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MICROBIOLOGICAL ASSESSMENT OF DRINKING WATER QUALITY AT DIFFERENT STAGES OF WATER TREATMENT

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The object of research is the quality of sources of centralized water supply according to epidemiological indications and the technology of their disinfection at different stages of water treatment using the example of the «Zhytomyrvodokanal» utility company (UC) (Ukraine). The object of research is evaluated and it is found that studying the bacteriological state of water bodies that are sources of centralized water supply is currently one of the most important tasks. Especially, given the significant impact of human activities on surface waters and the insufficient pace of modernization of water treatment equipment. It is determined that widespread disinfection methods using ultraviolet and chemicals (chlorination and ozonation) have their strengths and weaknesses. The paper presents the results of analyzes of water from sources of centralized water supply at different stages of water treatment according to microbiological indicators during 2019: total microbial number (TMN) and total number of coliphages. The unsatisfactory condition of water bodies has been established; it is a source of water supply in the city. It is proved that the existing technology of disinfecting water from centralized water sources, which is carried out in two stages using soluble chlorine and sodium hypochlorite, is effective in neutralizing bacteria of the Escherichia coli group. As a research result, the dependence of the concentration of microorganisms in water sources of centralized water supply on weather conditions is revealed (in total, microbial pollution is observed from May to October). A moderate level of water pollution (ranging from 1.1 to 7.5 units) has been proven by the epidemiological criterion in the «Denyshi» and «Vidsychne» reservoirs (Zhytomyr Region, Ukraine). It has been established that the epidemiological criterion is an acceptable level in clean water tanks. It can be argued that the water in the tanks is suitable for drinking water use by the local population. Thus, the research results show that the technology of water disinfection (involves the introduction of two stages of water treatment) used at the «Zhytomyrvodokanal» UC is effective. Accordingly, this technology may be interesting for other settlements, in the absence of significant funds for the modernization of equipment and in the face of climate change, accompanied by an annual increase in temperature and an increase in the number of microorganisms in water sources.

Keywords: microbiological pollution, drinking water, water treatment, epidemiological indicator, monitoring of water quality, seasonal changes.

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SUBSTANTIATION OF ENVIRONMENTAL AND RESOURCE-SAVING TECHNOLOGIES FOR VOID FILLING UNDER UNDERGROUND ORE MINING

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The object of research is the technology and technical means to clear the voids during the underground mining of ores in the disturbed arrays. One of the most problematic places is the filling of man-made voids that affect the occurrence and redistribution of the stress-strain state (SSS) of the rock mass. Their existence in the earth's crust provokes disturbance of the daily surface, as well as the influence of geomechanical and seismic phenomena, up to the level of earthquakes.

Analytical researches, comparative analysis of theoretical and practical results by standard and new methods with the participation of the authors are performed. The peculiarities of the manifestation of mountain pressure in the rock massifs of a complex structure are considered, due to the intensity of the fracture structures (acoustic stiffness from 0.11 to 0.18 MPa/s, impact coefficient – 0.98). The conditions of manifestation of residual bearing capacity of disturbed rocks and translation of geomaterials into the volume compression mode were investigated (in the zone of disturbed rocks the attenuation coefficient decreases to 0.04–0.15 from the initial value of 0.25–0.35). The basic estimation of durability of workings and inhomogeneous rocks with a strength of 50–150 MPa at depths up to 600 m is shown, depending on the position of workings with respect to the elements of structural disturbance and the possibility of creating reliable structures. Conclusions have been made about the efficiency of the use of load-bearing structures from rocks of greater than 0.2 m in size and mechanical strength of more than 50 MPa, which allows to expose the roof without collapsing at spans of up to 50 m. The bearing layer of the rocks produced space can be filled by insulation or a hardener with a strength of up to 1.2 MPa. The research results can be used in the underground development of ore deposits of complex structure of Ukraine, the Russian Federation, the Republic of Kazakhstan and other developed mining countries of the world.

