**Bulletin 45**

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| УДК 628.31  **S.V. Sverguzova, I.G. Shaikhiev, Zh.A. Sapronova, R.R. Valiev**  **THE USE OF GABBRO-DIABASE PROCESSING WASTE**  **FOR WASTEWATER TREATMENT**  The development of new efficient sorption materials based on industrial and agricultural waste is an actual task. The possibility of using gabbro-diabase processing waste (debris, fragments, dust) for obtaining sorption materials suitable for use in water purification is considered in this article. The reference data of chemical composition and some physical properties (average density, true density, porosity, attrition, impact strength, compressive modulus, water absorption, tensile strength, frost resistance mark, abrasion loss) are presented. As a result of microscopic examinations carried out by high resolution microscope "Hitachi-8-800" the disordered particles of micro- and nano-sized irregular shape with a mesh surface structure and multiple active centers were detected on the gabbro-diabase surface. This indicates the presence of the sorption properties in the examined gabbro-diabase. During the suspension effect research in the gabbro-diabase – water system it was established that the gabbro-diabase particles surface has positive charge. This is evidenced by the acidification of the filtrate in comparison with the suspension. When cleaning model solutions of methylene blue (MB) dye, the purification efficiency was 99,25% with an initial concentration of 10 mg/dm3 and 97,3% for a solution of MB with a concentration of 20 mg/dm3.  **Key words:** gabbro-diabase, processing waste, wastewater treatment, sorption materials, industrial waste recycling, methylene blue, treatment efficiency.  *DOI: 10.17217/2079-0333-2018-45-6-11* |
| УДК 553.411  **V.А. Shvetsov, V.P. Chicheva, О.А. Belavina**  **RATIONALE FOR THE NECESSITY OF JOINT USE OF SAMPLE WEIGHT**  **AND BATCH COMPOSITION VARIATION METHODS IN ROUTINE ASSAY ANALYSIS**  The basic method for finding gold and silver in geological prospecting and gold mining industries is an assay test. Pursuant to regulatory documents the final composition of batch for rock and ore assay analysis is to be selected (or calculated) by a production laboratory analyst using various methodological practices. The present paper provides rationale for the necessity of joint use of methodological practices: sample weight and batch composition variations. This approach is used by the authors in routine assay analysis of the first and second grade ores. The results of two active experiments are given in the article. A party of audit samples of first grade quartz auriferous ore selected from one of the deposits of Kamchatsky Krai was analyzed by assay method during the first experiment. Each assay was analyzed four times using different batches. A party of routine assays of quartz-sulphide ore was analyzed during the second experiment. Each assay was analyzed two times. The first finding of noble metals was performed using samples weighting 50 g, the material of sample weights was exposed to oxidizing roasting and was mixed with batch. During the second finding of gold and silver, samples weighting 10 g, batch with no desoxidant in its composition were used. The operation of oxidizing roasting of sample weights material was excluded. The experiments results showed that the joint variation of sample weight and batch composition enables to define main reasons of gold and silver loss in the process of fire assay of quartziferous ore sample weights (incorrect selection of sample weight and batch composition); in the assay analysis of quartz-sulphide ores the possibility of oxidizing roasting operation exception was proved that increases the rapidness of analysis, workforce productivity, reduces the power consumption, improves the working conditions. In turn the working conditions improvement promotes the professional advancement of production laboratory analysts.  **Key words:** assay routine analysis, batch composition, sample weight variation method, auriferous ores, gold and silver losses.  *DOI: 10.17217/2079-0333-2018-45-12-17* |
