

## **BIOLOGICAL SCIENCES**

### **Biological Resources**

UDK 639.5(470.64)

#### **Methods of Breeding Medical Leech (*Hirudo Medicinalis*) in Laboratory Conditions in the Kabardino-Balkarian Republic**

**Julietta K. Kozhaeva, Alim A. Kekkeзов**

**Abstract.** The article presents the results of a research conducted in 2018-2024 to study the methods of keeping and breeding the medicinal leech (*Hirudo medicinalis*) in laboratory conditions in the Kabardino-Balkarian Republic. The aim of the study is to evaluate the effectiveness of using various substrates when laying medicinal leech (*Hirudo medicinalis*) queens in laboratory conditions. The following substrates were used in the studies: lump peat; lump peat with moss in a ratio of 2:1; pure moss collected from trees; moss collected from clay soil with an admixture of clay; clay-sand mixture covered with a layer of moss on top. When using different types of substrates for queen cells, it was found that the maximum size of the laid cocoons and the yield of offspring was found in the variant using pure tree moss. Of particular importance is the fact that an autumn queen was involved in the experiments. The mortality rate of queens during the cocoon laying period was highest for substrates such as clay-sand mixture and lump peat. No mortality of queens was recorded in substrates such as wood moss and moss-peat mixture. Lump peat, traditionally used in the breeding of medicinal leeches in biofactories and industries, showed one of the worst results in most parameters (fertility and mortality of queens).

**Keywords:** medical leech, substrate, *Hirudo medicinalis*, moss, breeding, peat

## **AGRONOMY, FORESTRY AND WATER MANAGEMENT**

### **General Farming and Crop Production**

UDK 633.15:631.81.095.337(470.64)

#### **The Impact of Silicon-containing Preparations on Corn Productivity in the Kabardino-Balkarian Republic**

**Yuri Mukhamedovich Shogenov**

**Abstract.** The article presents the results of research conducted in 2021-2023 on the Rodnik 180 SV hybrid corn crops. The purpose of the study is to study the features of the formation of the productivity of the early-ripening hybrid depending on foliar treatment with silicon-containing preparations at different stages of vegetation on leached chernozem in the foothill zone of Kabardino-Balkaria. Foliar application of silicon-containing preparations was carried out three times – in the phase of 5-6 leaves, 8-9 leaves and double treatment 5-6 + 8-9 leaves. During field studies it was established that foliar treatment with silicon-containing preparations increases the number of cobs per 100 plants when using Kelik Potassium + Silicon by 15.0-17.6%, NanoSilicon by 13.3-21.9% and Microvit-6 Silicon by 18.3-18.5%, as well as the length of the cob within 14.7-28.3%, the weight of grain per cob by 14.2-26.6% and the yield of grain per cob by 2.8-6.1%. Treatment of the Rodnik 180 SV corn hybrid with NanoSilicon (double treatment in the 5-6 and 8-9 leaf phases) and Microvit-6 Silicon (single treatment in the 5-6 leaf phase) preparations allowed, in the conditions of the foothill zone of the Kabardino-Balkarian Republic, to increase annually the yield to 1.6-2.7 t/ha of grain with high yield properties.

**Keywords:** corn hybrid, number of ears per 100 plants, length of the cob, number of grains in the cob, grain weight from 1 cob, grain yield from the cob, yield, productivity, silicon

## **Horticulture, Vegetable Growing, Viticulture and Medicinal Crops**

UDK 634.737:632.954(470.64)