Keywords: mountain range, underground development, void filling, environmental and resource conservation technology, mining efficiency.

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DEVELOPMENT OF PRIORITY MEASURES (SOLUTIONS) FOR THE ENVIRONMENTALLY SAFE MANAGEMENT OF MUNICIPAL WASTE AT THE COMMUNITY LEVEL

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Environmentally safe waste management remains one of the priority areas of civil society. Despite the introduction of a number of regulations, such as Directive 2008/98/EC of the European Parliament and of the Council of 19.11.2008, the issue of effective management in the field of waste management not resolved. Therefore, the process of solid waste management at the level of territorial communities is considered as the object of research. Among the main shortcomings of this process is the lack of effective mechanisms and algorithms for systems to support informed decisions on waste management in their specific area.

The article proposes and discloses a scientific and methodological approach to integrated expert and analytical evaluation of the processes of household waste management and substantiates the feasibility of environmental safety management measures. In the course of the research the decomposition of the household waste management process was carried out. This allows to identify the sources and characteristics of hazard detection, among which the largest contribution is made by waste incineration plants without energy (47.41 %) and the conditions of waste accumulation with increasing hazard (54.95 %). Using the analytic hierarchy process (AHP) allows to take into account individual and collective judgments of experts, which not only improves the quality of research but also allows to determine the priority of environmental safety management measures. According to the calculations, the most important (44.01 % of the total contribution) is the measure to introduce the best available technologies for solid waste management. Obtaining such results is possible due to the fact that the method of analysis of hierarchies allows

to determine the step-by-step transitivity and consistency of expert assessments.

Compared to similar methods the proposed method, as simple and straightforward, is quite easy to use. This increases the effectiveness of transparent decision-making at the grassroots level through the involvement of highly qualified environmental and public administration professionals.

Keywords: analytic hierarchy process, environmental safety, expert evaluation, household waste management, waste management.

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EVALUATION OF GAS EVOLUTION OUTSIDE THE EXTRACTION SECTION AT THE ACTIVATION OF COAL-BEARING STRATUM DISPLACEMENT

page 26–30

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The object of research is the processes of gas evolution from undermined sources within the exploited extraction section and beyond its boundaries under the influence of activation of rock displacement. To date, no quantitative dependencies have been established for gas evolution from the worked out (treatment workings) of the carbonaceous stratum when its movement is activated. Difficulties in studying gas evolution in the case under consideration lie in the need to carry out the necessary measurements of methane consumption in the workings and degassing wells of the mine field section and wing over the entire period of time working out the extraction column. The purity of the experiment is ensured by the operation of only one lava in the wing of the mine field. The ventilation scheme of the extraction section and the location of the measurement points in the mine workings make it possible to establish methane emission zones in the worked out space of the exploited and stopped lavas. The paper presents an analysis of the change, currently little studied, of gas evolution outside the exploited extraction section into the worked out space of stopped lavas. The main factors affecting the change in the level of gas evolution are determined, both within the extraction section and beyond its borders.

The methodology of the experiments is assumed that the level of gas evolution from the undermined coal-bearing stratum is determined by coal mining and the degree of development of treatment works in the extraction section. On the basis of experimental data, the dependences of gas evolution on coal production and the degree of development of treatment works within the extraction section are established. Out of the extraction section, gas evolution from the worked out space of stopped lavas occurs when the development of the minefield wing is sufficiently developed and is determined by the intensity of coal mining in the exploited section. When the Earth's surface and the coal-bearing stratum are fully developed, the gas evolution from the mined-out space of the stopped lavas during the initial period of operation of the next lava can be several times higher than the methane emission within the existing extraction section.

Studies have shown that the mechanism of the process of gas evolution within the extraction section and beyond its boundaries proceeds under the influence of various influencing factors.

Keywords: extraction section, mine field, coal mining, coal-bearing stratum, worked out space.

