols atmospheric oxygen without the aid of enzymes not oxidized, for direct e dotvrascheniya browning process requires oxidative enzymes inactivate. Methods for inactivating enzymes:

- For polyphenol oxidase, potent inhibitors are benzoic, p-hydroxybenzoic, p-aminobenzoic acid.
- Thiols such as cysteine and other amino acids that contain sulfur, inhibit n e are enzymatic processes because of their reducing properties.
- Bromides, chlorides, fluorides and tiotsianidy displace copper ion of enzyme structure and ing and biruyut it.
- When the potatoes are immersed for 10-15 minutes in a 0.3% HCl solution , the pH of the surface layer decreases and adverse conditions are created for the action of oxidative enzymes.

- NaCl has a depressing effect on the enzymes , 2% solutions are used - but the method is ineffective.
- Good reducing agent is sulfur dioxide, having the ability to readily and harvesting the enzyme activity is stronger, the lower the temperature and the higher the concentration of sulfur dioxide therein.

This is the basis for sulfitation with a 1% solution of $NaHSO_3$ or $Na_2S_2O_5$ (Na pyrosulfite). The duration of sulfitation is 5 minutes, followed by 2 times washing. The residual content of SO_2 is not more than 0.002%.

1.2 Color-control materials

These are compounds that change color in the product as a result of vzaimodeys tons Wii with the components of food raw materials and finished products.

Among them, bleaching substances should be noted - additives that destroy the native and native pigments or colored products that are formed upon receipt of food products.

Sulfur dioxide - SO_2 (E 220) due to the ability to connect with oxygen quo to the sulfoxide sulfur is used as a curing agent for some foods and beverages. In the presence of SO_2 are better preserved compounds responsible for the color and taste of dried s of boiling fruit and fruit juices.

Sulfitation used to prevent darkening of the vegetable material in proce with ce drying and storage. Sulfitation treatment carried 0.1-0.5% sodium sulfite (Na_2SO_3), bisulfite ($NaHSO_3$), sodium metasulfita ($Na_2S_2O_5$) by submersible e Nia feedstock for 2-3 minutes or irrigation within 20-30 s. Solutions of sulfuric acid (H_2SO_3) and its salts are strong reducing agents, inactivate oxidative enzymes and thereby inhibit the processes of enzymatic browning. In addition, in the process of sulfitation SO_2 attached I etsya to free carbonyl groups of reducing sugars, protecting them from the reaction of melanoidins.

For white wines of SO_2 are added in large quantities, so he successfully predotvr and schaet oxidation light-yellow pigment. DBD SO_2 = 0.7 mg / kg body

weight cheloveka.V due to the fact that the SO_2 has the ability to destroy thiamine, its use produ to minute serving source of this vitamin, is not recommended.

Nitrite and potassium nitrate (E 250, E 251) is used in the treatment (after) meat mja with GOVERNMENTAL products for preserving red. Myoglobin - pigment red meat at mutually and interacting with nitrites forms **nitrosomyoglobin,** which gives meat products and pits color pink-red, it does not change during heating. Particleboard = 30-50 mg / kg body weight. A similar effect has and potassium nitrate, which by means of enzymes vyd e trolled microorganisms converted into potassium nitrite.

Potassium bromate K In rO_3 (E 294a) is used as a bleach for flour. However, its use leads to the destruction of vitamins B_1 , PP and methionine. In process technology pr e rotates in potassium bromide. The latter is a part of many food products as a natural component and is therefore not toxic even when added to flour 100mg / kg, particleboard = 40 mg / kg.

1. The practical part

Experience 1. Determination of the residual content of sulfur dioxide

The principle of the method for determining SO_2 is that as a result of the reaction between sodium bisulfite, sodium hydroxide and sulfuric acid, fragile sulfuric acid is formed, which decomposes into water and sulfur dioxide. The latter is quantitatively oxidized by iodine sulfuric acid:

$NaHSO_3 + NaOH = Na_2SO_3 + H_2O$

$Na_2SO_3 + H_2O = Na_2SO_4 + H_2SO_3$

$H_2O\ SO_2$

$SO_2 + I_2 + 2\ H_2O = 2HI + H_2SO_4$

Reagents:

1. A solution of iodine with a concentration of 0.01 mol / DM_3
2. a solution of sodium hydroxide concentration of 1 mol / DM_3
3. a solution of sulfuric acid with a concentration of 0.5 mol / DM_3

4. 1% starch solution

Equipment

1. Microburette
2. burette stand
3. beaker
4. conical flasks with a capacity of 150-200 cm 3
5. mortar and pestle
6. Knife
7. Grater
8. Cutting board

Work order

At least 10 medium-sized tubers are taken from an average sample, cut into two parts along two perpendicular axes, and each fourth part is rubbed on a fine grater. The resulting mass is quickly and thoroughly mixed and ground in a mortar (or grated) to obtain a homogeneous homogeneous gruel. Then, from a prepared sample, weighed portions weighing 5 g each with an error of not more than 0.01 g and transfer them quantitatively to 50 cm 3 of distilled water into conical flasks with a capacity of 150-200 cm 3 . To the flasks add 5 cm 3 of a solution of sodium hydroxide with a concentration of 1 mol / dm 3 , close them with stoppers, shake the contents and leave to stand for 15 minutes.

Then, 10 cm 3 of a solution of sulfuric acid with a concentration of 0.5 mol / dm 3 are added to the flasks , their contents are mixed, 1 cm 3 of a 1% starch solution is added and titrated with shaking of a solution of iodine with a concentration of 0.01 mol / dm 3 until a blue color appears not disappearing for 2-3 days. The tubers of non-sulfonated potato, taken simultaneously with samples of the semi-finished product, are examined in a similar way, since there are substances in the potato that can be oxidized by iodine.

Mass fraction (%) of residual sulfur dioxide is calculated by the formula:

$$\mathbf{M} = \frac{\mathbf{(V - V_1) \cdot K \cdot 0.00032 \cdot 100}}{\mathbf{m}}, \qquad (3.1)$$

where V - V 1 is, respectively, the volume of iodine solution with a concentration of 0.01 mol / dm 3 used for titration of a sample weight of sulfitated potatoes, and an iodine solution with a concentration of 0.01 mol / dm 3 used for titration of a sample weight of unsulfonated potato, cm 3 ;

K is the correction factor for conversion to a solution of iodine with a concentration of 0.01 mol / dm 3 , 0,00032 is the mass of sulfur dioxide being oxidized by 1 cm 3 of a solution of iodine with a concentration of 0.01 mol / dm 3 , g;

m is the mass of a sample of raw, peeled sulfitated potatoes., g

The discrepancy between the two parallel determinations shall not exceed 0.001%.

To calculate the residual content of sulfur dioxide in the studied samples of potatoes, to formulate conclusions on the work.

3. Security questions

1. What is the essence of the darkening of peeled vegetables and fruits when stored in a peeled state?
2. What are the ways to protect peeled vegetables and fruits from darkening?
3. What color-regulating substances are known to you?
4. Explain the essence of the method for determining the residual content of sulfur dioxide.

4. The task for independent work

On an individual task to prepare messages, essays or presentations of creative projects:

- The use of color-regulating reagents in food production.

Tasks for an additional bonus on the ball - rating system:

The use of color-regulating reagents in the production of dietetic, therapeutic and prophylactic food.

Laboratory work No. 4

Subject: And the investigation of the properties of pectin

Learning objectives: To study the properties of pectin, to master methods of quality control of pectin substances, to acquire knowledge and practical skills in the field of food production, to substantiate the adoption of a specific technical solution when developing new technological processes for the production of food products; choose technical means and technologies taking into account the environmental consequences of their use.

As a result of studying the topic, students should :

Know: the main regulatory legal acts of the use of food additives in food production. Priorities in the area of food production, the main tasks in the area of food bezop with Nost of the country, providing the population Ba in GOVERNMENTAL nutrients.

Be able to make a specific technical decision when developing new technological processes for the production of food products; choose the technical means and technologies, taking into account the environmental consequences of their use, be evidence-based formulations and technologies for the safe and healthy fo production of Vågå power;

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution in the development of new technological processes for food production .

1. The theoretical part

Pectins (E 440) are natural substances / carbohydrates of the highest order / in which fragments of D-galacturonic acid are connected by glycosidic bonds into filamentous giant molecules. Carboxyl groups are partially esterified with methanol. High and low esterified pectins are distinguished depending on the degree of esterification. Pectins are produced from fruits and vegetables by acid or alkaline extraction or by enzymatic digestion. The peculiarity of pectins is that they, unlike agar, agaroid, fucellarana, are able to form jellies only in the presence of sugar and

acid. Optimum conditions for obtaining jelly are created with a percentage content of: pectin-1, sugar-60, and acid-1. Pectins are commonly used in industrial pastry NOSTA as gelling agents.

Dry apple pectin / OST 1868-72 /, beet food pectin / OST 1862-72 /, dry citrus pectin are supplied to food enterprises. The higher the quality of pectins and the higher its content, the more sugar must be added to form a jelly.

Highly esterified pectins are used in an amount of 1-5 g / kg for the preparation of marmalades, jellies, fruit juices, ice cream, mayonnaise, sauces, and for the preparation of curd cream - up to 8g / kg.

Low esterified pectins are used for the production of low sugar products / vegetable jellies and pastes, jellies, milk puddings, etc. /. In the human body, up to 90% of pectins are split and digested.

Methods of quality control of pectin substances

To characterize the pectin preparations obtained from various plant materials, it is necessary to determine their properties. For this, it is necessary to determine the moisture content of pectin and ballast substances, free carboxyl groups, methoxylated carboxyl groups, acetyl groups, and the pH of a 1% pectin solution.

2. The practical part

Experience 1. Determination of humidity (OST 18-62-72)

To determine the moisture content, a weighed portion of pectin weighing 0.5-0.8 g on an analytical balance is dried in an oven at 130 ^{0}C for 50 minutes to constant weight. Humidity pectin X ,%, calculated by the formula

$$X = \frac{g_1 - g_2}{g_1 - g_0} \cdot 100, \qquad (4.1)$$

where g $_1$ is the mass of the bottle with a hinge before drying, g;

g $_2$ - weight of the bottle with a hitch after drying, g;

g $_0$ - mass of empty box, g.

Experience 2. Determination of pectin content by calcium pectate (OST 18-62-72)

0.05-0.08 g of pectin powder weighed on an analytical balance is dissolved in 20 cm3 of distilled ice water and set for 2-3 hours to swell and dissolve the pectin. After that, the pectin solution is neutralized with phenolphthalein and 1 cm3 of 10% HCI is added . 80-85 cm $^{3\ of}$ 96% ethanol are added dropwise to the neutralized solution, stirring vigorously. After 1-2 hours, the resulting precipitate of pectin substances is quantitatively transferred to a thick paper filter, washed 3 times with a water-alcohol solution (4 parts of 96% alcohol per 1 part of water) and once with 96% alcohol, without giving dry the precipitate on the filter.

The precipitate is quantitatively washed from the filter with hot water into a glass with a capacity of cm ^{3} , and the filter is placed in a separate glass and washed 2-3 times with hot water. Wash water is collected in a glass with a capacity of 500 cm ^{3} , where the precipitate of pectin was washed off, and the amount of liquid should not exceed 200 cm $^{3\ the}$ contents of the glass are neutralized with 0.1 N phenolphthalein. NaOH solution until faint pink. To saponify pectin add 20 cm ^{3} 0,5N. NaOH and set for 15-20 hours, then the solution is heated to a temperature of 50-60 ^{0} C and filtered through a dense paper filter. At the end of the filtration, the filter is washed several times with hot water, adding wash water to the first filtrate. The total amount of liquid should be from 275 to 300 cm ^{3} . To the filtrate add 50 cm ^{3} 1N. acetic acid, 50 cm ^{3} . calcium chloride (2N.), stirred and set for 1 hour, after which the mixture was boiled for 5 minutes. And filtered through dried to constant weight and suspended ashless filter. The filter cake is washed with boiling water until it reacts negatively with a chlorine ion (check by reaction CI $^{-}$ with silver nitrate). Then the precipitate is washed with 96% ethanol. The filter cake is dried in an oven to constant weight. The mass of sediment is taken equal to the mass of calcium pectate. Pectic acid content *Pc* %, calculated according to the formula

$$Пк = \frac{(G - g_0) \cdot 100 \cdot 0{,}92}{G_1}, \qquad (4.2)$$

where G is the mass of the box with sediment after drying. g;

G 1 - a portion of pectin, g;

0.92 is the conversion factor of calcium pectate to pectic acid.

Experience 3. Determination of the amount of ballast substances (OST 18-62-72)

Pectin powder (3-4 g) with a particle size of not more than 0.25 mm was placed in a conical flask, filled with acidified alcohol (100 cm3 of 70% ethyl alcohol and 5 cm3 of concentrated hydrochloric acid) and stirred for 15 minutes. Then the mixture is transferred quantitatively to a No. 2 glass filter and washed with acidified alcohol until a negative reaction is observed for calcium (with ammonium oxalate) and aluminum (with alizarin).

