AGRONOMY, FORESTY AND WATER MANAGEMENT

Horticulture, Vegetable Growing, Viticulture and Medicinal Crops

UDK 634.11

Development of intensive horticulture on slopes based on apple varieties immune to scab

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Abstract. This article presents the results of research conducted in 2023–2025 on intensive apple plantings at Bogaty Urozhay LLC in the Kabardino-Balkarian Republic (KBR). Arable land in the KBR is in acute shortage. Comprehensive research is underway to study sloping lands for use in industrial horticulture. With the emergence of new scab-resistant varieties, it is necessary to analyze their effectiveness in mountainous conditions. The objective of this study was to evaluate scab-resistant varieties Florina, Modi, Topaz, and Golden Rush on terraced fields in the forest-mountain zone of the KBR. Long-term observations of the plantings indicate that, based on phenotypic traits, fruits of the Florina, Modi, and Topaz varieties grown in the forest-mountain fruit-growing zone are more attractive and in demand by consumers. At the same time, despite its stable yield, the Gold Rush variety is characterized by moderate vigor and late-ripening fruit, yielding inferior fruit quality to comparable varieties. It has been established that the use of scab-resistant apple varieties significantly reduces pesticide loads and orchard treatment costs, while producing high-quality fruit free from fungal diseases, even in years with unfavorable weather conditions. The intensely colored, consumer-attractive fruit of the Florina, Modi, and Topaz varieties is recommended for cultivation on terraced fields in the forest-mountain zone of the KBR. However, the Golden Rush variety has inferior marketability and is not recommended for use in this zone.

Keywords: slope lands, fallow terraces, forest-mountain zone, intensive orchard, immune varieties, planting density

UDK 635.64:631.8

The effect of liquid complex fertilizers on growth and development of tomatoes

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Abstract. In Russia, technologies for the application of liquid complex fertilizers have long been developed for both open and protected soil, where they are used in conjunction with herbicides, fungicides, and mineral fertilizers. This combination allows for the effective cultivation of plants in unfavorable conditions and increases yields. Liquid complex fertilizers are particularly promising for super-intensive cultivation. Tomatoes are particularly suitable for this purpose, as their production has long been super-intensive. For maximum efficiency, it is necessary to select the right fertilizers and develop technologies for their application. We defined the aim of our research: to study the effect of liquid complex fertilizers on the growth and development of tomato plants in photoperiod 6. The scientific novelty of this study lies in the fact that for the

first time in the foothill zone of the Kabardino-Balkarian Republic, liquid complex fertilizers have been used to optimize cultivation technology. In our studies, we tested liquid complex fertilizers on the growth and development of tomatoes and also determined the optimal doses of the studied fertilizers. The subject of our research was the early-ripening tomato hybrid Alesya F1, recommended for cultivation in the North Caucasus. The following liquid fertilizers were selected for testing: KompleMet Tomato, Magic Watering Can, and Aquirin. These fertilizers were used to treat seeds and spray tomato plants. The tests were conducted in accordance with generally accepted field trial methods. Based on the data obtained, we can conclude that the use of liquid fertilizers significantly affects plant growth. Among the fertilizers studied, KompleMet Tomato demonstrated the best results across all parameters. Magic Watering Can placed intermediately, and Aquirin was less effective than the other fertilizers. Ultimately, KompleMet Tomato appears to be the most promising for increasing tomato yield and quality.

Keywords: tomato, liquid complex fertilizers, tomato height, plant dry mass, bud formation, flowering onset

ANIMAL SCIENCE AND VETERINARY MEDICINE

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

UDK 636.2

Features of taking into account the influence of climatic factors on the optimization of milk production during the pasture period

Vladimir M. Gukezhev, Karina A. Temirdasheva

Abstract. The study examined the frequency of occurrence of maximum and minimum values of gross milk yield, depending on the air humidity. It was found that the average air humidity during the entire study period was almost the same, at 66.5% for maximum milk yield and 65.9% for minimum milk yield. In the May months, during 34 days out of 41 days during the period of minimum milk yield, the milk yield was higher than the optimal milk yield in the following months, with an average difference of 297.2 kg. In pasture conditions, humidity does not have a clear effect on milk yield, as evidenced by the slight difference in the average values of the analyzed periods, which were higher in the months of May, June, and August, with minimum milk yields of 4.6%, 6.0%, and 0.7%, respectively, and in the months of July and September, with maximum milk yields of 0.4% and 3.2%, respectively, and an average of 0.6% higher in the maximum milk yields for the analyzed period. On average, during the study period (1200 days), the average daily milk yield was higher than the average for 291 days (24.2%) and amounted to 13,008.3 kg, while the minimum yield was 12,346.8 kg for 271 days (22.6%), with a difference of 661.5 kg. The annual milk loss during the grazing period was 54.8 tons.