### **Optimization of the Technology of Growing Tall Blueberries when Using Herbicides in Kabardino-Balkaria**

**Elena M. Egorova, Farida D. Taumurzayeva**

**Abstract.** The article presents the results of studies conducted in 2023-2024 on highbush blueberry plantations at Yug Agro LLC, KBR. The cultivation technology involves placing plants on ridges and artificially sodding the row spacing with mixtures of perennial grasses. In order to reduce the competitive potential of weeds, the contact herbicide Megapolis is used in the near-trunk strip. Due to the uneven terrain and the lack of ideal weather conditions during herbicide treatment, the product often drifts onto cultivated plants. This is accompanied by growth inhibition, a decrease in leaf surface area, and suppression of blueberry plants. The purpose of the study is to study the effect of foliar application of the growth regulators Fitaktiv Extra (0.05%) and Aminozol (0.5%) to reduce the toxic effect of herbicides used in the near-trunk strips. Three application periods were tested: prophylactically (3 days before working with a desiccant), the day after working with a desiccant, and combined (both before and after working with a desiccant). The study proved the reliable effectiveness of the protective effect of both preparations when applied foliarly the day after the desiccant. On average, over two years of research, it was found that in this case, the decrease in the area of leaves formed immediately after working with a desiccant is 0.6-0.7 cm<sup>2</sup> (10-12%). At the same time, such a decrease without protection reaches 40%. The effect on other growth indicators is similar. Prophylactic use of growth regulators have not had a significant protective effect, and double is not significantly better than a single application after desiccant, and therefore is not advisable.

**Keywords:** blueberry, herbicide, Fitaktiv extra, Avinosol, leaf, stress, inter-row treatments

## **ANIMAL SCIENCE AND VETERINARY MEDICINE**

### **Animal Pathology, Morphology, Physiology, Pharmacology and Toxicology**

UDK 619:616.441:636.2

### **Pathomorphological Analysis of the Transformations of the Thyroid Gland of Swiss Cows in Endemic Conditions**

**Aues Kh. Pilov, Timur T. Tarchokov, Zaurbek M. Aisanov**

**Abstract.** In Kabardino-Balkaria, the thyroid gland of cows is influenced by the biosphere and transformation. It was revealed that against the background of the hypofunctional state of the gland, focal strumoid changes of a focal nature are detected. Such changes were considered as

prenatal conditions that affect the hormonal balance of the entire animal body, affecting its condition and productivity. The progression of the hypofunction of the gland led to a further increase in follicles, flattening of the epithelium, which indicated a hypofunctional state of the gland, against which nodular and diffuse macrofollicular strumoid changes, and abundant desquamation of thyrocytes in colloidal masses develop. It was noticed that the increase in signs of hypofunction led to compression of blood vessels, disruption of blood supply and evacuation of colloid into the vascular bed. This process was often the first stage of presubstantial states. It was also revealed that the compensatory mechanism in the affected glands led to the formation of foci of increased proliferation in the form of papillomatous protrusions of connective tissue covered with high, prismatic thyrocytes. The forms of goiter lesions, their frequency and nature indicate the unity of the phylogeny and ontogenesis of the thyroid gland in humans and cattle, as well as the unity of pathogenesis in all mammals.

**Keywords:** fibrosis, calcification, hyalinosis, desquamation, necrosis, hemosiderin

## **Private Animal Husbandry, Feeding, Feed Preparation and Livestock Production Technologies**

UDK 636.598.082.4(470.57)

### **The Influence of Age on Reproductive Performance of Large Grey Geese**

**Rinat R. Gadiev, Alfiya R. Gayfullina, Olga S. Yakushenko**

**Abstract.** The article presents data on the reproductive qualities of ganders of the parent flock of the large gray breed in the 1st, 2nd, 3rd and 4th years of use, as well as the results of age selection of parent pairs when using them on geese of the 2nd biological cycle. The purpose of the study is to assess the reproductive qualities of ganders of different ages and the effectiveness of age selection. For the first time, the reproductive qualities of geese of different ages were studied and the effectiveness of age selection of parent pairs was shown. The studies were conducted in the conditions of Bashkirskaya Ptitsa LLC in the Blagovarsky District of the Republic of Bashkortostan. It was found that, compared with the first year of use, the live weight increased and amounted to 15.5% in ganders of the second year of use, 25.4% and 22% in the third year of use. At the same time, the age of ganders affected the volume of ejaculate, although the activity of sperm in the ejaculate did not change significantly in ganders of the first, second and third years of use. Subsequently, the fourth-year ganders show some decrease in sperm activity compared to other age periods. The best reproductive capacity indicators were found in the third-year ganders, as evidenced by the indicators of sperm concentration in the total volume and the number of active sperm in the ejaculate. In general, when selecting parent pairs by age, it is advisable to select ganders of the second and third years of use for females of the second year of the biological cycle.