The precipitate is washed with pure 75% alcohol until it reacts negatively with a chlorine ion (with silver nitrate), then with pure 96% alcohol and dried to constant weight at a temperature of 80-85 0 C.

The amount of ballast substances *B* ,%, calculated by the formula

$$Б = \frac{(G_1 - Gn) \cdot 100}{G_1}, \qquad (4.3)$$

where G p - weighed pectin after washing with alcohol,

Experience 4. Determination of the content of free carboxyl groups

About 0.5 g of washed and dried pectin is placed in a 300 cm 3 flask , moistened with pure 96% ethanol to prevent clumping and 100 cm 3 of distilled water are added , mixed and left overnight until the pectin is completely dissolved. The solution is titrated with 0.1 N. NaOH until a red color appears, which does not disappear within 1 min. When 6 drops of the Hinton indicator are added (for its preparation, 1 volume of 0.4% bromothymolblow, 1 volume of 0.4% red cresol, 3 volumes of 0.4% red phenol and 1 volume of distilled water are mixed). The content of free carboxyl groups *Ks* ,%, calculated by the formula

$$Kc = \frac{a}{G_1} \cdot 0.45, \qquad (4.4)$$

where a is the amount of 0.1 n NaOH solution used for titration, cm 3 ;

1 cm 3 of 0.1 N NaOH solution corresponds to 0.0045 g of COOH .

The same solution is examined to determine the amount of methoxylated carboxyl groups.

Experience 5. Determination of the content of methoxylated carboxyl groups

After determining the content of free carboxyl groups, 10 cm 3 0.5 N from the burette is added to the neutralized sample . NaOH . The flask was closed and allowed to stand for 2 hours at room temperature to saponify the methoxylated carboxyl groups. Then to the solution is added from the burette 10 cm 3 0.5 N. HCI and excess of the latter are titrated with 0.1 N. NaOH .

The amount of 0.1n. NaOH spent on the second titration corresponds to the **number of esterified *Ke* groups ,** %, in the test sample, which is calculated by the formula

$$K\text{Э} = \frac{б}{Gnn} \cdot 0{,}45, \qquad (4.5)$$

where *b* is the amount of 0.1 n NaOH spent on the second titration, cm 3 ;

G_{pp} - weighed portion of washed and dried pectin powder, g.

To calculate the amount of methoxylated carboxyl groups, it is necessary to introduce a correction for acetyl groups, which are also saponified under these conditions. The number of acetyl groups is determined by distillation.

The number of methoxy groups K_m , %, subject to correction for acetyl groups is

$$K_m = K_e - A_n , \quad (4.6)$$

where And_c - the number of acetyl groups,%.

The degree of methoxylation (esterification) of pectin □ ισ calculated by the formula

$$\lambda = \frac{K_м}{K_o} \cdot 100, \qquad (4.7)$$

where K_{about} - the total number of carboxyl groups,%;

$$K_o = K_m + K_s , \quad (4.8)$$

where K *with the* content of free carboxyl groups,%.

The content of methoxyl groups $K_{СН3О}$,%, calculated by the formula

$$K_{СН3О} = K_м \frac{31}{45}, \qquad (4.9)$$

where 31 is the equivalent mass of CH_3O-groups;

45 is the equivalent mass of COOH groups.

Experience 6. Determination of the pectin content in the dried residue of the test sample of pectin

after alcohol treatment P_1,%, calculated by titrometric data

$$П_1 = \frac{a \cdot 1{,}76 + в \cdot 1{,}90}{Gnn}, \qquad (4.10)$$

where *in* - the amount of 0.1 N. NaOH spent on the determination of methoxylated carboxyl groups, cm^3.

1 cm^3 0.1 N. NaOH solution corresponds to 0.0176 g of demethoxylated galacturonic acid or 0.0190 g of methoxylated galacturonic acid.

Experience 7. Determination of pectin content in the original sample (OST 18-62-72)

To calculate the pectin content in the initial sample, it is necessary to introduce a correction for the ballast substances contained in it.

The pectin content in the initial sample of pectin P,%, calculated by the formula

$$П = П_1 \frac{G_n}{G_1}, \qquad (4.11)$$

where G_p - weighed pectin after washing with alcohol, g;

G_1 - a portion of pectin before washing with alcohol,

Experience 8. Determination of the content of acetyl groups in the powder of pectin

About 0.5 g of pectin , weighed on an analytical balance, is placed in a 50 cm^3 volumetric flask , 26 cm^3 of a 0.6% NaO H solution is added and left for 6-8 hours. Then, the contents of the flask are adjusted to the mark with distilled water.

20 cm 3 of solution are taken into a distillation flask, 20 cm 3 of MgSO 4 solution are added (100 g of MgSO 4 are dissolved in water to 180 cm 3 and 1 cm 3 of concentrated sulfuric acid is added) and a piece of pumice. The rubber outlet from the steam generator is closed with a clamp. The distillation is carried out by heating the flask 1 on the burner until the volume in it reaches 15-20 cm 3 , then open the clip from the steam generator and let the steam pass. The speed of transmission of steam and heating of the flask is regulated so as to maintain a volume of 15-20 cm 3 in the flask (under these conditions, quantitative distillation of acetic acid is achieved). 100 cm 3 of distillate were taken and titrated with phenolphthalein or phenolroth with 0.1 N NaOH . In parallel, a blank experiment is carried out with 20 cm 3 of solution and 20 cm 3 of distilled water. The difference between titrations corresponds to the number of acetyl groups in a sample of pectin, the content of which *K ac is* calculated by the formula

$$Kau = \frac{43{,}04 \cdot c}{G_1 \cdot 100}, \qquad (4.12)$$

where c is the difference between the quantities of 0.1 N. NaOH solution spent on titration in the experiment with a sample and in a blank experiment, cm 3 ;

43.04 - the equivalent mass of acetyl groups, or in terms of pectin.

$$Kau = \frac{43{,}04 \cdot c}{G_1 \cdot \Pi}. \qquad (4.13)$$

Experience 9. Determination of the ash content of the investigated pectin (OST 18-62-72)

A portion of the studied pectin 0.5-0.8 g is carefully burned in a pre-calcined and weighed crucible on a burner or electric stove until the combustion products cease to be isolated and then calcined in a muffle to constant weight. The total ash content X,%, calculated by the formula

$$X = \frac{G_K}{G_1} \cdot 100, \qquad (4.14)$$

where G to - the mass of pectin after calcination,

To determine the ash insoluble in 10% hydrochloric acid, 30 cm 3 of 10% HCI are added to the ash obtained in the crucible and heated in a water bath for 30 minutes, after which the liquid is filtered through an ashless filter. The filter residue is washed with hot distilled water until a negative reaction to the chlorine ion. The washed filter with the remainder is placed in the same crucible, dried, burned, calcined in a muffle, cooled and weighed. The amount of ash insoluble in 10% HCI , *x* ,%, calculated by the formula

$$x = \frac{G_H}{G_1} \cdot 100, \qquad (4.15)$$

where *G n* - ash, soluble in 10% HCI contained in taken for determination of sample, g.

Experience 10. Determination of pH of 1% pectin solution

Pectin powder (0.3 g) is dissolved with stirring in 30 cm 3 of distilled water containing no carbon dioxide. The resulting mixture is heated for 10-15 minutes, maintaining a temperature of 50-60 0 C, the solution is drained (decanted) from the insoluble residue and the pH is determined using a universal indicator paper or potentiometer using a glass or quinidron electrode. The results of studies of the quality of various types of pectins are presented in a table

Table 4 .1- The main indicators of pectins

Наименование показателей	Type of Pectin		
	Beetroot	Apple	Citrus
1. The content of ballast substances,% 2. Free carboxyl groups, K s 3. The esterified carboxyl groups, K e 4. Acetyl groups, K ac 5. Methoxylated groups, K m 6. The total number of carboxyl groups, To about 7. Methoxy groups, To SNZSO 8. pH of a 1% pectin solution 9. Ash content,% 10. Humidity,% 11. The degree of methoxylation, □			

12. The degree of methylation, and 10. Влажность, % 11. Степень метоксилированности, λ 12. Степень метилирования, а			

Draw conclusions on work and give recommendations on the use of various pectins in food production.

3. Security questions

1. The chemical structure of pectin substances
2. The physiological and biological significance of pectin substances
3. The use of pectins as food additives
4. Characteristics of pectin-containing plant materials
5. Physico-chemical properties of pectin substances and their use in the production process

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects:

- The use of pectins in food production.
- Regulatory acts to ensure the safety of new types of food products.

Tasks for an additional bonus on the ball - rating system:

The use of pectins in the production of baby food, dietetic, therapeutic and prophylactic nutrition.

Laboratory work No. 5

Theme of the lesson : And the study of the foaming ability of dietary cellulose ethers

Learning objectives: to acquire knowledge and practical skills in the field of food production. Determine the foaming ability and stability of the whipped methyl cellulose solutions depending on the concentration and temperature, justify the adoption of a specific technical solution when developing new technological processes for the production of food products; choose technical means and technologies taking into account the environmental consequences of their application.

As a result of studying the topic, students should :

Know: Priorities in the field of food production, the main tasks in the area of food bezop with Nost of the country, providing the population Ba in GOVERNMENTAL nutrients.

Be able to make a specific technical decision when developing new technological processes for the production of food products; choose the technical means and technologies, taking into account the environmental consequences of their use, be evidence-based formulations and technologies for the safe and healthy fo production of Vågå power .

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution in the development of new technological processes for food production .

1. The theoretical part

1.1 Cellulose and its derivatives

In the group of food additives include cellulosic nature produk you mechanical and chemical modification and depolymerization of natural cellulose. Cellulose is a linear polymer that is constructed from L-glucose units connected by 1,4-β-glycosidic bonds.

The presence of β-glycosidic bond leads at the secondary and tertiary structures (conformations of the polymer chains, packing tse drink into fibrils) to the formation of linear molecules with zones Cree stallichnosti (highly oriented portions) including

individual amorphous (non-oriented) portions. This structure causes large mechanical strength of the fibers cellulite PS and their inertness to most solvents and reagents.

Cellulose as a food additive is used in two mo codification of:

microcrystalline cellulose (E 460 i), partially hydrolyzed by acid in amorphous regions most accessible for attack by reagents, and then ground; differs in shortened molecules;

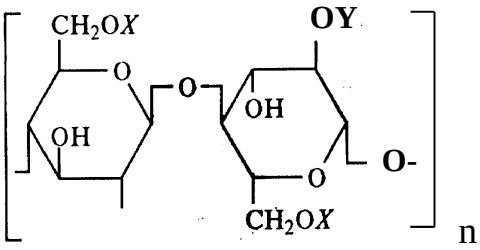
powdered cellulose (E 460 ii) isolated from plant of raw materials (wood, cotton and the like. n.) by removing concomitant ve societies (hemicellulose and lignin), and then crushed.

Cellulose as a food additive used as emulsion Gator, teksturator and as an additive that prevents caking and balling.

Chemical modification of cellulose molecules leads to measurable neniyu properties and, consequently, a change of functions in food systems.

In the formation of cellulose derivatives, the availability and reactivity of hydroxyl groups in β-, D-glucopyranose residues play a large role. In terms of reactivity, hydroxyl groups are arranged in the OH sequence at C_6 > OH at C_2 > OH at C_3.

Food additive status have seven chemical modification of cellulose, which are mono- or diproizvodnye with pro stand ether bond (ether). In general terms, the modified bathrooms cellulose can be described by the following formula:



Food additives are harmless cellulosic nature, since it is not exposed to the gastrointestinal tract of the destruction and stand out are unchanged. Total daily intake of food pro aqueous pulp may be 0-25 mg / kg body weight chelove ka. Their dosages in food products are determined by specific technological tasks.

Methyl cellulose (E461) and hydroxypropyl methylcellulose (E464). Soluble in cold water (but do not dissolve in the hot) wi mations viscous solutions. The viscosity of solutions of these cellulose derivatives, depending on their concentration and is practically independent schaya the pH in the range 2-13, decreases with increasing temperature until gelation that occurs in the range of tempera round 50-90 ° C. Upon reaching the gel point temperature solution viscosity starts to sharply increase flocculation temperature (coagulate to form a friable flake agrega cent). The process is reversible, ie. E. The temperature decrease may be obtained starting solution, due to the reversibility of the formation and rupture of the hydrogen bonds between the polymer mo molecules cellulose ethers and water molecules.

Methylcellulose (MC, E 461) at a temperature of 20 to C or lower and soluble in water forms a straight on transparently viscous solutions that fall flaked when heated above 50 to C; upon cooling, the flakes again go into solution.