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MODELING OF TECHNOLOGICAL PARAMETERS OF FILAMENT JOINTS OF CLOTHING PARTS FOR PROFESSIONAL SPORTS FENCING

page 31–34

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The object of the presented research is the technological process of manufacturing clothes for professional sports fencing. The subject of research is the quality of the knitted joints, which are regulated by technical requirements and require special attention when designing an assortment of clothes for fencing athletes.

The research methodology is based on the analysis of scientific literature, measurement of mechanical properties and modeling of technological parameters of knitted joints of fencing clothes. In order to determine the effect of the number of stitches on the breaking strength and the longitudinal deformation of the knitted joints of fencing clothes, mathematical modeling of the manufacturing process using the experimental design method is used. The choice of

the experimental design is associated with determining the number of experimental points and their placement in the factor space, which will make it possible to obtain the necessary information for making a decision with a relatively small number of experiments. During the study, methods were used to determine the breaking strength and extended deformation of the joints. A feature of the study is the determination of rational technological parameters of the knitted joints while maintaining the necessary tensile strength and a certain level of longitudinal deformation. The rational parameters of the number of stitches in the seam-sewn and finishing stitching lines for the studied materials of fencing clothes are those for which the tensile strength of the seam is ≥970 N and the longitudinal deformation does not exceed ±2.0 %, namely: t–(5.0÷6.5) stitches/10 mm, h–(3.0÷3.5) stitches/10 mm.

The obtained results prove the possibility of using mathematical modeling methods to predict the quality of knitted joints of clothing parts for professional sports fencing. This approach is of practical importance and can be applied both at the stage of designing the technology of manufacturing clothes for professional sports fencing when choosing processing modes for new materials, and at the stage of manufacturing and quality control of performed operations.

Keywords: fencing clothes, knitted joints quality, seam strength, seam deformation, quality control.

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RESEARCH OF THE INFLUENCE OF SOYBEAN GERMINATION ON CHANGES IN THE AMINO ACID COMPOSITION AND THE CONTENT OF PHYTIC ACID

page 35–37

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Providing the population with environmentally friendly protein products of plant origin is an important task of national importance in any country. However, the native use of soybeans today is limited due to the presence of anti-nutrients in them, namely the content of phytic acid, which can increase the formation of intestinal gas. It is possible to reduce the content of phytic acid in legumes during germination. Vegetable protein, which is the main component of legumes, has the ability to accumulate inorganic trace elements, transforming them into organic forms during soaking during germination. The object of research is «Diamond» early ripe soybean variety with a protein content of 43.88 %. 2018 harvest from the Agrotek collection nursery (Kyiv, Ukraine). The characteristics of

the soaking solutions are with a concentration of potassium iodide of 38 g/1000 cm^3 H_2O, which corresponds to the iodine content in the solutions of 41 μg/g and satisfies 1/3 % of the daily need for iodine. The grain is soaked for 48 hours. In the course of the research, the method of ion exchange chromatography, the AAA T-339m amino acid analyzer (Czech Republic) and the TM Shimadzu LC-20 chromatograph (Japan) are used. The phytic acid content is determined by the Lott method. It is established that the total amino acid content in native grain sprouted in aqueous solutions and sprouted in a solution with potassium iodide (KI) content increases from 288.8 to 443.6 and 562.6 μg/g of dry matter, respectively. The content of phytic acid is studied and it is found that its content in native grain is 29.3 g/kg, sprouted in aqueous solutions – 8.6 g/kg, sprouted in a KI solution – 3.2 g/kg. From the experiment it is possible to conclude that the process of germination of soybean grains in KI solutions affects the increase in amino acid content by almost 50 %. Due to the high hydrophilicity of the protein, the mass of germinated grains increases by 2 times. Let's assume that the solution with KI is a synergist of phytic acid inactivation. The conducted research complex is the scientific basis for the use of this raw material in the technology of meat products for people with chronic colitis and iodine deficiency conditions.