**Keywords:** ganders, age selection, reproductive capacity, egg weight, egg incubation, hatching of goslings

## **The Effectiveness of Growing Quails for Meat, Depending on the Depth of the Mound of Bedding Material in the Poultry House**

**Viktor V. Malorodov, Valeriya E. Polyakova,  
Denis N. Golentovskij, Amina A. Edilova**

**Abstract.** The study was conducted in order to identify the appropriate depth of bedding material for growing quails for meat. The work was carried out in the winter period of 2023-2024 in the conditions of the educational and production poultry house of the Russian State Agrarian University – Moscow Agricultural Academy named after K. A. Timiryazev. For this purpose, 3 groups of meat and egg quails of the Manchurian breed, 57 heads in each, were formed using the pair-analog method. The birds were grown on deep litter with a stocking density of 0.02 m<sup>2</sup> per 1 head with constant access to feed and water in conditions of a standard microclimate up to 39 days of age. The depth of the bedding material embankment in group I (control) was 10 cm; in group II – 7 cm; in group III – 5 cm. Growing quails on litter 5 cm deep led to an increase in the survivability of livestock at the age of 5 days by an average of 4.0%; reduction of feed consumption per 1 kg of live weight gain over 2 weeks of rearing by 1.59 kg; improvement of the condition of the soles of quail feet by an average of 1.4 points and the quality of the litter by 2.5 points. No significant difference in productivity and meat qualities was observed between quails of different groups. Reduction of the depth of the litter mound from 10 to 5 cm allows, while maintaining the zootechnical efficiency of quail meat production, to reduce the cost of litter material and improve the condition of the soles of the birds' feet.

**Keywords:** quail, deep litter, meat productivity, quality of bedding material, condition of the sole of the bird's foot, litter moisture

## **The Influence of Probiotics in the Diets of Young Cattle on Biological and Economic Characteristics**

**Yulia V. Matrosova, Alexander A. Ovchinnikov,  
Dmitry A. Savenko, Olga S. Yakushenko**

**Abstract.** The work was carried out on the basis of Berkut LLC, Republic of Kazakhstan, on young cattle with the aim of comparative evaluation of metabolic processes in the body of calves against the background of the use of probiotics RuminPro and Actisaf in the feeding diet. The addition of yeast probiotics RuminPro and Actisaf to the diet of calves of the milk period at a dose of 3 g / head per day showed their positive effect on the level of enzymatic activity of the rumen microbiome in its fermentation of easily and difficultly split carbohydrates, as well as proteolytic activity. At the same time, RuminPro provided an increase in the total protein in the rumen chyme by 13%, including protein nitrogen – by 20.1%, and VFA – by 15%, while with Actisaf the difference was 5.8%, 9.1 and 7.0%, respectively. A 14.8% decrease in the ammonia level in the rumen contents in the RuminPro supplement group showed its greater entry into the liver for protein synthesis, while in the Actisaf group the difference was only 6.9%. During the growing period, the calves with RuminPro supplement demonstrated a higher protein-synthesizing function of the liver and an increase in the total protein content in the blood from 0.6 to 5.6%, and an optimization of the albumin to globulin ratio (1.3). In both groups of calves, probiotics increased the carotene level in the blood, the alkaline reserve of the blood, and did not

have a negative effect on the mineral metabolism of calcium, phosphorus, and magnesium. The RuminPro supplement increased the live weight of calves by six months of age by 4.9%, and Actisaf by 1.7%. The average daily gain of young animals using RuminPro exceeded the control group by 5.76% ( $P \leq 0.001$ ), with Actisaf – by 1.71% ( $P \leq 0.001$ ), which made it possible to increase the profitability of live weight production of calves in the dairy period by 2.7% and 0.5%, respectively.