Aqueous solutions have binding MC, emulsifying, dispersing and foams of forming properties.

Hydroxypropyl cellulose (E463). Soluble in water at a pace ture not exceeding 40 ° C. Its solubility increases with presence of sucrose. The viscosity of the solutions, which is independent of pH in the range 2-11, decreases with increasing temperature until flocculation, advancing, bypassing the step of gelation, in the inter shaft 40-45 ° C. The process is reversible, and with a decrease in temperature, re-dissolution of this cellulose ether in water will occur. Aqueous solutions of hydroxypropyl cellulose exhibit poverhnos tnuyu activity, acting in disperse systems as a food emulsifier. The solutions of the cellulose derivative are compatible with most natural and synthetic water-soluble poly . Mers - methylcellulose, carboxymethylcellulose, gelatin, alginates, etc., which creates the possibility of joint uses Bani to achieve specific technological effects: to obtain a predetermined value of viscosity, gel forming Bani necessary texture .

Carboxymethyl cellulose (E466). It dissolves in hot and ho lodnoy water to form solutions of different viscosity, which depends on the degree of substitution of

hydroxyl groups in the molecule intact methylcelluloses. Carboxymethylcellulose (CMC) is commonly used for nutritional purposes with a degree of substitution 0,65-0,95 forming pa cross-sections of high and medium viscosity. As in the case of other derivatives GOVERNMENTAL, viscosity CMC solutions decreases with increasing tempera tours, but does not occur in contrast to solutions of additives gelling or flocculation. Another is distinctive Nye characteristic - the dependence of solution viscosity on pH CMC. In the range of 5-9 is almost independent of pH at pH below 3 mo Jette increase, and at pH higher than 10 can be reduced. Blends of carboxymethylcellulose and hydroxypropyl cellulose have a synergistic effect, which is manifested in the increased viscosity of the solution compared to the viscosity of solutions of individual Dob wok. Structure and function of food technology esters cellulite PS are shown in Table 5.

Table 5 .1- Modified cellulose and their technological functions.

E-number	Title	*X*	У	Technological Function
E461	Cellulose	CH_3	H	Thickener, stabilizer, emulsifier
E462	Ethyl cellulose	CH_2CH_3	H	Filler, binding agent
E463	Hydroxypropyl cellulose	$CH_2CH(OH)CH_3$	H	Thickener, stabilizer of recuperators, emulsifier
E464	Hydroxypropyl methylcellulose	$CH_3CH(OH)CH_3$	CH_3	Also
E465	Methyl ethyl cellulose	CH_3	CH_2CH_3	Thickener, stabilizer, emulsifier, foaming agent
E466	Carboxymethyl cellulose sodium salt	CH_2COONa	H	Thickener, stabilizer
E467	Ethyl hydroxyethyl cellulose	CH_2CH_3	CH_2CH_2OH	Emulsifier, stabilizer, thickener

Process of preparation of cellulose ethers comprises the step of increasing its reactivity, because the close packing ka cellulose fibers prevents interaction hydroxyl GOVERNMENTAL groups with the molecules of the reagents. To do this, the cellulose is subjected to swelling or transferred into a soluble state. In industrial

GOVERNMENTAL process conditions lead to heterophasic medium (dispersion Zell vines in acetone or isopropyl alcohol) by treating cellulose with sodium hydroxide solution at a temperature of 50-140 ° C with education Niemi alkalitsellyulozy (mercerization process). Dietary derivatives nye prepared by reacting cellulose with alkyl halides alkalimodifikatsii (formation of methylated and ethylated derivatives) or the corresponding epoxides (preparation hydroxyethyl and gidroksipropilproizvodnyh).

Combining reactants, obtained mixed derivatives nye cellulose, for example, methylethylcellulose, hydroxypropylmethylcellulose, etc. Modification of the cellulose similarly to the starch modifications lead to a change of properties (solubility, solution viscosity, gelling ability and m. P.), Which is reflected at its tehnologo cal functions in food systems. Traditionally, these additives are used in technologies hlebobuloch GOVERNMENTAL and confectionery, dairy and non-fat emulsion GOVERNMENTAL products, soft drinks, where they act qual stve emulsifiers and stabilizers of multicomponent dispersions, suspensions and emulsions, provide the necessary KONSiS tentsiyu and palatability

2. The practical part

Experience 1. Determination of the foaming ability of methyl cellulose solutions

For research, solutions of methyl cellulose are prepared according to the following recipe and technology:

Table 5.2 - Options solutions for research

Name of ingredients	1 option	2 option	3 option	4 option
Cellulose Distilled water	10 1055	15 1050	20 1045	25 1040
Exit	1000	1000	1000	1000

Water is heated to a boil. Hot water at 90 of C (1/5 part norm) pour methylcellulose and left for 30 minutes to swell. The remaining liquid is cooled to a temperature of 10 to S. After swelling of methylcellulose was added thereto and the solution chilled water is mixed thoroughly until complete dissolution of the methylcellulose.

The prepared solutions were cooled to a temperature of 10, 15, 20, 25 of the C and whipped to a mixer to increase the foam volume 3-5 times, thus it is necessary to fix whipper duration and volume of the foam, the height of the mud column to column frothing and foam height after whipping .

Foaming capacity methylcellulose solutions during whipping of claim redelyayut by the formula:

$$ПС = \frac{Hn \cdot 100}{Hp},\% \quad (5.1)$$

where PS - foaming ability,%;

Np - the height of the column of foam, cm;

Hp - height of the solution before whipping, see

Experience 2. Determination of the stability of the whipped mass to delamination

$$У = \frac{Hп3 \cdot 100}{Hп0},\%$$

The stability of the whipped mass to stratification is found from a relationship of:

where Y is the stability of the whipped mass,%;

Hп3 - the height of the foam column after 3 hours of exposure, cm;

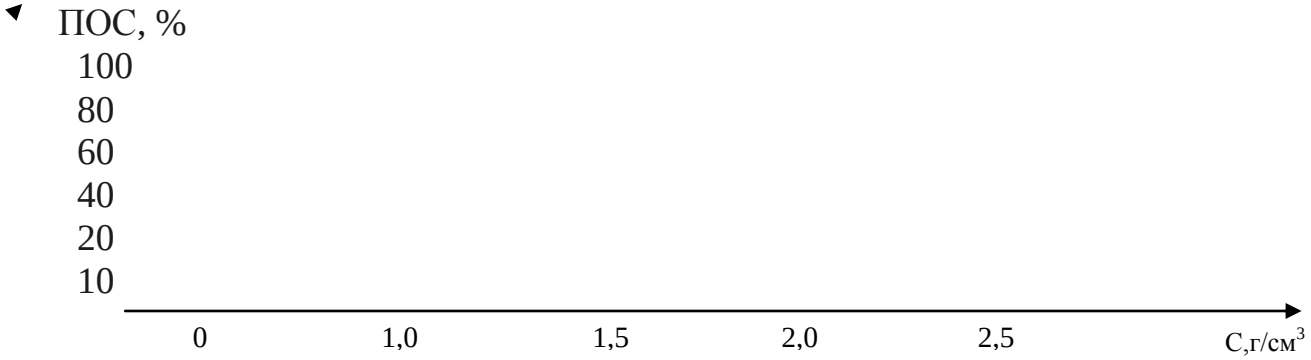
Hп0 - the initial height of the column of foam, see

The results of the experiments are presented in table form:

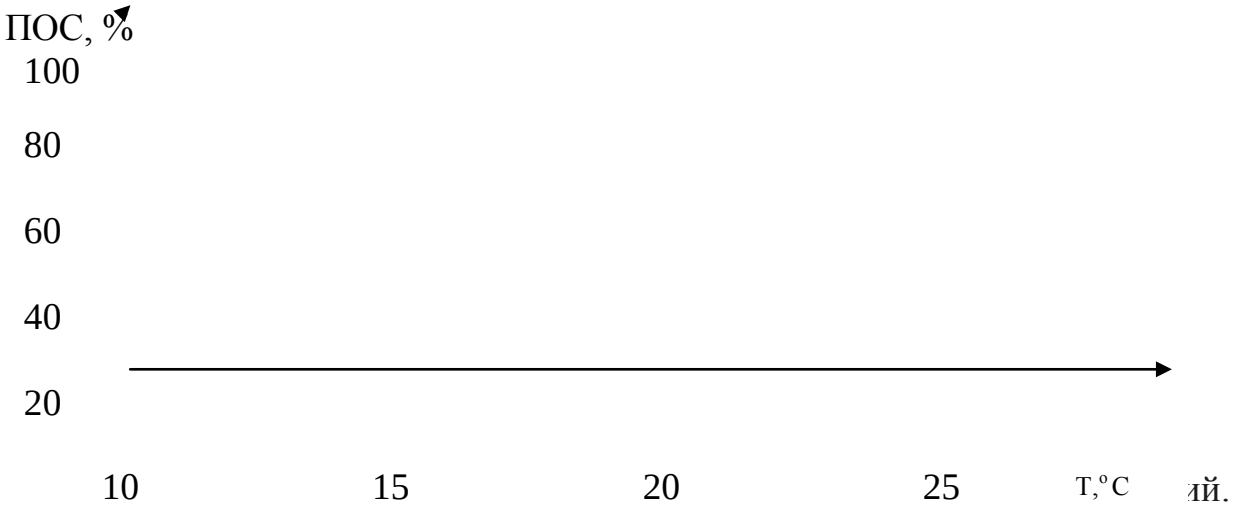
Table 5.3 - the main results of the study

The concentration of solutions of MC	Temperature of MC solutions before whipping, o C	Foaming ability,%	The stability of the whipped mass,%

Build: 1. A graph of the dependence of the foaming ability of MC on the concentration of MC;



2. A graph of the dependence of the foaming ability of MU on the temperature of whipping.



ий.

3. Security questions

1. What dietary cellulose ethers do you know?
2. What is the chemical nature of dietary cellulose ethers?
3. What modifications of edible cellulose ethers are known to you?
4. What are the properties of food cellulose ethers?
5. What physical and chemical factors affect the technological properties of food cellulose ethers?

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects:

- The use of cellulose ethers in food production.

Tasks for an additional bonus on the ball - rating system:

The use of cellulose ethers in the production of baby food, dietetic, therapeutic and prophylactic nutrition

Laboratory work No. 6

Study subject: TO onservanty food. Determination of nitrates and nitrites in meat and meat products

Learning objectives : to become familiar with preservatives that prevent microbial spoilage of food; determine the content of nitrates and nitrites in meat and meat products, Master ionometric and photometric methods for the determination of nitrates and nitrites in meat and meat products. To master knowledge and practical skills in the field of food production

As a result of studying the topic, students should :

Know: Priorities in the field of food production , the main tasks in the area of food bezop with Nost of the country , about careless Ia population Ba in GOVERNMENTAL nutrients .

To be able to accepted s specific e TECHNICAL e solution is, in the development of new technological processes of manufacture of food products; choose the technical means and technologies, taking into account the environmental consequences of their use , be evidence-based formulations and technologies for the safe and production healthy fo about Vågå power .

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution when developing new technological processes for food production .

1. The theoretical part

Nitrite and potassium nitrate (E 250, E 251) is used in the treatment (after) meat mja with GOVERNMENTAL products for preserving red. Myoglobin - pigment red meat at mutually and interacting with nitrites forms ***nitrosomyoglobin*** ,

which gives meat products and pits color pink-red, it does not change during heating. Particleboard = 30-50 mg / kg of human body weight . A similar effect has and potassium nitrate, which by means of enzymes vyd e trolled by microorganisms proceeds in potassium nitrite.

Among the list of toxic and harmful Sub- stances found in the raw materials and products, of great practical importance is the determination of nitrate and nitrite ions, which serve as sources of animal feed and GSS governmental nitrite added to simulate the colors is produced at stve meat products.

The problem of production of organic products pi Thaniah associated with the implementation of instrumental methods cont ro To tsvetoreguliruyuschih substances (harmful for human health) used in the conditions of production and of sufficient accuracy and rapidity. Compared with the above methods, the ion-selective method for determining nitrate and nitrite ions has several advantages, primarily associated with the short duration, accuracy and ease of determination, as well as the compactness of the devices.

Depending on the level of the material base in analytical practice, these or those methods can be applied.

Potentiometric method for the determination of nitrate and nitrite ions involves the use of an ion (nitrate) electrode type EM-LO $_3$ -01 by indicating and measuring the EMF electrode ionometry I-130 (or nitrate). Ionometer is designed to measure the activity of hydrogen ions (pH), od novalentnyh and bivalent anions and cations (pX) oxidative tion-reduction potentials in digital form and in the form of DC signals. The content of nitrate ions mozh but capture without prior measurement of pH. The accuracy of the measurement is not affected by the presence of phosphorus, proteins and fats. It is not recommended to determine in objects containing sodium chloride in mass concentrations of more than 3.5%.