Keywords: protein foods, soybeans, germination process, accumulated iodine, iodine-deficient states.

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DEVELOPMENT OF A METHOD FOR PRODUCING FRUIT BERRY PASTE AND EQUIPMENT FOR ITS IMPLEMENTATION

page 38–40

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The object of research is the technological process for the production of fruit and berry semi-finished product. Existing technologies for processing fruit and berry raw materials are characterized by the loss of valuable components of the feedstock, namely blanching at a temperature of 85–100 °C and long-term boiling, resulting in loss of vitamins can reach 60 %. Hardware design of traditional processes for processing fruits and vegetables, as a rule, is not sufficiently unified, inconvenient in operation and is designed for high productivity. One of the most problematic places is the significant energy and metal waste of traditional equipment and the insufficiently high quality of the finished product. The intensification of the processing of fruit and berry raw materials is possible through the introduction of new technologies and equipment, the use of which can reduce the cost of energy and material resources.

During the study, the experimental results of the developed paste were used: apple – 60 %; apricot – 30 %; cornel – 10 %, taking into account organoleptic and physico-chemical indicators. For the technological process of paste production, a hardware line was selected using the developed universal multifunctional device (UMD) and a rotary film device (RFD). This will provide a guaranteed increase in technical and operational indicators with a significant reduction in energy and metal consumption compared to existing analogues. It has been established that for effective puree evaporation in RFD from 11–14 % to 27–30 % dry matter, it is necessary to grind the raw material to a particle diameter of not more than 0.1–0.5 mm after RFD cooking. The processing temperature of puree in RFD is 62–67 °C, and the concentration time is 2–3 minutes. To reduce the evaporation period and more rational use of RFD, before this operation it is necessary to apply puree to 55–60 °C.

The introduction of the developed instrument-technological line will contribute to the production of competitive semi-finished

products of high quality with a wide range of uses in food production and restaurant facilities.

Keywords: fruit paste, technological line, puree concentration, universal multifunctional device, rotary film device.

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COMPARATIVE CHARACTERISTICS OF TECHNOLOGICAL PROPERTIES OF FOUR-SPRCIES TRITICALE GRAIN COMPARATIVE TO CLASSIC TRITICALE AND COMMON WHEAT GRAIN

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An example of effective crossbreeding of wheat and rye grain is the grain of classic triticale, which is currently gaining growing popularity among manufacturers of bakery products and cereals. As a result of further hybridization of the grain of classical triticale and common wheat, highly productive forms of four species triticale were obtained. Despite the similarities to wheat grains, four species triticale grains have differences in technological properties, and therefore require further study. One of the most problematic places is the identification of significant differences between the properties of the four species triticale and its parent forms. Therefore, it is important to conduct a comprehensive study and comparison of the technological properties of four species triticale, classic triticale and common wheat, which will justify its intended purpose. So, the object of research was selected four species triticale of Alkyd, Strateg, Tactic, line LP 195 varieties (Ukraine).

In the course of the study, current methods for determining the technological properties of cereal grain were used, and the results were processed by analysis of variance. The grain of four species triticale has a large mass of 1000 grains compared to wheat and

classical triticale, which is associated with its larger size. Four species triticale is characterized by less sphericity compared to wheat due to the longer length, affects the duty cycle of the grain mass and grain nature. The nature of the grain of four species triticale is significantly inferior (by 38–85 g/l) to the nature of wheat grain. Four species triticale grains are glassy (98–99 %) and similar to traditional triticale grains according to this indicator. According to the gluten content (20–25 %), the grain of four species triticale is significantly inferior to wheat, but its quality is satisfactory.

The research results presented in the work demonstrate a high glassiness and a low amount of gluten. This makes it possible to efficiently use the grain of four species triticale for cereal production, or as part of composite mixtures in the production of bakery products.

Keywords: triticale, common wheat, technological properties, mass of 1000 grains, grain nature, grain glassiness.

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