**Keywords:** calves, probiotic supplements, Romanian Pro, Actisaf, blood, scar digestion, gain, live weight, feed costs

UDK 636.22/.28(470+571)

## **Beef Cattle Breeding in the Russian Federation: Points of Growth**

**Dagir R. Smakuev, Rustam Z. Abdulkhalikov, Mukhamed M. Shakhmurzov,  
Vitaly Kh. Vorokov, Anatoly F. Shevkhuzhev**

**Abstract.** In recent years, the Russian Federation has seen a reduction in the share of cattle production in live weight in the total volume of livestock and poultry production from 21.3% in 2015 to 17.3% in 2023. The conducted analysis of the development of beef cattle breeding, as well as a comprehensive assessment of the probonitized livestock, made it possible to identify the main points of further industry growth. One of them is the structural shift in production towards large commercial agricultural enterprises with a strong resource base. In 2015-2023, the number of breeding herds in the country decreased by 22.5%, and the number of breeding animals decreased by 25.4%. Currently, there are 13 specialized meat breeds and 9 intra-breed types in the country. The main ones are the Kalmyk, Hereford, Kazakh white-headed, Aberdeen Angus breeds, which account for 96.2% of the total livestock. The largest increase in livestock numbers in 2015-2023 was demonstrated by animals of the Russian polled, Galloway and Hereford breeds, with a sharp reduction in Aberdeen Angus, Limousin, Charolais, Kalmyk and Simmental cattle. According to the cattle appraisal data for 2023, the average daily live weight gains were higher than the industry average for Simmental, Charolais, Limousin and Blanc-Bleu Belge bulls, as well as Aubrac, Blanc-Bleu Belge, Charolais, Simmental and Aberdeen Angus heifers. Data on the age structure of cows in breeding herds indicate the effective use of their breeding stock. However, there are also points for further growth here, related to the optimization of the reproduction of beef cattle, as indicated by such an indicator as the proportion of cows over 8 years old of over 40% among the Kazakh White-Headed, Limousin and Obrac breeds.

**Keywords:** meat subcomplex of the agro-industrial complex, regional meat clusters, points of sectoral growth, structure of meat production, geography of meat production, breeding herds, breed composition, breeding composition, productive potential, livestock reproduction

## **Breeding, Selection, Genetics and Biotechnology of Animals**

UDK 636.4

### **Improving Assessment Methods of Duroc Pigs**

**Alexandra E. Svyatogorova, Olga L. Tretyakova, Natalia N. Kolosova,  
Nikolai A. Svyatogorov**

**Abstract.** The studies were conducted in accordance with the thematic plan of research of the Federal State Budgetary Educational Institution of Higher Education "Don State Agrarian

University" on the topic "Development of effective molecular genetic methods for forecasting, increasing and implementing the genetic potential of productivity, resistance, and resistance to diseases of farm animals". The aim of the study was to assess the productive potential of animals based on the relationship of marker genes with fattening and meat qualities of Duroc pigs. New data were obtained on the polymorphism of the POU1F1/RsaI, MC4R/TagI and LEPR/HpaII genes in Duroc pig populations. An assessment was made of the frequency of alleles for boars and sows. A comparative analysis of fattening and meat qualities of pigs of homozygous and heterozygous genotypes was conducted. The influence of different alleles of the POU1F1/RsaI, MC4R/TagI and LEPR/HpaII genes on fattening and meat qualities of Duroc pigs has been revealed. A method for assessing line consolidation has been proposed, allowing the creation of competitive animals that meet the paternal line standard and are capable of consistently transmitting high productive qualities to their offspring. Test systems have been developed to determine the polymorphism of the POU1F1, MC4R and LEPR genes. Selection indices have been compiled, and a system for index assessment of pigs has been developed for the Index Assessment module of the ACC computer program.