Measurement EMF and determining nitrate concentration Provo DYT in the aqueous extract obtained from the product sample after pre preliminarily extracting the mixture with vigorous stirring, followed by filtration.

To study solutions with low concentrations of nitrate and nitrite ions, the additive method is used. In a 50 cm 3 vytyazh ki measured electromotive force, then it is administered potassium nitrate so that weight sovaya nitrate concentration increased to a value corresponding constituents previously constructed calibration graph. The desired value is calculated from the difference in values.

To determine the content of nitrite oxidized persul fop ammonium to nitrate. The difference between the detected summarioy nym containing nitrate ions and the initial concentration of nits rat ion is nitrite ion concentration .

Photometric methods used in a number of modifications, each of which is of practical importance in the analysis of meats GOVERNMENTAL products and based on a particular chemical rea tion to form specific colored solutions. In the example used a method based on the reaction of nitrite with an N -1-naftiletilendiaminom dihydrochloride and sulfanilami house in the filtrate with a remote protein, followed by visual or photometric determination of the color intensity. When photocolorimetric determining color intensity ki corresponds to the international standard method and used for differences in the evaluation.

They also use a method based on the reaction of nitrite with Griss reagent (a mixture of solutions of sulfanilic acid and □– naphthylamine in acetic acid) in a filtrate with a removed protein, followed by measurement of the color intensity using a photocolorimeter.

2. The practical part

Objects of study **.** Different types of meat slaughtered stomach GOVERNMENTAL and poultry; sausages, products from pork, beef, lamb, poultry; KONSER you, manufactured using sodium nitrite.

Sample preparation. From sausage casing is removed, with sausages stuffed in bacon and languages - surface layer of bacon and a shell with hams, blades, rolls, and pork loin GRU Dinky - surface layer of bacon. The samples were then twice from shrinking in a meat grinder with apertures of the lattice diameter of 3 to 4mm. Products, consisting entirely of bacon with intermediate -GOVERNMENTAL layers

of muscle tissue (in the form of ham, bacon, pressed and similar), completely crushed.

The minced meat is thoroughly mixed, placed in a glass or plastic jar with a capacity of 200 to 400 cm ^{3} , filling it completely , close the lid. The sample was stored at (4 ± 2) ° C until the end of the analysis. The analysis is carried out no later than 24 hours after sampling. A sample of raw products is analyzed immediately after grinding.

Experience 1. Determination of nitrate and nitrite ions by the ionometric method

<u>Materials, reagents and equipment</u>

I-130 ionometer or nitratomer; ion-selective electrode on MO ^{3} ions; reference electrode - silver chloride; scale technical and analytical Kie; conical flasks with a capacity of 250 cm ^{3} ; chemical stacks us a capacity of 50 cm ^{3} ; measuring cylinder with a capacity of 100 cm ^{3} ; volumetric flask with a capacity of 1 dm ^{3} ; pipettes with a capacity of 5 and 10cm ^{3} ; potassium nitrate, analytical grade; an aqueous solution of zinc sulfate mass fraction of 0.45%; aqueous potassium sulfate solution concen centration (1/2 K_2SO_4), 1 mol / dm ^{3} ; an aqueous solution of sodium hydroxide NaOH (0.1 mol / dm ^{3}); aqueous persulfate ammo Nia (NH_4) S_2O_3 mass content of 8%.

In order to determine the working range of concentrations yarns rat ions previously constructed calibration graph.

Construction of a calibration graph. A portion potassium nitrate weighing 10.1 g was dissolved in distilled water in a volumetric count baa capacity of 1 dm ^{3} , the water content is adjusted to the flask meth ki. Prepared solution of potassium nitrate molar concentration of 10^{-1} mol / dm ^{3} ($pNO_3 = 1$). The method of serially diluted Nia obtained from a series of standard solution prepared sol moat potassium nitrate concentration of 10^{-2} 10^{-3} 10^{-4} and 10^{-5} mol / dm ^{3} (pNO_3 are respectively equal to 2, 3, 4 and 5).

In five beakers, 50 cm ^{3} of standard solutions of potassium nitrate are selected , and 1 cm ^{3} of potassium sulfate solution is added to each beaker . Immersing the

electrodes in a beaker in kazh recorded EDS element house Before starting measurements, the electrodes are washed several times with distilled water. Measurements are carried out , passing from dilute solutions to concentrated ones. The obtained measurements are building a calibration curve in coordinates E = f (pNO 3), none dyvaya axis of ordinate value *E* on the abscissa axis (mV) - corresponding values pNO 3.

Analysis Procedure

For determination of nitrate ions in 250 cc capacity conical flask 3 placed canopy ku product weighing 10- 20 g , taken up with 0.01 g , ADD lyayut 100 cm 3 distilled water (preheated to 50-60 of C) and extracted for 30 min with continuous change Shivani. The contents of the flask are cooled and filtered through a paper filter into a conical flask. In the resulting turbid solution, proteins precipitate. To this filtrate was added to 2.5 cm 3 of sodium hydroxide solution the molar concentration of 0, l mol / dm 3 and 10 cm 3 of zinc sulphate solution a mass fraction of 0.45% , was heated 5 min in a water bath at a temperature of ki singing, the flask was cooled and the resulting solution is filtered through a paper filter. The filtrate and the washings after washing on the filter with protein precipitate collected in a volumetric count buoy capacity of 100cm 3 and bring to volume with a solution of potassium sulfate molar concentration of 1 mol / dm 3 . In about transparently filtrate measured emf, the magnitude of which at ka Abelian gauge graph are the initial quantity of nitrate ions in pa alignment. To determine nitrite ions, they are oxidized with ammonium persulfate to nitrates. To 25 cm 3 of filtrate are added 0.5 cm 3 of the solution of ammonium persulphate content of 8 mass %, vigorously ne remeshivayut and after 5 minutes was measured emf, the magnitude of which are the concentration of nitrate ions after oxidation of nitrite ion using a calibration curve. The difference between nai dennym total content of nitrate ions and the initial con centration of nitrate ions is a concentration of nitrite ions present in the test solution.

The content of nitrate ions (mg%) in meat and meat products is found by the formula are found by the formula:

$$X_1 = [(62c * 100): m] * 100, \qquad (6.1)$$

62 is the molar mass of the equivalent of nitrate ions, g / mol;

C is the concentration of nitrate ions before oxidation, found according to the calibration graph, mol / dm 3 ;

100 - the volume of the filtrate, cm 3 ;

m - sample of minced meat, g.

The content of nitrite ions (mg *%)* in meat and meat products is found by the formula:

$$X_2 = \frac{46(C_1 - C)*100}{m} * 100, \qquad (6.2)$$

where 46 is the molar mass of the equivalent of nitrite ions, g / mol;

C 1 concentra tion of nitrate ions after oxidation found on the calibration graph, mol / dm 3 ;

100 - the volume of the filtrate, cm 3 .

Calculate the content of nitrate and nitrite ions in the studied samples and draw conclusions on the work.

Experience 2. Photometric method for the determination of sodium nitrate by the Griss reaction

<u>Materials, reagents and equipment</u>

Meat grinder; Scales Labora Thorn; water bath; volumetric flasks with a capacity of 100, 200 cm 3 ; chemical glass; conical flasks with a capacity of 100 cm 3 ; in Ronchi glass; ashless paper filters; photoelectric colorimeter or spectrophotometer; a solution of sodium hydroxide molar concentration of 0.1 mol / DM 3 ; zinc sulfate solution with a mass fraction of 0.45%; aqueous ammonia molar con centration of 3.0 mol / dm 3 ; a solution of hydrochloric acid with a molar concentration of 0.1 mol / dm 3 ; Griss reagent; a comparison solution containing 1 μg of sodium nitrite in 1 cm

3 ; working solution nitri that sodium; anhydrous sulfanilic acid, p. a. (or r.h.); - naphthylamine, x. h

Reagent Preparation

Griss reagent. Prepare pa photocell 1 and 2 and mixed equal volumes. In case pink solutions appear during mixing, zinc dust is added, shaken and filtered. Prepared immediately before use.

Solution 1. 0.5 g of sulfanilic acid is dissolved in 150 cm 3 of a solution of acetic acid with a molar concentration of 2 mol / dm 3 .

Solution 2. 0.2 g of – naphthylamine is boiled with 20 cm 3 of water, the solution is filtered and 180 cm 3 of a solution of acetic acid with a molar concentration of 2 mol / dm 3 are added to the filtrate . The solution is stored in a dark bottle.

Comparison Solution Prepare using the camp -standard working solution and sodium nitrite.

To prepare a standard solution of sodium nitrite was weighed sample of sodium nitrite containing 1 g of base of the substance. Weight of sample (g) to chemically pure rea tive with a mass fraction of the main substance 99 % calculated by the formula

The sample is transferred to a volumetric flask with a capacity of 1000 cm 3 and adjusted to the mark with distilled water. To prepare the working solution of sodium nitrite 10 cm 3 of stock solution re worn in a volumetric flask of 500 cm 3 and was adjusted to the mark with water. The working solution of sodium nitrite used to construct eniya calibration curve.

To prepare a comparison solution, 5 cm 3 of the working solution is transferred into a volumetric flask with a capacity of 100 cm 3 and adjusted to the mark with water. 1 cm 3 of the comparison solution contains 0.001 mg (or 1 μg) of sodium nitrite.

Analysis Procedure

Weigh 20 g of sample prepared for analysis with accuracy of less than 0.01 g , was placed in chem cal glass poured 35-40 cm 3 of distilled water, over a heated up (55 ± 2) ° C and insist periodically stirring for 10 min Then the hood is filtered through a filter into a volumetric flask with a capacity of 200 cm 3 . A portion was

washed several times and transferred to a filter, washed again with water, then dissolved oh lazhdayut and dilute to the mark with water.

For the preparation of extracts of smoked products from the pigs Nina, lamb, beef and raw sausage mass weighed soi 20 grams pour 200 cm ^{3} preheated to (55 ± 2) ° C distilled water and insist, stirring occasionally for 30 min. Then the extract was filtered through a filter, not ne renosya precipitate on the filter.

20 cm ^{3} extracts are placed in a volumetric flask with a capacity of 100 cm ^{3}, add 10 cm ^{3} sodium hydroxide solution with a molar concentration of 0.1 mol / dm ^{3} and 40 cm ^{3} zinc sulfate solution with a mass fraction of 0.45 % to precipitate proteins. The mixture in the flask grevayut for 1 min in a water bath at a temperature bale Nia, then cooled, adjusted to the mark with water, stirring dissolved and filtered through ashless filter paper.

In parallel, a control is carried out on the analysis reagents of meschaya into a volumetric flask of 100 cm ^{3} instead of 20 cm ^{3} vytyazh ki 20 cm ^{3} of distilled water.

In a conical flask of 100 cm ^{3} is poured into 5 cm ^{3} about transparently filtrate obtained after the precipitation of proteins, 1 cm ^{3} of ammonia solution, 2 cm ^{3} of hydrochloric acid solution, 2 cm ^{3} distillate an isolated water and, to enhance coloration, 5 cm ^{3} comparison solution containing 1 μg of sodium nitrite in 1 cm ^{3}. Then poured into a flask of 15 cm ^{3} Griess reagent and after 15 minutes was measured int sivnost color spectrophotometer at a wavelength of 538 nm or photoelectrocolorimeter with green filter (№ 6) in a cuvette with a thickness of the light absorbing layer 2 cm in relation to the reference solution.

Mass fraction of nitrite *(%) is* calculated by the formula

$$X = \frac{M_1 * 200 * 100 * 100 * 30}{\text{m} * 20 * 5 * 10}, \qquad (6.3)$$

wherein M $_1$ - concentration by weight of sodium nitrite, found on gauge mu graphics g / cm ^{3};

m is the mass of the sample of the product, g;

10 6 - coefficient re water in grams.

Construction of a calibration graph. The 6-dimensional flask together Axle 100 cm 3 each pipetted volumes Started following which a solution of: 0; 1.0; 2.0; 4.0; 6.0; 8.0 cm 3 . The working solution is not added to the first flask, using it as a control.

To each flask was added 5 cm 3 of ammonia solution, 10 cm 3 of hydrochloric acid solution was adjusted with water to the mark and displaced Shiva. The conical flasks with 100 cm 3 pipetted into 15 cm 3 of the prepared solutions, 15 cm 3 Griess reagent and after 15 min at room temperature from measures the intensity of pink color in a spectrophotometer at λ = 538 nm or photoelectrocolorimeter with green svetofil Trom (№ 6) in a cuvette with a light absorbing layer thickness of 2 cm in relation to the comparison solution.

Prepare three series of standard solutions, each time starting with the preparation of the stock solution of the new linkage yarns sodium Rta.