| УДК 664.953:597.555.51  **A.Yu. Glukharev, L.K. Kuranova, V.A. Grokhovsky, V.I. Volchenko**  **THE OPTIMIZATION OF CANNED FOODS PRESCRIPTION CONTENT**  **FROM FROZEN COD GONADS AND COD LIVER OIL**  The new assortment of the canned paste from the frozen cod gonads and semi-product of cod liver oil called as “Arctic Energy” was developed. The series of pastes prescriptions with different dosages of basic ingredients was developed using the theory of experimental planning and computer modeling. Organoleptic characteristics, structural and mechanical index (the penetration value) were chosen to assess the optimal degree. The optimal penetration value was identified with the method of pair nonlinear regression between it and consistency index. The generalized optimization parameter was developed using significance coefficients determined experimentally. The obtained regression equation made it possible to find optimal component ratio (% of raw fish mass): cod caviar – 39,86%, semi-product of cod liver oil – 19,5%, cod milt – 40,64%. The prescription of canned pastes was optimized on the basis of this ratio. The canned food sterilization mode for the can № 2 was developed; the actual lethality for microorganisms was 6,6 conventional min. The canned food “Arctic Energy” can be classified as a functional product with high energy value due to the polyunsaturated fatty acids content.  **Key words:** canned food, optimization, paste, gonads, caviar, fish milt, semi-product of cod liver oil, penetration value, sterilization mode, functional product.  *DOI: 10.17217/2079-0333-2018-45-18-27* |
| УДК 664.959.5:597.555.51  **Y.V. Zhivlyantseva, L.K. Kuranova, V.I. Volchenko, V.A. Grokhovsky**  **PEPTONE FROM SECONDARY PRODUCTS OF ATLANTIC COD PROCESSING:**  **TECHNOLOGY, QUALITY, USE**  The safety of the cod filleting waste was determined based on the results of microbiological and toxicological tests. The Atlantic cod bone-muscular waste (BMW) contains 18,95% of a high-grade animal protein and 0,15% of fat, therefore it can be potentially used as a protein raw material to produce peptones. The technology of obtaining peptone from the cod filleting waste was developed and optimized. It is proposed to use a cryoextrusion method at the stage of fish waste grinding. The enzyme use (protosubtilin G3X) in hydrolysis of proteins was substantiated. Proteolytic activity was determined, which was 560,77 mkmol TYR/g, the optimal temperature of enzymatic hydrolysis was 45 ± 1°С. Applying the theory of experimental planning and computer modeling, the series of experiments was performed to optimize the stage of fish wastes enzymatic hydrolysis. Parameters close to optimal were established, such as enzyme concentration of 1,33% to the total waste weight and hydrolysis process period of 3 hours. The chemical and biochemical indexes of the peptone quality obtained with the optimized technology were detected. It was determined that the mass fraction of protein in the product was 92,27%, water was 4,7%, sodium chloride was 2,6%, fat was 0,3 %. The amino acid composition of the product was determined, and its biological value was calculated. Our results showed that the only limiting amino acid in the peptone protein was tryptophan (its skor was 66,8%); the product rationality coefficient was 0,42. In this case it is supposed as a balanced protein product which can be recommended as a complete protein basis to produce sports nutrition products.  **Key words:** protosubtilin, enzymatic peptone, amino acid composition, triptophan, balanced protein product, cod bone-muscular waste.  *DOI: 10.17217/2079-0333-2018-45-28-36* |
| УДК 664.952/.957  **S.V. Zhuravleva, Т.М. Boytsova, Zh.G. Prokopets, А.V. Zhuravleva**  **INFLUENCE OF BIOMODIFICATION**  **ON ORGANOLEPTIC INDICATORS OF MUSCULAR FABRIC FISH**  The influence was studied of *Lbm. acidophilum, Bifidobacterium longum, Streptococcus salivarius spp. thermophilus* on the organoleptic characteristics of saline muscle tissue of fish with different enzymatic activity. A positive effect of biomodification on the organoleptic characteristics of muscle tissue of hydrobionts was established using such microorganisms as *Lbm. acidophilum*, *Streptococcus salivarius spp. thermophilus*. It is indicated that it is expedient for biomodification to use fish species with low activity of their own enzyme systems. A deodorant effect of biomodification of muscular tissue of pollock by lactic acid microorganisms was noted. It is indicated that the biomodification of lactic acid bacteria by the muscle tissue of fish with a high activity of their own enzyme systems and also the use of the *B. longum* maturation as biomodifiers is not expedient.  **Key words:** biomodification, *Lbm. acidophilum, Bifidobacterium longum, Streptococcus salivarius spp. thermophilus*, muscle tissue of fish, whey.  *DOI: 10.17217/2079-0333-2018-45-37-42* |