**Keywords:** polymorphism, POU1F1/RsaI, MC4R/TagI and LEPR/HpaII genes, Duroc pigs, selection, breeding indices

## **AGROENGINEERING AND FOOD TECHNOLOGIES**

### **Technologies, Machines and Equipment for the Agro-industrial Complex**

UDK 620.22

#### **Influence of Structural Characteristics of Carbon Fibers on Mechanical Properties of Phenylon-based Carbon Fiber**

**Vladimir Z. Alov, Zaira M. Zhirikova, Kantemir V. Alov**

**Abstract.** The article is devoted to the problem of creating structural polymer composites with high values of operational properties. The most promising for these purposes are phenylene-based carbon fiber plastics filled with short carbon fibers. Filling phenylene with hard fibers increases stiffness, flow resistance, strength, fire resistance, fracture toughness, tribological wear resistance, reduces the coefficient of thermal expansion and friction. Phenylene-based polymer composites are structurally complex bodies consisting of a polymer matrix, a filler and an interfacial region. The dependence of the structure and properties of carbon fiber plastics on the duration of mixing of the components has been found, and this dependence has a synergistic character. Such a nature of the structure implies the relationship of the nature of the structure from the distribution, orientation and aggregation of carbon fibers. The dependence of the control parameter of the carbon fiber structure (fiber orientation factor) on the duration of displacement of components in a rotating electromagnetic field for three lengths of nonequilibrium ferromagnetic particles used is investigated. The optimal length of ferromagnetic particles has been determined at which the maximum orientation of carbon fibers is possible. The structure of carbon fiber plastics is a synergetic system, which means that its main characteristics depend on the duration of displacement. The synergistic nature of the carbon fiber structure means the relationship between the nature of the structure and the distribution, orientation and aggregation of carbon fibers. It is shown that the fiber orientation factor determines the formation of the carbon fiber structure only within certain limits controlled by the molecular and structural characteristics of the polymer matrix. The use of variations in the fractal dimension of

the carbon fiber structure made it possible to calculate possible changes in its mechanical properties.

**Keywords:** carbon fiber, phenylon, ferromagnetic particles, fiber orientation, thermal cluster, modulus of elasticity and fractal dimension

UDK 631.372:621.436.1

## **Research of the Influence of Natural, Climatic and Road Conditions on Vehicle Performance Indicators**

**Aslan K. Apazhev, Yuri A. Shekikhachev, Khachim H. Ashabokov,  
Luda Z. Shekikhacheva**

**Abstract.** Depending on natural, climatic or meteorological conditions, the characteristics of the road infrastructure, the condition of the road surface, visibility, thermal operating conditions of units, etc. can significantly change, which affects the speed limit and efficiency of the vehicle. As a result of the studies, it was found that the average speed of trucks in mountainous conditions is approximately 40-50% lower, and fuel consumption is 10-15% higher than in flat conditions. In high mountain conditions, the load on the low stages of the transmission increases by 5-6 times. Engine torque values are reduced by 1.5-1.7 times. The effective engine power drops by 40-50%. The time and distance of acceleration to a given speed increases by 2.5-3 times. When the air temperature in the intake pipe increases by 10°C, the effective power of diesel engines without supercharging and with supercharging from a drive supercharger decreases by an average of 2.2%, and with constant limited smoke by 3%. The power of carburetor engines under the same conditions decreases by an average of 1.8%. In addition, a change in temperature leads to a change in the total resistance to movement, which affects fuel consumption and the average speed of the car. During the transition of longitudinal slopes from descents to ascents, the road capacity gradually increases and only on ascents of more than 4% begins to sharply decrease. The influence of the radius of curves in the plan on the speed of vehicles is most significant up to values of 250 m, after which the speed increases monotonically. The condition of the road surface or the smoothness of roads also have a significant impact on the average speed of vehicles and fuel consumption: as the smoothness of the surface deteriorates, the average speed sharply decreases and fuel consumption increases.