The obtained mean data from three standard sol ditch on graph paper measuring 25 × 25 cm build calibrations purely illustrative graph. On the horizontal axis represents mass concen tration of sodium nitrite (g / cm 3), and the ordinate - respectively corresponding values of optical density. Calibration gras fic must pass through the origin.

The obtained test results tabulated recommend my form:

Table 6.1 - the results of the study of products

Sample	Method used	Content, mg / kg	
		nitrite	nitrates

The results obtained are compared with the students to the maximum admissible values for this type of products do you water and formulate the general conclusion of the work.

3. Security questions

1. What color control substances used in the production of meat products are known to you?
2. What is their toxicological assessment?
3. What methods are used to control the content of harmful color-regulating substances in analytical studies?
4. What is the essence of the determination of nitrate and nitrite ions in meat products?

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects :

- The use of preservatives in food production .

Tasks for an additional bonus on the ball - rating system:

Scientific research in the field of expanding the range of preservatives for production and product supply.

Laboratory work No. 7

Lesson Topic: P Search Flavors

Learning Objectives: to acquire knowledge and skills in the field of food production, familiarize yourself with the types of flavorings, the requirements for quality video e stvu, conditions, etc. , and enforcement and storage;
determine the quality of food ar about vanillin matizator. Learn to justify the adoption of a specific technical solution in the development of new technological processes for the production of food; choose technical means and technologies taking into account the environmental consequences of their application .

As a result of studying the topic, students should :

Know: Priorities in the field of food production , the main tasks in the area of food bezop with Nost of the country , about careless Ia population Ba in GOVERNMENTAL nutrients .

To be able to accepted s specific e TECHNICAL e solution is, in the development of new technological processes of manufacture of food products; choose the technical means and technologies, taking into account the environmental consequences of their use , be evidence-based formulations and technologies for the safe and production healthy fo about Vågå power .

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution when developing new technological processes for food production .

1. The theoretical part

1.1. General characteristic flavors, classification and used e of

Food flavorings are introduced into food products:

- to stabilize the taste and aroma;

- restoration of taste and aroma lost in the process of production or storage of food products;

- enhancing the natural taste and aroma;

- imparting flavor variety of monotypic products (cakes, to and Ramel, etc.);

- giving taste and aroma to tasteless products (soft drinks, chewing gum, etc.).

Modern terminology includes the following flavorings Ba in the definitions can:

Food flavoring (flavoring) is a food additive introduced into a food product to improve its aroma and taste, which is a mixture of aromatic substances or an individual aromatic substance.

Flavor smokehouse (flue) - food aromatizer floor in tea based on the purified fumes used in traditional prefecture smoked.

Flavor Technology (reactor) - food aroma Thies a torus obtained by reacting amine compounds and redutsi ruyuschih sugars at a temperature of not higher than 180 ° C for not more than 15 minutes.

By *origin* flavorings are divided into natures nye (tension y -sectoral) substances identical to natural and synth Kie (synthetic) compound.

Natural flavoring - food flavoring comprising ap about matic substances or mixtures thereof derived from raw materials of vegetable or animal origin, including processed for consumption Tp and -traditional methods of preparing food (drying, fry and of, fermentation, fermentation, and others.) by physical (pressing, ex t ragirovanie, distillation, distillation, freezing, etc.) or biotehnol about cal (fermentation, fermentation, etc.) methods.

Food production using only natural flavors is not always possible, because they are weak, not Art and stably for their preparation and a large amount of raw material required.

Flavor - food aromatizing Torr, with a holding aromatics or mixtures thereof, iden tified in a s Rieux vegetable or animal origin, but obtained by chemical synthesis or isolated from natural raw materials by chemical meth of rows; technology (reaction) and smoking (smoke) Flavors of ry.

Most flavors this group are characterized by high Art and bility, intensity and relative cheapness. Thus, vanillin, I a -governing product identical to natural, fully corresponds to a Nilin jet h Cove vanilla. Thus on aromatization product requires 40 times varied s Chez vanillin, vanilla than that in 250-300 times less.

Artificial flavoring - food flavoring containing individual aromatic substances or their mixtures obtained by chemical synthesis and not identified so far with raw materials of plant or animal origin.

These fragrances possess high stability, brightness and profitability.

Flavors are conventionally divided into sharp and sweet.

Spicy flavors (*spicy)* give the taste and smell of spices, herbs, vegetables, smoke, fish, mushrooms, etc.

Sweet flavors - all kinds of fruit, vanilla, w on koladnye, coffee.

No food codes are assigned to food flavorings. This explains nyaetsya about Mr. Romney amount produced in the world flavors, which Representat in lyayut are usually multicomponent -component composite composition of the system, making it

difficult to question their hygienic evaluation and inclusion in the international digital systems mu codification.

By food flavorings *not include* hydroalcoholic extracts and g lekislotnye extracts of plant material, as well as juices Fruit and Berry (including concentrated), syrups, wines, brandies, liqueurs, spices, etc. in Gia products.

The main sources of aromatic substances can be:

- essential oils, aromatic substances, extracts and infusions;
- natural fruit and vegetable juices, including liquid, pasty and dry concentrates;
- spices and products of their processing;
- chemical and microbiological synthesis.

Recently, the so- called natural aromas — essential oils, spice extracts, and dry plant powders — have been most widely used .

Essential oils - pure isolates of flavors available in the outcome nom with s Riez. Prepared by cold pressing or hydrodistillation (steam distillation). Used mainly for when Denmark smell drinks ma nd onezam, sauces, confectionery and other products.

Spice extracts (oleoresins). A distinctive feature is t Xia content of volatile flavoring agents, such as imparting oc t company of components (pepper extract), do not occur in the corresponding essential oil (pepper essential oil). Spice extracts are obtained from aromatic raw materials by extraction with volatile solvents. Ispolz have are in the production of meat products, canned fruits, vegetables, etc. have goy food.

The dry powders of plants I vlyayutsya dry concentrates apo Matic e Sgiach substances resistant to the production process and store Nia food etc. on the control to the comrade. Obtained by removing water from the initial ground raw material or juice by spraying, sublimation, and other modern technologies.

Flavors are produced in the form of liquid solutions and emul sions with at xux or pasty products.

Poroshkovoobraznye flavors often prepared microcapsules and Rovani - by co-spray-drying a liquid solution arom and tizatora and carrier, which is used as modifits and Rowan starch, dextrin, sugar, salt, gelatin.

Flavors can be dissolved in edible alcohol (ethanol), prop, and glycol or triacetin. For example, propylene glycol improves the stability flav and tori prolongs their storage 2-2.5 times, lowers their consumption by reducing the volatility (exception - flavors for alcoholic drinks).

Quality and durability of the flavoring is largely determined by t Xia solvent, which is almost always included in its composition.

1.2. Amplifiers of taste and aroma

Amplifiers of taste and aroma (smell) - food additives that enhance the natural taste and (or) smell of a food product. They also RESET navlivayut or stabilize the flavor lost during the pro duction pishch e Vågå product, as well as correcting some undesirable nye components of taste and aroma.

Amplifiers of taste and aroma are assigned codes E, and they are included in the 12th functional class Codex Alimentarius .

Their scope extends to almost all food groups. The most well known are: glutamic acid (E620), other ri bonukleinovye acid and salts thereof (increase gastronomich e skie tastes and flavors - salty, meat, fish, etc.); maltol (E636), these l maltol (E637) (Wuxi Lebanon perception fruit, cream and other aromatic and comrade, mainly , the confectionery).

1.3. Hygienic requirements for food flavorings

All batches of food flavorings must be made from high on the quality of raw materials authorized for use in food products, in strict compliance with hygiene standards. They do not need soda p reap any toxic ingredients and should be safe for the item on the consumer of. The flavoring ingredients are agreed upon in the manner established by the Russian Ministry of Health.

It is not allowed the introduction of flavorings in the natural products to enhance their inherent natural flavor (milk, bread, fruit on the stems concentrate

juices, cocoa, tea, coffee, other than dissolving, spices, etc.), as well as to mask defects and falsification of food products.

Scope and recommended maximum dosage aromatic and tizatorov installed by the manufacturer, are governed by the rules in a tive and technical documents and confirmed by the sanitary-epidemiological of a exception.

The use of flavorings in food, etc. about ucts regulated by the technological instructions and recipes for Manuf in leniyu these products are approved and coordinated with the authorities Goss Mr. surveillance in accordance with established procedure.

With a holding of flavorings in food should not exceed mouth and ment of regulations.

A limited number of flavors are allowed in the manufacture of baby food. For the production of breast milk substitutes for infants as flavorings may Execu s Call of only natural fruit extracts (according to TI). For produc t wa cereal products and fruit bases for healthy children older than 5 months allowed flavorings (according TI), and the van and ling, ethyl vanillin (50 mg / kg of product), and the vanilla extract (according TI).

According to the *safety indicators* flavorings must comply with cl e blowing requirements:

- **the** content of toxic elements should not exceed acceptable levels (mg / kg): lead - 5.0, arsenic - 3.0, cadmium - 1.0, mercury - 1.0;

- a flavoring smoking contents of benzo (a) pyrene next page should not s shat 2 mg / kg (n), the contribution of smoking flavoring content in benzo (a) pyrene in the vehi e should not exceed the product O 0.03 mg / kg (n) ;

- the microbiological flavorings should sootvets m Vova require a niyamas shown in Table. eleven.

When using a raw material in the production of flavors stretching and Tel'nykh origin containing biologically active substances, mfd about tovitel must declare their content in the finished flavorings. With a holding of biologically active substances in foodstuffs must not exceed the established limits.

The composition of flavorings be administered foods (juices, salt, sugar, spices, etc.), Fillers (solvents or carriers), edible d of bavki and substances (bitter tonic additives and auxiliary-dressing) having sanitary-epidemiological findings.

In terms of food safety to be limited upotr B Leniye synthetic flavorings and expand produ d GUSTs and use natural juices, infusions, and other essential oils.

1.4. The choice of flavorings and their introduction into food products

The existing names of flavorings are not always completely character and call its flavor, as There may be different versions of flavorings. For example, along with tens and E varieties of cherries have been created and dozens of different flavors "cherry": in one version dominant in a sweet note, in another - drupes, in the third - slight bitterness, etc.

When choosing a flavor should not be inferred at historical and tially "weak" or "sharp" impression, because This is the top n of you flavor, which in the finished product may not appear.

Selection for the particular flavor of the food product opred e wish to set up the physicochemical properties and the technology of producing product. So, art of matizator with clean and strong top notes more suitable for Beza l kogolnyh drinks. Gingerbread is best to choose a more stable with strong basic notes, but after checking its compatibility with the PC on the test nents and heat resistance. Fully sc e thread flavoring effect can only when tasting final food product.

The dosage of flavoring agents in the production of foods and hanging on the desired intensity of flavor, from the organoleptic properties etc. on THE PRODUCT and its production technology.

Approximate doses applying liquid flavorings typically constitute 50 to 150 g , powdery - 200- 2000 , essential oils - 150 g to 100 kg of finished pr of induction.

Flavors may be added undiluted to the product (for example, spice extract powder in the manufacture of sausages) or as a concentrated solution (suspension) in

a suitable solvent (water, oil, alcohol or a small portion of the flavoring product itself). For foods like corn sticks, you can spray diluted ra with a flavoring agent.

The choice of the moment of making a flavor in a particular product is determined I etsya features of its technology. For example, in cold meats, cheeses, sauces add flavor with salt, and non-alcoholic beverages and oil i nye creams - with sugar syrup. In manufacture of products, by subjecting e Mykh heat treatment, to reduce flavor loss during heating and Research Institute recommended aromatize them as late as possible. After adding flavoring, thorough mixing of the product is necessary.

1.5. Supply and storage of flavors

Food flavorings should be delivered in containers suitable for storage and transportation of food products. It is not recommended to use cardboard drums and aluminum containers as packaging.

The consumer packaging of the food product indicates the presence, nature of the aromatizer and its nature.

Shelf life flavorings in accordance with the requirements of the Goss n RF surveillance - from 6 to 30 months, natural essential oils - 12 months.

All types of flavoring agents should be stored in dry, ventilate n nom place at a temperature of from minus 5 to plus 15 □ C separately from each other s Darya.

Party flav and tori must be accompanied by a sanitary-epidemiology-cal s and exception.

2. The practical part

Experience No. 1. Vanillin research

Vanillin is a white crystalline powder with a strong specific odor. By its chemical structure, vanillin is an aromatic aldehyde and home. Vanillin is obtained by the interaction of guaiacol with formic aldegum and home. The empirical formula is $C_8H_8O_3$.

Vanillin as a flavoring agent is widely used in the production of chocolates, and yes, flour products, drinks, etc.

Vanillin stored in clean, dry, cool, well-ventilated areas, not IME w boiling foreign odor, at a temperature not higher than 25 □ C include and tion humidity of 80%.