| УДК 664.143  **L.A. Nadtochii, A.I. Lepeshkin, E.D. Dudnik, A.V. Proskura,**  **M.B. Muradova, R.M. Melchakov**  **THE INFLUENCE OF TEMPERATURE REGIME ON THE GLAZE VISCOUSITY**  **PROPERTIES**  It is important to take into account the rheological properties of food systems at various stages of food product technological process, since these indicators affect on the finished product quality significantly. The researches of the melting point influence on the structural and mechanical properties of the glaze for confection by means of the rotary viscometer RHEOTEST were conducted. The object of this research was food glaze, designed as a coating for muesli bars. The melting point of the glaze, which is most often used in confectionery industry, in particular 85, 90 and 95ºC, was chosen as a changing input parameter of the experiment. The estimated parameter of the experiment was the effective viscosity of the glaze under various mechanical effects on the investigation object with shear rate from 1 to 102 s–1. In order to study the thixotropic properties of the glaze samples, the ability to restore the structure after mechanical action after 15 minutes at rest was evaluated, then the effective viscosity of the glaze samples in the opposite direction (with a shear rate from 102 to 1 s–1) was measured. In result the influence of the temperature regime on the effective glaze viscosity was proved: at 85ºC the glaze does not harden because of the maximum value of viscosity coefficient, such temperature is optimal in terms of the recovery degree of the investigated product; at 90ºC effective viscosity dependence on shear rate was lower on 5% compared to the sample at 85ºC; at 95ºC the product showed the lowest values of the effective viscosity coefficient. The glaze sample produced at the recommended melting point (85ºC) was analyzed in terms of the consistency of the finished product with an automatic digital penetrometer, that made it possible to characterize the glaze as a too hard object with a limited possibility of spreading.  **Key words:** glaze, rheological properties, effective viscosity, thixotropic properties, shear rate, melting points, penetration, consistency.  *DOI: 10.17217/2079-0333-2018-45-43-49* |
| УДК 634.5:637.514  **N.L. Naumova, A.V. Buchel, A.A. Lukin, I.Yu. Migulya**  **THE STUDY OF THE CEDAR NUT KERNELS CAKE APPLICATION**  **IN THE LIVER PATE FORMULATION**  The possibility of using cedar nut kernels cake in the liver pate preparation was studied. The substitution of 10,0% of beef liver in liver pate for a similar amount of ground nut kernels cake helps to form slightly sweet taste and more delicate consistency of the finished product; to increase protein content (by 14,9%), ash content (by 11,6%), minerals, such as manganese (in 4 times), magnesium (in 2,5 times), phosphorus (in 1,6 times), calcium and copper (in 1,4 times), zinc (by 15,5%), iron (by 7,4%); to decrease in the vitamin A content by 27,5% with stable amounts of vitamins E and D3. The addition of cake into the liver pate formulation in the proposed dosage does not have a negative impact on the physicochemical and microbiological quality indicators of the finished product. For the first time, the practical possibility of ground nut kernels cake using in the amount of 10,0% in the liver pate production of the increased mineral value was established.  **Key words:** liver pate, cedar nut kernels cake, mineral value.  *DOI: 10.17217/2079-0333-2018-45-50-57* |