**Keywords:** car, engine, operation, power, fuel, efficiency, road surface

UDK 631.3.02

## **Systemic Approach to Solving the Problem of Resource-saving Use of Machine and Tractor Unit (MTU)**

**Ruslan A. Balkarov, Vyacheslav B. Dzuganov**

**Abstract.** The article considers the general scientific concept of a comprehensive solution to the problem of resource-saving use of MTU from the standpoint of a systems approach. The tasks set are solved at a number of interconnected levels of resource saving (optimization) from the choice of crop cultivation technology to private modes of operation of individual units that ensure maximum savings of all resources, including fuel and energy. The problem as a whole is the most complete use of the potential of each unit, taking into account the conditions of its

operation. It is necessary that the composition of each unit (power machine, number of working machines taking into account the capacity of process tanks) and its operating modes, working and idle runs, acceleration and braking were optimal and ensured the minimum consumption of all used resources. Such a comprehensive solution to the problem of increasing the efficiency of MTU use is possible only on the basis of a multi-level systems approach, both in the creation of units and in their industrial operation. Resource-saving tasks at each level are formulated in such a way that the output results of the preceding levels serve as input information for the lower levels of the hierarchical ladder. In this case, the resource-saving effects of all levels are added up. The greatest effect will be obtained by implementing all interconnected optimization levels. However, given various production situations, it is possible to solve specific resource-saving tasks at a limited number of levels. Given agrotechnical and other limitations, it is also possible to adjust the optimization results obtained at the upper levels at any lower level. The practical application of the proposed integrated approach allows for increasing the resource-saving indicators of agricultural units, both at the development stage and in production operation.

**Keywords:** system approach, resource saving (optimization), optimality criteria, efficiency of MTU use, types of units

UDK 620.22

## **Quantitative Description of the Modulus of Elasticity of Polymer Composites for Structural Purposes**

**Zaira M. Zhirikova, Vladimir Z. Alov, Kantemir V. Alov**

**Abstract.** The intensive development of modern agricultural engineering requires the development of new composite materials based on polymers with high performance properties. Improved performance is provided by the introduction of strengthening additives into the polymer matrix. Carbon fibers are promising materials for these purposes. The introduction of carbon fibers into the polymer contributes to the creation of a high-molecular polymer material. Phenylene, obtained on the basis of aromatic polyamides, was used as a matrix polymer. The advantage of phenylene is that materials based on it combine high heat and heat resistance with frost resistance, rigidity and strength with good antifriction properties, which makes it possible for them to be widely used in agricultural engineering. The mechanical properties of carbon fiber reinforced plastics based on phenylene filled with carbon fiber have been studied. In the framework of fractal analysis, correlations were obtained between the modulus of elasticity of the studied carbon fiber plastics and the fractal dimension of the localization regions of excess energy, which is "pumped" into the polymer matrix. The possibility of a significant variation in the modulus of elasticity with a constant filler content due to structural changes is shown. An increase in the energy "pumped" into the polymer matrix or the degree of its "perturbation", characterized by an increase in the dimension of the areas of localization of excess energy, leads to an increase in elasticity, and an increase in feedback in the structure of carbon fiber plastics, meaning "pumping" of the polymer material from one packed component to another, determines a decrease in its magnitude.