Materials for work:

- vanillin;
- technochemical scales;
- water bath;
- test tubes;
- glass cups;
- pipettes per 10 cm ^{3};
- strips of white thick paper 10 × 160 mm in size;
- H_2SO_4 reagent;
- 0.5% ethyl alcohol;
- 0.2% solution of chromic acid K;
- 0.5 n solution of Na or K hydroxide (NaOH , KOH);
- 0.1% solution of methyl orange;
- hydroxylamine hydrochloride, 0.5 N solution in 60% ethanol, no minutes trawling by methyl orange (*preparation* : ma sample of reagent with soi 4 g rasstvoryayut in 40 cm ^{3} of distilled H_2O, administered 60 cm ^{3} of ethanol and stirred, the solution is neutralized with methyl orange o mu);
- regulatory documents.

Organoleptic and physico-chemical characteristics of vanillin Representat in Lena in Table. 7.1 .

Table 7. 1 - Organoleptic and physico-chemical indicators of van and lina

Show Name e lei	Characteristics and norms
Внешний вид	Crystalline powder

Цвет	White to light yellow
Smell	Vanilla
Solubility in water	At a ratio of 1:20 - in water to those m perature to 80C
Solubility in alcohol	At a ratio of 2: 1 - 95% ethanol at low heat e Vania
Solubility in H_2SO_4	At 1:20 - in sulfuric acid at cl and bom LOAD e Vania
Melting point, °C	80,5-82
The vanillin content,%, no less	99
Ash content,%, not used for Leah	0,05

2.1. Vanillin Test Methods

2.1.1. Determination of organoleptic indicators of vanillin

Appearance and color is determined visually, which prosmatr and vayut sample volume of 30-50 cm 3 , placed in a beaker of clear glass pax and bridges 100 cm 3 , a diameter of 45 mm and a height of 90 mm . Art and Kahn installed on a sheet of white paper. Color is considered in transmitted or reflected day in clear light.

The smell is determined using a strip of thick white paper measuring 10x160 mm, which is wetted by immersion 1/6 in a freshly prepared 10% solution of vanillin in ethanol. Odor is checked periodically in tech e of 15 minutes. It should be peculiar to vanilla and on.

2.1.2. Determination of solubility of vanillin in water

The course of determination . A portion of vanillin weighing 0.5 g was dissolved in 10 ml of di with tillirova N hydrochloric water, heated to 80 □ C. The solution should be clear and slightly yellowish.

2.1.3. Determination of the solubility of vanillin in alcohol

The course of determination . A weighed portion of vanillin weighing 2 g is dissolved in 1 cm 3 of 95% ethanol with gentle heating in a water bath. The solution should be clear and slightly yellowish.

2.1.4. Determination of the solubility of vanillin in sulfuric acid

The course of determination . A weighed portion of vanillin weighing 0.1 g , weighed with an accuracy of up to 0.01 g , is dissolved under slight heating in 2.0 ml of H_2SO_4 chemically pure The solution should be a clear, light yellow, which is darker than 0.2% chromium solution of sour on th potassium.

2.1.5. Determination of the mass fraction of vanillin

The method is based on the quantitative formation of oximes at interaction minutes Corollary hydroxylamine hydrochloride with compounds which include a carbonyl group. The content of the carbonyl compound (vanillin) ODA e fissioning of an equivalent amount of N Cl , released during the reaction, the titer of vaniem 0.5N sodium hydroxide Na or K.

The course of determination . A portion of vanillin weight of 1 g is weighed in a flask with the parts up to a □ 0.0002 g and contribute to the same 25 cm^3 of 0.5 N solution w d roksilamina Hydrochloride. Immediately titrate Mark H Cl 0.5 N sodium hydr about ksida Na or K in the presence of methyl orange to the appearance of yellow to Raska.

The mass fraction of dye paste in the dry residue is calculated in% by pho p mule:

$$B = \frac{a \cdot M}{m - 20}, \qquad (7.1)$$

and wherein - the volume of 0.5 N hydroxide solution Na or K spent on titers and set, cm^3 ;

M is the molecular weight of vanillin, g (M = 152.1 g);

m - weight of vanillin, g.

2.2. Presentation of work results

1. Describe the progress of work.

2. Report the results of the study in the form of a table. 7. 2 .

3. To draw a conclusion about the quality of the flavoring according to the results and from the following.

Table 7. 2 - Test results of vanillin flavor

Indicators	Actual	The norm
Organoleptic: - appearance - Colour - smell		
Physicochemical: - solubility in water - solubility in alcohol - solubility in sulfuric acid - the content of vanilina,%		

Experience No. 2. Steam distillation of terpenes from citrus fruits

Natural flavors are extracted by physical methods (pressing, extraction, distillation) from the starting materials of plant and animal origin. They are, for the most part nerastv of Rima in the water , ho Rosho soluble in vegetable oils. On the shelf life of an essential oil is strongly influenced to lichestvo terpenes (limonene, citral, Ger and Niola et al.), The most easily oxidized oil compounds.

The experimental technique. Grind a piece of lemon peel or orange about 1 cm ^{2} in size and place in the first tube with 3 ml of water. Then insert a vent tube into the tube, lower the end of which into another tube placed in a glass of cold water. The fluid in the first straight of the tag gently boil until 1-2 mL baa meet the second tube with a colored liquid (condensate), mark its characteristic smell. Add a few drops of condensate to the 1% aqueous solution of potassium permanganate, lane e stir the solution, and mark edited e neniya.

Observations:

Conclusions:

Experience № 3. Preparation flavorings identical manners s Nome

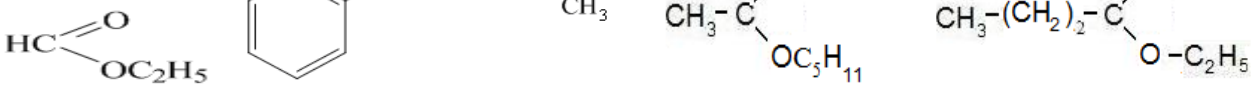
The experimental technique. In four test tubes , add carbonic k and slots (1 ml) and alcohols (2 ml), then add 10 drops of concentrated sulfuric acid, heat the mixture to a boil. After a few seconds, the on to the Tower of groin ether:

a) Acetic acid + isoamyl alcohol → isoamyl acetate (smell c y shi);

b) formic acid + ethyl alcohol → ethyl formate (smell of rum);

c) acetic acid + benzyl alcohol → benzyl acetate (*smell of jasm and on*);

d) butyric acid + ethyl alcohol → e tilbutyrate (smell of an a nasa).



ethyl form and benzyl acetate isoamyl acetate e tilbut and rat

Observations:

Conclusions:

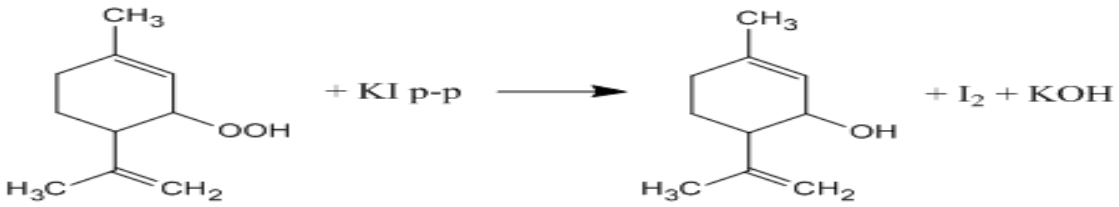
Experience No. 4. Detection of peroxides in terpenes and essential oils

Stake flavoring components in the flavoring for x of di tsya only 10-20%, the rest - solvents or carriers. Flavoring agents having in their composition easily oxidizable components (aromatic and tiziruyuschie components or carrier) must be stored in a dark place in tightly closed containers at a temperature of 5 - 15 □ C, to prevent Oka with Lenia oxygen. Oxidizing eniyu exposed primarily nenas s whelping with Connections, thus formed unstable hydroperoxides into □ - n on the decomposition with respect to the double bond which can be detected by ReA to tion with iodide to and Leah.

The experimental technique. In some tubes to place 1 drop of a 10% solution of potassium iodide and 5 drops of test substances: terpenes (skip and gift, limonene, menthol, etc.), Essential oil (dill oil, camphor, those p pentynyl, peppermint, etc.), carriers (oleic acid, sunflower oil, olive oil, etc.). Shake the mixture vigorously. The liberated iodine on to the roughness of the solution from straw yellow to brown. If the color of the solution is slightly straw yellow (i.e. poorly distinguishable), then add 1-

2 drops of a 1% starch solution to the mixture. In the presence of iodine stain solution Prio b PETA with and Nij color.

Chemism:



α - limonene hydroperoxide

Observations:

Conclusions:

3. Security questions

1. What is the practical significance of food Flavors of lions?
2. In some cases, not allowed the use of flavorings in food processin e O products?
3. What are the requirements for food flavoring about frames?
4. How are flavorings classified?
5. What are the main ways to get food flavorings?
6. How is the selection of flavors for use in vehi e O products?
7. How are food flavorings stored and transported?
8. For some indicators of an assessment of quality and safety n and schevyh Flavors of lions?
9. Why extraction β -carotene from carrots is carried tetrahlormet as Mr rather than water?
10. As evidenced by the observation bleaching solution permang and potassium with Nata mutual of action β -carotene ?
11. Based on the experiment, draw a conclusion about the ratio of dyes to changes in the pH of the solution .
12. Why can not you dissolve natural dyes in hard water?

13. What is the reason for volatility of terpenes with water vapor?

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects :

- The use of food flavorings in food production .
- Regulatory legal acts providing free of pasnosti new types of food products .

Tasks for an additional bonus on the ball - rating system:

Scientific research in expanding the range of food flavorings and their use in food production .

Laboratory work No. 8

Theme of the lesson: In pouring antioxidants on the physicochemical parameters of vegetable oils and fats

Learning objectives: to acquire knowledge and practical skills in the field of food production . To study the effect of antioxidant vitamins (vitamins E, A, C) on the physicochemical parameters of vegetable oils and fats . Learn to justify the adoption of a specific technical solution in the development of new technological processes for the production of food; choose technical means and technologies taking into account the environmental consequences of their application .

As a result of studying the topic, students should :

To know: the effect of antioxidant vitamins (vitamins E, A, C) on the physicochemical parameters of vegetable oils and fats . Priorities in the field of food production , the main tasks in the field of food security in the country .

To be able to accepted s specific e TECHNICAL e solution is, in the development of new technological processes of manufacture of food products; choose the technical means and technologies, taking into account the environmental consequences of their use , be evidence-based formulations and technologies for the safe and production healthy fo about Vågå power .

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution when developing new technological processes for food production .

1. The theoretical part

1.1 Antioxidants / antioxidants /

Like preservatives, antioxidants / AO / are used to increase the shelf life of food products. The basis of their action is ***inhibition*** Oka reactions with Lenia food components. Oxidation occurs under the influence of oxygen, air, light, temperature, technical factors of production. Oxidized lipids in the first place and their compounds, vitamins and other biologically important substances, which reduces the nutritional tse n Nosta product.

Final oxidation products adversely affect organoleptic properties and may be toxic to the human body. For example, direct oxidation of lipid components and leads to the formation of hydroperoxides which are oxidized to produce toxic compounds such as aldehydes, ketones, free fatty acids and many of their polymer products and tion.

To prevent oxidative damage, antioxidants / AO / are used, which are divided into two groups - natural and synthetic.

Natural antioxidants include tocopherols / vitamin E /, ascorbic acid / vitamin C /, terpenes, flavones, carotenoids.

Synthetic antioxidants include butyloxyanisole / BOA /, butyloxytoluene / BOT /, d o decylgallet / DG /, polymethylsiloxane / PMS /, diludine / D /, phenol derivatives, Santokhin, D and Bug, phenosan - acid, etc.

For foods used RAB, BHT, DW, which are inhibitors of f e nolnogo type, ie. E. Inhibit oxidation by reacting with pereoksidn s E radicals, or come into engagement with a synthetic natural antioxidant and E or phospholipids.

The permissible level of synthetic AO in food does not exceed 0.02%.

1.2 Characteristics of fats

Fats - a trihydric alcohol esters of glycerol and Ms p GOVERNMENTAL acids, called triglycerides.

By origin fats are divided into vegetable (oils) and the keenly so nye. As part of natural fats, several tens of various fatty k and a slot were found. Among them, a large proportion belongs to higher fatty monocarboxylic acids, i.e. acids with the number of carbon atoms in the molecule equal to 16 or more. Low molecular fat k and slots are less involved in the formation of fats.

Higher fatty acids, found in the composition of glycerides, Section e lyayutsya into 2 groups: saturated and unsaturated (cat hydrocarbon chain of ryh contains one or more double bonds). For most fat foods are characterized by raznokislotnyh triglycerides, with a holding in the molecule, two or three different fatty acids. Monoacid fats are less common than multacid fats. About 70 different fatty acids are known in nature, but the most commonly found in fats are: of saturated, palm and tin, stearic; unsaturated - oleic, linoleic, lines of Lenovo, arachidonic.