| УДК 664.858  **N.A. Frolova**  **OPTIMIZATION OF MARMALADE PRESCRIPTION DUE TO THE INTRODUCTION**  **OF FRUIT AND BERRY RAW MATERIALS OF THE AMUR REGION**  A scheme for the complex processing of berries growing on the territory of the Amur Region (currants, blue-berries and cranberries) including the extraction of juice and the production of phyto powder from the pulp remained after the extraction of juice for the purpose of complex waste processing and additional enrichment of marmalade with biologically valuable ingredients contained in the pulp (phyto powder) was proposed. The technology of increased biological value marmalade production through the use of juices and herbal powder of currants, blueberries and cranberries with complete elimination of synthetic additives from the prescription was proposed. To reduce the calories of products, sugar was replaced with maple syrup. The optimal ratio of the injected juices and the phyto-powder into the marmalade, taken in equal proportions, which was 2:2 to the total weight of the formulation components, was determined. The biological and energy value of the finished products was examined. Studies of organoleptic and physico-chemical indicators of marmalade were conducted. The established expiration date of the marmalade was 2 months.  **Key words:** marmalade, biological value, berries, currants, blueberries, cranberries, juice, phyto powder.  *DOI: 10.17217/2079-0333-2018-45-58-65* |
| УДК 664.91/.94  **Yu.P. Shulgin, Yu.I. Prikhodko, R.Yu. Shulgin, T.Yu. Shkarina**  **QUALITY AND BIOLOGICAL VALUE OF CANNED FOODS**  **ON THE BASIS OF NON-TRADITIONAL MEAT RAW MATERIALS**  An assortment of new canned food based on kangaroo meat and additional components having reduced energy value was developed. The assessment of their quality and biological value was carried out. The content of kangaroo meat in natural canned food was 90,0%, in meat-growing canned food was 45,0%. The meat-growing canned food product includes vegetables and boiled-frozen Cucumaria Japanese as the additional source of collagen. The ready-made canned food based on kangaroo meat differed from products with beef in low fat and reduced energy value. They did not contain frozen fat. In the natural canned food based on kangaroo meat, protein content was 20,0–21,0%, animal fat – 2,1–2,5%; in combined canned food – 16,6–17,6% and 1,6–1,9%. The canned food based on kangaroo meat is the additional source of iron, zinc, thiamine, riboflavin and collagen-forming proline amino acid. The content of these nutrients in 100 g of the products can meet the daily need of an adult by 15% or more. The canned food is recommended as a mass consumption product, as well as for basic and specialized diets correction.  **Key words:** kangaroo meat, canned food, content, proteins, fat, proline, minerals, vitamins.  *DOI: 10.17217/2079-0333-2018-45-66-72* |
| УДК 558.535.8(571.66)  **T.L. Vvedenskaya, А.V. Ulatov**  **THE INFLUENCE OF FISH PROCESSING PLANT DRAINS ON THE ECOLOGICAL STATE**  **OF KANONERSKY BROOK (AVACHA RIVER BASIN)**  Two fish processing plants are situated in the lower part of Kanonersky brook, which is one of major tributaries of the Avacha river. The fish processing wastes of them are thrown partially into this brook. Significant exceeding in the maximum allowed levels of ammonium, phosphates and iron for the fishery reservoirs was indicated due to the results of hydrochemical analysis of water samples from this zone. The water quality can be classified as «clean» in the area lower the first plant, but after the plants and near the brook's mouth where concentration of dissolved oxygen is low and oxygene biological consumption is high the water can be classified as «extremely polluted». No macrozoobenthos was observed lower the plants, except sporadic pollution-tolerant invertebrates. No juveniles of the Pacific salmon were registered in the lower part of the brook during the whole period of observation, but some individuals of Dolly Varden trout (*Salvelinus malma*) were observed upward the plants and three-spined stickleback was found in the brook's mouth.  **Key words:** anthropogenic pressure, Kamchatka, water quality, macrozoobenthos, pacific salmon, ecological state.  *DOI: 10.17217/2079-0333-2018-45-73-79* |