**Keywords:** carbon fiber, carbon fiber, modulus of elasticity, filler, fractal dimension, Poisson's ratio



## **Study of Thermal Processes in a Biogas Plant**

**Batyr A. Fiapshev**

**Abstract.** The article considers the issues of mathematical modeling of thermal processes in biogas plants in order to increase the uniformity of the temperature field distribution in the bioreactor. With anaerobic fermentation of manure and other agricultural waste, it is possible to obtain biogas, which will provide up to 25% of the needs of small agricultural consumers in energy carriers and valuable bioorganic fertilizers. Such waste processing is the most effective eco-oriented measure, ensuring its disinfection, reducing pollution of soil, water resources and the atmosphere with pollutants and pathogenic flora. Processing of agricultural waste in biogas plants is a complex task that has not yet been fully solved. Analysis of the results of studies of the efficiency of the mixing and heating process in the design of biogas plants, theoretical and experimental studies on the utilization of agricultural waste with the production of biogas and biofertilizers showed that the existing methods of heating and mixing do not provide uniform heating of the fermented mass. In this regard, a process flow diagram of a biogas plant has been developed, ensuring uniformity of the temperature field, for the needs of small farms, consisting of a methane tank, a gas holder, a mixing and heating device, auxiliary equipment and control and automation equipment. Theoretical temperature uniformity of the mixed medium is achieved by combining the heat exchanger and the mixing device into one unit in such a way that the upper and lower blades are offset relative to each other at an angle of 25-350, and the side blades are located at an angle of 25-350 relative to the horizontal plane of the bioreactor. The conducted studies on mathematical modeling made it possible to determine the economical operating modes of the biogas plant.

**Keywords:** biotechnology, biogas plant, methane tank, mathematical modeling, temperature homogeneity, mixing, processing of agricultural waste

## **Food Systems**

### **Modeling Measures to Reduce the "Inedegrability Index" in Organizing School Meals: Analytical Review of Monitoring the Length of Breakfast and Lunch Breaks in General Educational Organizations of the Russian Federation**

**Konstantin V. Krivoshonok**

**Abstract.** An effective system of organizing school meals includes measures that help reduce the "inedibility index" of dishes in the school canteen, monitoring and evaluation of which is the result of increasing the level of satisfaction with nutrition among school-age children. The measures that help to reduce the "inedibility index" of meals in the school canteen include standardizing the length of the break for each meal, which should be at least 20 minutes, as well as the number of breaks, and the turnover of seats in the school canteen dining hall. The purpose of the study: hygienic assessment of the length of the break for meals in general education organizations represented in the constituent entities of the Russian Federation. Materials and

methods of the study: The materials of the study were monitoring data and their analysis, conducted in relation to general education organizations (n=120). Results. An assessment was made of the results obtained for the indicator "duration of the break" for meals (breakfast and lunch). It was found that out of 154 schools, only one school in the capital, with a capacity of 200 to 500 students, has a 20-minute break during lunchtime, while in a large rural cluster with 1921 students, the break for breakfast is 25 minutes and for lunch – 28 minutes. Inconsistency was revealed between the information on the length of the break and the actual observations (measurements) for all clusters of schools of different sizes. It was found that the duration of the break during breakfast is within an average of 10 to 19 minutes for three types of clusters, and lunch lasts from 10 to 18 minutes, which clearly contradicts the requirements of SanPiN 2.3/2.4.3590-20. The obtained results indicate a discrepancy between the sanitary and hygienic standards for the indicator "duration of break" for food intake in the breakfast group by 10-50% and in the lunch group by 5-50%.

**Keywords:** school meals, inedibility index, length of break, food waste, clusters

UDK 637.5.04/.07

### **Investigation of Amino Acid and Fatty Acid Composition of Horse Meat of Dry and Wet Maturation**

**Talgat A. Mukhamedov, Saule M. Mukhamedova, Amina S. Dzhaboeva**

**Abstract.** The use of dry and wet maturation technology of horse meat requires a comparative assessment of their amino acid and fatty acid composition. The article presents the results of studies on dry and wet maturation of horse meat for 14 and 21 days. Comparative indicators of horse meat for the protein component, atherogenicity and thrombogenicity index, iodine number are given depending on the method and duration of maturation. Samples of dry and wet maturation of horse meat for 14 and 21 days, obtained from the longissimus dorsi muscle of the dorsal-lumbar cut of horse meat, were used as the object of the study. The content of essential and replaceable amino acids in dry-maturation horse meat for 14 and 21 days is higher compared to wet-maturation horse meat. In dry and wet-maturation horse meat, amino acids with sweet and umami taste are inferior to amino acids with a piquant taste. Dry and wet-aged horse meat have higher saturated fatty acid content than monounsaturated fatty acids. Horse meat maturation affects the fatty acid composition and increases the resistance of lipids to oxidation.