Fats of various origins differ from each other in the composition of fatty acids. The vegetable fats are contained mainly n e saturated fatty acids, and saturated animal predominate. The properties of fats are mainly due to the properties of fatty acids. Thus, the predominance of our s -substituted or unsaturated fatty acids ok but having substantial influence on the fat melting point. It increases with an increase in the number and for and of saturated fatty acids. The higher the melting point of fat, the more difficult it is to digest. The more unsaturated fat (unsaturated) fatty acids and the greater the degree of unsaturation (number of double bonds), the lower the fat melting temperature, so vegetable oils remain Ms d kimi even at temperatures close to 0 ° C and below.

Of the **chemical properties of** the most important for dietary fat is so camping *oxidation.*

During storage, fats may undergo rancidity, in s the title of their ***oxidation*** . Fat oxidation by oxygen in the s spirit without the participation of enzymes called *autoxidation (autoxidation).* This begins edited e nenie fat with formation of peroxy

compounds in the results s Tate oxidation by atmospheric oxygen of unsaturated fatty acids. Then in a second hour GOVERNMENTAL oxidation reactions of peroxy compounds accumulate aldehydes to e tones, low molecular weight acids and other substances imparting fat hot s cue taste. Oxidation and total rancidity of fats are accelerated in the presence of even a small amount of moisture, light, at elevated temperatures. The rate of oxidation increases with increasing number of double bonds in the molecule Ms p GOVERNMENTAL acids in the presence of catalysts - trace metals (copper, iron). Oxidizing e of fat can take place with the participation of enzymes, e.g., oxidation ma p Garin, butter molds at a lesion. Oxidative rancid and of - the most common type of damage to railway and moat. In this case, not only fats degraded organoleptic Propert t wa, but also reduces their bioavailability by reducing with a holding essential polyunsaturated fatty acids (oleic, linoleic, linolenic, arachidonic).

Physico-chemical indicators of fats. Fats are characterized by a certain of torymi common (physical and chemical parameters, which relative to syatsya density, melting temperature and solidification, the coefficient of refractive e Nia, viscosity, acid number, saponification value, iodine value, etc. Comparison obtained in the analysis of physico-chemical parameters Allows you to establish the nature and quality of fat.

The acid number indicates how many mg of potassium hydroxide required for non minutes tralization of free fatty acids contained in 1 g of fat. Communication of Water transportation fatty acids accumulate in the fat at its hydrolysis. The more the benefits of pleasing and are long storage conditions, the greater the accumulated communication of Bodnya fatty acids. The acid number characterizes the freshness and dobrokach e stvennost fat and the fat rich n and schevyh products.

Saponification number is characterized by the number of mg of potassium hydroxide q.s. about dimogo to neutralize both free and bound fatty acids, with a hold in 1 g of fat. High saponification number indicates the straight and absence of low molecular weight acids in fat.

Iodine number indicates the number of grams of iodine which can of connecting

and nitsya to 100 g of fat. Iodine is known to be capable of reacting with nepredel s GOVERNMENTAL fatty acids, joining them at the place FEB th bonds. The more unsaturated fatty acids contained in the fat molecule, the ball b neck amount of iodine it can bind. The higher the iodine number, the fat is more easily oxidized and less stable during storage.

Oxidation of fats by the action of temperature (140-200 o C) is called s vayut ***thermal oxidation*** **.** Thermal oxidation products are cyclic peroxide, which is then converted in the Art and stably secondary products of oxidation of fats - *dihydroxy* possessing ka n tserogennymi properties. Fats, particularly vegetable oils, with a short t e pilaf processing deeper oxidation do not undergo changes due to the natural content of *antioxidants* - tocopherols phosphite and tidov, of carotenoid d GOVERNMENTAL pigments.

2. The practical part

Experience 1. Determination of the amount of fatty acids in the fat molecule (ether number)

The amount of acid precipitation in a fat molecule is determined veiled through "ethereal pure". An ethereal number is the number of milligrams of potassium hydroxide needed to neutralize the fatty acids generated by the saponification of 1 g of fat. This number is determined by the difference between the "saponification number" of fat and its "acid number".

Therefore, the work boils down to the determination of the named values with subsequent calculation by the "ether number" of the amount of higher fatty acids in the studied fat molecule.

Experience 2. Determination of acid number

The acid number characterizes the presence of free fatty acids in the fat. The acid number is expressed by the number of milligrams of potassium hydroxide, which went into the neutralization of free acids in 1 g of fat.

This number is one of the most important indicators characterizing the quality of fat. The acid number of fresh fat usually does not exceed 1.2-3.5. During the storage of

fat, triglycerides are hydrolyzed and free fatty acids accumulate. Increased acidity of fat indicates a decrease in its quality.

Reagents: 1. Vegetable oil with the addition of various antioxidants.

2. The neutralized alcohol-ether mixture (a mixture of alcohol and ether 1: 2, which is neutralized with 0.1 N KOH solution for phenolphthalein)

3. KOH 0.1 n solution

4. Phenolphthalein 0.1% solution

Equipment : 1. Round-bulb flasks, 0, 2 dm^3

2. water bath

3. Flat bottom flasks, 0.2 dm^3

4. Burette

Work order

1 g of sunflower oil is placed in a conical flask , 10 cm^3 of a mixture of alcohol and ether are added and mixed well. Add 2 - 3 drops of phenolphthalein and quickly titrate with 0.1 n KOH with shaking until a pink color appears, which does not disappear within 1 minute.

Acid number is determined by the formula:

$$X = (a * 5,6 * K) : c \qquad (8.1)$$

where X is the acid number, mg;

a is the volume of alkali spent on titration of the test sample, cm^3 ;

5.6 - the amount of mg KOH contained in 1 cm^3 0.1 n KOH;

K is the correction factor for 0.1 n KOH;

C - oil sample, g.

Experience 3. Determination of saponification number

The saponification number is the amount of mg KOH needed to neutralize all fatty acids (free and bound in glyceride) stored in 1 g of fat.

The saponification number of some benign fats and oils has the following values: beef fat - 190 - 200; mutton - 192 - 198; pork - 193 - 200; cow oil - 212 - 247; linseed oil - 187 - 195.

Reagents: 1. Vegetable oil with the addition of various antioxidants

2. KOH 0.5 n alcohol solution (preparation: 30 g of KOH is dissolved in 30 cm 3 of distilled water, adjusted to 1 dm 3 with 95% ethyl alcohol and filtered after 24 hours)

3. HC1 0.5 n solution

4. Phenolphthalein 0.1% solution.

Equipment: 1. Water bath

2. Technical scales

3. Flasks are flat-bottomed, 200 cm 3

4.Burette

5. The round-bottom flask, 200 cm 3 .

Work order

0.5 g of vegetable oil (the same as in option 1) is prevented in one flask (experimental test), 0.5 cm 3 of water in the other (control test) and 15 cm 3 0.5n are added from each of the burettes . alcohol solution of potassium hydroxide. A reflux condenser is attached to the flasks and the mixture is heated with gentle shaking in a water bath at a gentle boil for 30-40 minutes.

After saponification flask add 4 drops fenolftalei on and their contents titrated with 0.5N. hydrochloric acid solution until the pink color disappears.

The saponification number is determined by the formula:

X = [(B - A) * K * 28.05]: s, (8.2)

where X is the saponification number, mg;

b is the volume of a solution of hydrochloric acid spent on the titration of a control sample, cm 3 ;

a is the volume of a solution of hydrochloric acid spent on titration of an experimental sample, cm 3 ;

28.05 - the amount of mg of potassium hydroxide corresponding to 1 cm 3 0.5n. hydrochloric acid solution;

K is the correction factor for the titer of 0.5 N hydrochloric acid solution;

s - a portion of fat, g.

After determining the "acid number * and" the saponification number *, calculate the "ether number" and determine the amount of acid residues (averaged) in the fat molecule.

Experience 4. Determination of the total number of unsaturated bonds in fatty acids

The determination of the degree of unsaturation of the acids that make up the fat can be carried out directly on a fat sample by iodometry or permanganometry. In the case of iodometry, the method is called "determination of the iodine number." The iodine number is the number of grams of iodine that has reacted with 10 Og of fat. The more unsaturated fatty acids in fat, the higher the iodine number.

The determination of the iodine number is based on the iodine addition reaction at the site of double bond cleavage in unsaturated fatty acids, according to the scheme:

$$RC\ H = CH\text{-}R\ '+ I_2 + H_2O \rightarrow R\text{-}CHI\text{-}CH\ (O\ H\ )\ \text{-}R' + H\ I$$

Unreacted iodine is filtered off with sodium thiosulfate.

Reagents : 1 . Vegetable oil with various antioxidants

2. Chloroform

3. Iodine, 0.1n. alcohol solution

4. Sodium thiosulfate, 0.1 N solution

5.Starch, 1% solution

<u>Equipment:</u>

1. Conical flasks on 50 cm ^{3} with traffic jams

2. Burette

3. Pipette on 10 cm ^{3}

Work order

In one flask (test sample), 0.1 g of the studied vegetable oil is stirred (weighed on an analytical balance), in another (control sample) - 0.1 cm ^{3} of water and 5 cm ^{3} of chloroform are added from each burette .

After dissolving a portion of the oil, add 10 cm ^{3} of 0.1 n alcohol solution of iodine in a flask (exactly!) With a pipette, close them with stoppers, mix with shaking and put in a dark place for 5 minutes.

Samples titrated with continuous agitation of 0.1 n. sodium thiosulfate solution until a light yellow color appears. Then 1 cm ^{3} of a 1% starch solution is added and titrated until the blue color disappears.

The iodine number is calculated by the formula:

X = [(B - A) * K * 0.01269 * 100] a: (8. 3)

where In is the volume of a solution of sodium thiosulfate used for titration of a control sample, cm ^{3} ;

A is the volume of sodium thiosulfate spent on titration of the experimental sample, cm ^{3} ;

K - factor coefficient correction for the titer of 0.1 N sodium thiosulfate solution;

0.01269 - the number of grams of iodine equivalent to 1 cm ^{3} 0.1 N. sodium thiosulfate solution;

100 - conversion factor per 100g; s - weight of fat, g.

Count the iodine number (X) by the number of double bonds in the triglyceride molecule.

Experience 5. Determination of peroxide value

Peroxide number of the Features terizes fat content in the primary oxidation products: peroxides and hydroperoxides.

To determine the peroxide value of fats used prei muschestvenno iodometric method. The peroxide value is expressed by the number of grams of iodine extracted from potassium iodide peroxides contained in 100 g of fat.

By reacting with an aqueous saturated fat sol rum potassium iodide in an acidic medium hydroperoxide and peroxide recovered iodine in the free state, which is titrated with 0.01N. hyposulfite solution. in the presence of starch.

The reaction proceeds in an acidic environment. Thus acetic kis lot reacted with a saturated solution of KI ka lija to form hydriodic acid

$$KJ + CH_3COOH\text{-}H \rightarrow CH_3COOK + HJ.$$

Hydroperoxides react with hydroiodic acid according to the equation

$$CH_3 (CH_2)_6 CHCH = CH (CH_2)_7 COOH + 2HJ \rightarrow$$
$$|$$
$$O\text{-} OH$$

$$CH_3 (CH_2)_6 CHCH = CH (CH_2)_7 COOH + J_2 + H_2O.$$
$$|$$
$$OH$$

The released iodine is titrated with hyposulfite

$$J_2 + 2Na_2S_2O_3 \rightarrow 2NaJ + Na_2S_4O_6.$$

Реактивы:

1. Хлороформ;
2. ледяная уксусная кислота;
3. насыщенный раствор KJ;
4. 0,01 н. раствор гипосульфита;
5. 1 %-ный раствор крахмала.

<u>Приборы и оборудование</u>

1. Конические колбы с притертой пробкой на 250 $см^3$;
2. водяная баня;
3. мерные цилиндры на 50 $см^3$;
4. пипетки на 1 $см^3$.

Порядок проведения работы

В коническую колбу отвешивают около 1 г жира, твердый жир расплавляют на водяной бане. В колбу приливают 10 $см^3$ хлороформа, растворив в нем полностью жир, добавляют 10 $см^3$ ледяной уксу

physical and chemical indicators	Sunflower oil			
	No antioxidant	With Vitamin A	With vitamin E	With ascorbic acid
The amount of fatty acids				
Ether number				
Acid number				
Peroxide value				

Saponification Number				
The total number of unsaturated bonds (iodine number)				

3. Security questions

1. What are the functions of antioxidants in foods?
2. How are antioxidants classified?
3. What is the mechanism of action of antioxidants?
4. What physico-chemical quality indicators characterize the oxidative damage of fats and oils?
5. What antioxidant vitamins are known to you?