| УДК 582.272.462(265.5)  **N.G. Klochkova, T.A. Klochkova**  **REVISION OF THE SPECIES COMPOSITION IN THE MARINE ALGAL FLORA OF EASTERN SAKHALIN ISLAND WITH RECORDS OF NEW SPECIES**  In this paper, we provide a checklist of marine algal species, which are distributed on the eastern coast of Sakhalin Island. It was based on the revision of published phycological records, and also include new records of algae found by us from Artsishevsky Cape during field studies conducted on Sakhalin Island in August 2013. This expedition was aimed to investigate the species composition and coenotic structure of kelp communities on the southern coast of Sakhalin. The total checklist of algae from the eastern Sakhalin includes 153 species, including 28 species newly recorded for this area (Chlorophyta – 4, Ochrophyta – 10, Rhodophyta – 14).  **Key words:** algae-macrophytes, eastern Sakhalin, new species records, revision of algal flora.  *DOI: 10.17217/2079-0333-2018-45-80-97* |
| УДК 574+556.115:579+556.555.6  **S.V. Muradov**  **ENVIRONMENTAL INTERACTIONS BETWEEN THERMOMINERAL WATERS**  **AND AUTOCHTONOUS MICROFLORA OF SILT SULPHIDIC PELOID**  The results upon the study of the thermomineral waters effect on the specific microbial community of the silt sulphide therapeutic mud obtained from Lake Utinoye in the southeast of Kamchatka were described. Long-term observations for the mud treatment field ecological state prove the available substandard indicators of its cover waters and bottom sediments sanitary condition. The autochthonous microbial community inhabiting in this lake does not provide the restoration of the required therapeutic mud conditions due to the changes occurred. The thermal waters toxic effect causes the lake bottom sediments cleaning abilities decrease. It was detected during the peloid cultivation in distilled water and in water with different amount of thermomineral water.  **Key words:** thermomineral water, cover waters, peloid, autochthonous microbial community, therapeutic mud, sanitary condition.  *DOI: 10.17217/2079-0333-2018-45-98-102* |
| УДК 581.526.3(262.5)  **O.V. Stepanyan**  **MACROPHYTOBENTHOS OF THE NOVOROSSIYSK BAY (THE BLACK SEA):**  **DEGRADATION UNDER CONDITIONS OF ECONOMIC ACTIVITY**  **AND CLIMATE CHANGES**  The transformation in the structure of the phytobenthos of Novorossiysk Bay began in the mid-2000s and has the features of a degressive succession. In the early 2010s, the reconstruction and expansion of the new Russian seaport was started. It caused the necessaty to assess the state of macrophytobenthos before the start of large-scale changes in the coastal zone and the water area of the bay. As a result of macrophytobenthos monitoring in this bay during the summer of 2011 the presence of 102 species of algae-macrophytes (green – 26, red – 53, brown – 23) was detected. The representatives of the genera *Ulva, Cladophora, Ceramium, Polysiphonia, Ectocarpus* dominated in number of species. The greatest species diversity was observed for relatively clean areas of the Eastern and Western coast, which are far from the port waters. The Shannon diversity index (H) for the port area was 1,64, 2,08 – for the western coast and 2,18 – for the eastern coast. The biomass of algae in Novorossiysk Bay varied in a significant range: 0,3 kg/m2 was in the port area, 1,5–1,8 kg/m2 was in the middle part of the bay, 3–3,5 kg/m2 – at the bay exit. By the end of 2000s the species diversity of the Novorossiysk Bay phytobenthos had decreased by 1,5 times in comparison with the 1970s, mainly due to the cold-water group of algae. At present poly- and mesosprobic species of warm-water complex dominate here. The area of brown algae *Cystoseira* which is the main edificator and the environment – forming type of Mediterranean-type thickets has decreased by 3 times compared to the 1960s. Due to the Black Sea surface layer warming which negatively impact on the *Cystoseira* algae communities it is evident that unreasonable economic activity can lead to the complete disappearance of long-term black sea algae communities in the Novorossiysk Bay.  **Key words**: pollution, climate changes, macroalgae, the Novorossiysk Bay, the Black sea.  *DOI: 10.17217/2079-0333-2018-45-110-116* |