**Keywords:** meat, horse meat, dry maturation, wet maturation, amino acid and fatty acid composition, biological value

UDK 663.911.1:663.6

### **The Possibility of Using Natural Plant Extracts in Healthy Food Products**

**Irina V. Sobol, Ekaterina A. Krasnoselova, Ludmila V. Donchenko**

**Abstract.** Insufficient intake of biologically active substances such as vitamins, macro- and microelements, dietary fiber, etc. by the human body leads to weakening of the body's defenses and increased susceptibility to various infections, especially in the off-season. The use of various wild and medicinal plants to maintain the body's defenses has been used since ancient times. In modern conditions, the use of such plants is based on scientific facts proving their benefits based

on studies of their chemical composition. The purpose of the research was to study the possibility of using natural plant extracts of wild plants to develop healthy drinks. Modern and standardized methods were used to assess the quality of raw materials and finished products. Popular wild plants were used to develop healthy drinks: rose hips, thyme and oregano, linden flowers, cranberries. They are distinguished by their rich multivitamin composition, which makes them valuable raw materials for the development and production of healthy or functional food drinks. They contain ascorbic acid, carotenoids, and dietary fiber. Apple pectin extract was chosen as the basis for the drinks. Pectin substances are natural antitoxinants, have radioprotective properties, and remove heavy metals from the body. The developed drinks have high organoleptic properties, a pleasant aroma, and a harmonious taste. The content of functional ingredients is in the concentration that meets the standards. The production of these drinks will expand the range of healthy food products to improve public health.

**Keywords:** wild plants, drinks, healthy food, pectin extract, natural antioxidants, functional ingredients

UDK 664.681.1:635.24:613.22

## **Use of Jerusalem Artichoke Processed Products in the Production of Specialized Flour Confectionery Products for School-age Children**

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**Abstract.** The aim of the study was to develop consumer properties of specialized flour confectionery products using Jerusalem artichoke processing products for school-age children. The objects of the study were Jerusalem artichoke tubers of the "Interes" variety (Krasnodar Krai, Russia), Jerusalem artichoke puree and syrup. A process flow chart for making Jerusalem artichoke cookies, as well as recipes for "Oatmeal with Jerusalem artichoke" and "Oatmeal-rye with Jerusalem artichoke" cookies have been developed. The finished products do not contain sugar or egg products and have high organoleptic characteristics. Physicochemical properties of Jerusalem artichoke cookies have been determined. It has been established that the developed products have higher wettability (162 and 168%) and reduced alkalinity (1.6 and 1.7 degrees) for "Oatmeal with Jerusalem artichoke" and "Oatmeal-rye with Jerusalem artichoke" cookies, respectively, relative to the control sample. Reducing humidity has a positive effect on the properties of the products – they become more crumbly. It was found that the energy value of the cookies decreased by 42.12% and 34.46%, respectively, for the "Oatmeal with Jerusalem artichoke" and "Oatmeal-rye with Jerusalem artichoke" cookies compared to the control sample. At the same time, the protein content increased by 53.33% and 43.33%, fats and carbohydrates decreased by 47.22% and 29.17% and by 33.24% and 34.11%, dietary fiber increased more than 2.5 times, respectively. The increase in the nutritional value of the finished cookies is also due to the increase in the content of vitamins and minerals in the finished product. The degree of satisfaction in dietary fiber is 21.3% and 17.3% for the cookies "Oatmeal with Jerusalem artichoke" and "Oatmeal-rye with Jerusalem artichoke", respectively. Microbiological indicators of the developed products comply with the requirements of TR CU 021/2011. The unit cost of production is about 163 rubles. The conducted studies ensure the production of food products with improved nutritional value indicators while minimizing material losses and energy costs. The results of the work can be in demand by food industry and public catering enterprises producing specialized flour confectionery products for school-age children.

**Keywords:** cookies, nutrition of school-age children, Jerusalem artichoke, recipe, technology, nutritional value