4. The task for independent work

On an individual assignment, prepare abstracts and presentations of creative projects :

- The use of antioxidants and antioxidants in food production .
- Regulatory legal acts providing free of pasnosti new types of food products .

Tasks for an additional bonus on the ball - rating system:

The use of antioxidants and antioxidants in the production of baby food, dietetic, therapeutic and preventive nutrition

Laboratory work No. 9

Round table: Modern approaches to the use of biologically active additives

Learning Objectives: learn the specifics of marking is biological e ski active d of bavok according to regulatory documents. About the limits of the level of assimilation of materials disciplines, students acquired knowledge and practical e skill and in the field of food production from food and dietary supplements, knowledge of new technological processes of food production , the ability to choose the technical means and technologies, taking into account the environmental consequences of their use .

As a result of studying the topic, students should :

Know: the main regulatory legal acts of the use of food additives in food production . Priorities in the field of food production , the main tasks in the field of food security in the country .

To be able to accepted s specific e TECHNICAL e solution is, in the development of new technological processes of manufacture of food products; choose the technical means and technologies, taking into account the environmental consequences of their use , be evidence-based formulations and technologies for the safe and production healthy fo about Vågå power .

Own methods for analyzing priorities in the field of food production, justify the adoption of a specific technical solution when developing new technological processes for food production .

Materials for work:

Developed by students creative projects, presentations, essays and messages "The use of food and biologically active additives in food production"

The list of issues that are submitted for discussion is determined additionally in preparation for the classes.

1. The theoretical part

BAA is used as an additional source of food and is biological e cally active ingredients to optimize the carbohydrate, fat, protein, into and Tamino and other metabolic at various functional with about distances, for normalization and / or improving the functional status of p ganas and human systems , including products that have to b scheukreplyayuschee, mild diuretic, tonic, sedative and other types of activities in different functional states, to reduce the ri with ka diseases, as well as for the normalization des microflora in zling tract, as enterosorbents.

Supplements should meet the established regulations mp e ments to quality in terms of the organoleptic, physical-chemical, md of biological, radiological, and other indicators to the permissible soda p zhaniyu chemical, radiological, is biological e Sgiach objects prohibited components and their compounds, microorganisms and

other biological aga n comrade, represent a hazard to human health. In biologi in GOVERNMENTAL food supplements regulated by the content of basic active agents.

Requirements for the packaging of dietary supplements and the information on the label (with a publicly SanPin 2.3.2.1290-03)

Packaging of dietary supplements should ensure the safety and quality of dietary supplements at all stages of turnover. When packaging materials should be used dietary supplements allowed for use in a prescribed manner for contact with food produ to Tammy or medicaments s E means.

Information requirements applied to label BAD, install m Xia in accordance with applicable laws and regulations docking at cops governing the imposition information on the label for consum e bit e la.

Information about dietary supplements should contain:

- names of dietary supplements;
- manufacturer's trademark (if any);
- refer to the regulatory or technical documentation, Liabilities and tion requirements that must comply with dietary supplements (dietary supplements for domestic a nd pr about duction and the CIS countries);
- BAA, indicating the order of ingredient in the composition, corresponding to th present them in descending weight or percentage exp e at all times;
- information about the main consumer properties of dietary supplements;
- Information about the weight or volume of supplements in a unit of consumer packaging and e se or volume unit of the product;
- information on contraindications for use in certain types of Zabol e vany;
- an indication that dietary supplement is not a medicine;
- date of manufacture, warranty period or date of the final date of sale of products;
- storage conditions;

- information about state registration of BAS with the number of and forth as you;
- location, name of the manufacturer (seller) and the place of finding e Nia and telephone of the organization authorized by the manufacturer (made of davtsom) to accept claims from customers.

The information listed above is brought to the attention of consumers in any form readable by the consumer.

The use of the term “environmentally friendly product” in the name and when applying information to the label of dietary supplements, as well as the use of other terms and novae that do not have a law of compulsory and scientific justification, is not allowed.

BAA storage requirements

Organizations involved in the storage of dietary supplements must be fitted in floating and ing on the range:

- racks, pallets, merchandise, cabinets for storage of dietary supplements;
- refrigerators (cabinets) for storage of thermolabile dietary supplements;
- mechanization means for loading and unloading (with neo b walk);
- devices for registering air parameters (thermometers, Psihro of meters, GLOCHAMORE of meters).

Thermometers, hygrometers and psychrometers placed away from the LOAD e successive devices, at a height of 1.5 to 1.7 m from the floor and at a distance of not less than 3 m from the door. The performance of these devices is recorded daily in a special journal. Controlling devices must undergo metrological n of Verka in a timely manner.

Each name and each batch (series) stored on separated BAA s GOVERNMENTAL by d dons.

On the shelves, the shelves of cabinets attached racking map with Set and eat here BAA's Party (series), expiry date, number of units xp and neniya.

Supplements should be stored in accordance with their physical and chemical

properties, when usl about ditions as specified by the manufacturer of BAD, observing modes pace e perature, moisture and light.

If during storage, transportation BAA violation, leading to BAD loss of appropriate quality and the acquisition of the hazardous properties, citizens, and other individuals and entities ESTATE t The operator occurring in circulation BAD, must inform about this is a proprietor and Supplements recipients. Such supplements are not subject to storage and sale, for example in lyayutsya for examination.

BAA transportation requirements

The vehicles used for the transport dietary supplements should be sanitary passport issued in due course be in good condition, the cleaning s mi.

Transport conditions (temperature, humidity) must sootvets m Vova regulatory requirements and technical documentation for each type of BAA. Transportation thermolabile BAA carried specialize on bathrooms or cooled Izotov p ical transport.

Supplements are transported and stored in a primary, secondary, group packagings provided acting regulatory and technical document and tion, which must protect from the effects of dietary supplements packaged weatherp p GOVERNMENTAL precipitation, dust, sunlight and mechanical damage.

Porters and drivers and forwarders, if they osuschest in lyayut loader functions must have a personal medical record in a tanovlenii sample.

Vehicles used for transportation of BAD at least of a contamination undergo washing using authorized bodies and uchre w cies gossanepidsluzhby detergents, disinfectants processing th conductive means.

When transporting dietary supplements must have inventories accompanying d of Document, designed in accordance with established procedures.

Requirements for the implementation of dietary supplements

Retail BAD through pharmaceutic established e Nij (pharmacies, drug stores, kiosks and pharmaceutic al.), Specialized m and Gazin health food, food stores (cn e cially departments, sections, kyo with ki).

When placing the unit and the premises for the implementation of dietary supplements should be guided by the requirements of the sanitary rules, etc. at GIH regulations for pharmaceutical institutions and tendering in there.

BAA sold must meet the requirements, the Charter in lennym norms and tive and technical documentation.

Retail sale of dietary supplements is carried out only in consumer packs and forging.

The label of each container space is usable, indicating the period of the STI, the type of product should be retained until the end of the implementation of produ to that.

The implementation of dietary supplements is not allowed:

- not passed state registration;
- without a certificate of quality and safety;
- not corresponding to sanitary rules and norms;
- expired;
- in the absence of proper conditions for implementation;
- without labels, as well as in a case where the information on the label is not sootvets t exists acc but -consistent with the state registration;
- if there is no information on the label applied in accordance with the requirements of the current legislation.

The decision on the disposal or destruction of accepted acc t Corollary to the Regulations on the examination of substandard and dangerous food sh s governmental raw materials and food products, their use or disposal, approved by Decree of Pr and Government of the Russian Federation.

Products withdrawn prior to its use, recycling or destruction shall be kept in a separate room (closet) in a special account with the hours nym indicating its quantity. Responsibility for the safety of the produ to tion borne by the owner.

In the case of the expiry of the registration certificate etc. on the started up the implementation of dietary supplements with not expired shelf life in the presence of the dock at the cops, confirming the release date of the period of the registration of

Mr Foot's license.

Manufacturer of dietary supplements for the media is St. e Denia product, please e necks state registration, and in particular its composition, properties, effects on human health and to loviyah use in accordance with the instruction approved by the established smacking e ke.

2. The practical part

Materials for work:

- samples of dietary supplements;
- GOST R 51074-2003 “Food products. Information for the consumer. General requirements";
- SanPin 2.3.2.1290-03 "Hygienic requirements to organization produ d OPERATION AND turnover biologist and cally active additive (BAA)".

The order of work

1. It is necessary to examine the consumer marking at least three Item.Type about vany BAA, and to conclude that the information request Ca n PiN 2.3.2.1290-03 and GOST P 51074-2003 , availability and accessibility information p mation made at the markings take the form that b l 9.1.

Table 9.1- Conclusions on the compliance of information about dietary supplements with the requirements of SanPiN

Requirements for the mark and alignment of dietary supplements (according to SanPiN 2.3.2.1290-03)	Name of dietary supplement		
	……	……	……

2. Submit and protect the prepared materials for participation in the Round Table.

3. Security questions

1. What is the functional role of dietary supplements for the human body?

2. List the basic requirements for the list of information submitted to the labeling of dietary supplements.
3. Features of the storage of dietary supplements.
4. What conditions must be observed when transporting dietary supplements?
5. Requirements for the implementation of dietary supplements. Supplements, definition, characteristics, method of application.
6. The rationale for the use of dietary supplements in food is a modern diet.
7. Regulatory and legal issues of dietary supplements to food.
8. Nutraceuticals, eubiotics, parapharmaceuticals, their definition and functions.
9. The main differences between dietary supplements and parapharmaceuticals are from nutraceuticals and drugs.
10. The main physiological functions of micronutrients in dietary supplements.
11. Criteria for fortifying foods with micronutrients.
12. Factors that form a negative image in the use of dietary supplements.
13. The main ingredients of functional products.
14. The role of vitamins in the body and in food production.
15. Theory of balanced nutrition.

8 Recommended reading and Internet resources:

8.1. Main literature

1. Kutkina, MN Innovation in the technology of food industry products: Textbook. allowance / M.N. Kutkina, S.A. Eliseeva. - SPb. : Trinity Bridge, 2016 .-- 168 p.

2. Popova N.N. Food and biologically active additives [Electronic resource]: study guide / N.N. Popova, E.S. Popov, I.P. Shchetilina. - The electron. text data. - Voronezh: Voronezh State University of Engineering Technologies, 2016. - 67 p. - 978-5-00032-220-8. - Access mode: http://www.iprbookshop.ru/64408.html

8.2. additional literature

1. Omarov, R.S. Food and biologically active additives in food production: a training manual / R.S. Omarov, O.V. Sychev; Federal State Budgetary Educational Institution of Higher Professional Education Stavropol State Agrarian University. - Stavropol:

Agrus, 2015 .-- 64 p. - Bibliogr. in the book. - ISBN 978-5-9596-1104-0; The same [Electronic resource]. - URL: //biblioclub.ru/index.php?page=book&id=438735

2. Seregin S.A. Biologically active additives in the production of products from animal raw materials [Electronic resource]: study guide / S.A. Seregin. - The electron. text data. - Kemerovo: Kemerovo Technological Institute of Food Industry, 2014. - 104 p. - 978-5-89289-821-8. - Access mode: http://www.iprbookshop.ru/61260.html

3. Food ingredients and biologically active additives in the production of animal products. Laboratory workshop [Electronic resource]: study guide / A.N. Ponomarev [et al.]. - The electron. text data. - Voronezh: Voronezh State University of Engineering Technologies, 2016. - 64 p. - 978-5

8.3. Methodical literature :

1. Shchedrina T.V., Sadovoy V.V. Guidelines for the implementation of laboratory work in the discipline "Food and biologically active additives" in the direction of preparation 03/19/04 Product technology and the organization of catering - Pyatigorsk, 2019. - 96 p.

2. Shchedrina T.V. Guidelines for students on the organization of independent work in the discipline "Nutritional and dietary supplements" in the direction of preparation 03/19/04 Product technology and the organization of catering - Pyatigorsk, 2019. - 32 p.

Internet resources:

1. ELS "University Online Library" - **Access mode:** http://biblioclub.ru
2. Technical regulation of the customs union TR TS 021/2011 On food safety **Access mode:** http://www.gost.ru/wps/portal/pages/
3. TR TS 029/2012 Safety requirements for food additives, flavors and processing aids. **Access mode:** http://www.tsouz.ru/eek/rseek/rseek/seek8/documents

4. Nutritional supplement sites

www.giord.ru

www.ingred.ru

5. Dietary supplement sites

www . mtu - net . ru / pharma - business - analysis

http : // www . registrbad . com / bad / nutrifarmanons

www.fa r o s p lus.ru - journal "Market dietary supplement"

www.fb.ru - Farmanalitik magazine

www.regmed.ru - quality, certification, regulations

www.dsm.ru - monitoring dietary supplements prices and sales

www.preparedfoods.com - functional foods

http://www.fao.org/ - FAO Food Safety Website