Keywords: number of cows, grazing period, heat stress, air humidity, maximum and minimum daily milk yield

UDK 636.598.03

Increasing the meat productivity of geese

Olesya A. Zhemukhova, Mukhamed M. Shakhmurzov

Abstract. The article presents the results of research on the use of a probiotic biologically active feed additive in the diets of waterfowl, in combination with the drug Monisen, to improve the productive qualities of poultry meat by stimulating nonspecific immunity and normalizing and activating metabolic processes in the body. This research is relevant due to the implementation of the state program for the development of the agricultural products, raw materials, and food market, which aims to address the issue of import dependence and ensure stable growth in agricultural production. In this regard, one of the most important products in the implementation of state policy in the field of agricultural support is the production of poultry meat, which contains a complex of necessary micro and macroelements for a full-fledged diet. It is clear that regular consumption of poultry products rich in proteins, amino acids, animal fat, minerals, and vitamins provides the body with high-quality food products. In this regard, experiments were conducted to study the effect of different dosages of a probiotic biologically active feed additive in combination with Monisen on the productive indicators of geese. During the experiments, the birds in the control group were fed according to the main diet (MD), while the birds in the experimental groups received a probiotic biologically active feed additive at different dosages: 15 ml of suspension in the first experimental group, 30 ml in the second experimental group, and 50 ml in the third experimental group. The results of studies on improving the productive qualities of waterfowl meat when using Monisen in combination with a probiotic biologically active feed additive in the diets of the I, II, and III experimental groups led to an increase in the live weight of the geese in the 1, 2, and 3 experimental groups from 14 days of age, respectively, by 8.18 (4.1%), 9.52 (4.7%), and 9.3 (4.6%) compared to the control group. A similar situation occurred with other age categories of birds, this means that the proposed complex is effective in the diet of geese.

Keywords: geese, live weight, pre-slaughter yield, probiotic feed additive, meat productivity

Breeding, Selection, Genetics and Biotechnology of Animals

UDK 636.2:636.082

Breeding value of brown Swiss bulls, depending on the country of origin and line affiliation

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Abstract. In dairy cattle breeding, the assessment of the quality of offspring and the rational use of bulls is of great importance, as if the bull turns out to be a deteriorator of the signs of dairy productivity, it will cause significant damage to the farm. The purpose of the study was to determine the influence of the country of origin and linear affiliation on the breeding qualities of the bulls of the Brown Swiss breed of the Joint Stock Company "Head Center for the Reproduction of Farm Animals", which supplies the Kabardino-Balkarian Republic with semen for artificial insemination of cows. The study involved 20 brown Swiss bulls, 18 of which were evaluated for their offspring's quality based on five indicators of milk production. The

experimental groups of bulls were formed based on their country of origin and lineage. The studies showed that the country of origin has a greater impact on the breeding value of bulls in terms of milk yield, milk fat, and milk protein (18.56–29.25%) than on the breeding value in terms of fat content (1.12%) and protein content (6.90%). Therefore, when selecting Swiss bulls-improvers for milk yield, milk fat, and milk protein, the country of origin should be taken into account, and when selecting bulls-improvers for fat and protein content, their line affiliation should be considered.

Keywords: Brown Swiss breed, bull-sire, milk productivity, offspring quality assessment, breeding value indicator

UDK 636.234.1.34

Reproductive qualities of daughters of Holstein bulls of different breeding

Artem S. Gorelik, Olga V. Gorelik, Svetlana Yu. Kharlap, Eva V. Razhina

Abstract. The breeding of dairy cattle of the Holstein breed uses the seed of the best bulls-producers of the global gene pool. The quality of bulls of different breeding in the comparative aspect is of interest. The object of the research were cows-daughters of the Holstein breed from bulls-producers Golden (Russia); Dominik (Denmark); Maguri (Germany). It was found that heifers of different breeding bulls differ in age of first insemination and at least in live weight. The heifers from the Golden bull 4177 of domestic breeding had a higher live weight at the first insemination with average age indicators in comparison with other groups of daughters. Higher age values at the first insemination were found in heifers from the bull Maguri 951704038 of German breeding. They were more homogeneous in terms of body weight. The largest variety of parameters of the age of the first insemination and the live weight at the first insemination turned out to be in the group of heifers of the Golden bull 4177 of domestic breeding, which may be due to the reduced stability of the transmission of traits from the bull. The duration of the service period in heifer groups slightly exceeds the recommended standards, which corresponds to the breed characteristics of Holstein cows. It ranges from 94.2 days (daughter of bull Maguri 951704038 German breeding) to 112 days (daughter of bull Dominik 4109205594 Danish breeding). The coefficient of variability for this trait within each group ranges from 43.57% to 71.20%. Such variation is unacceptable and requires a review of the work of all structural units to reproduce the herd.

Keywords: Holstein breed, breeding bulls, daughter cows, reproductive functions, service period, coefficient of variation

UDK 636.2

Economically Valuable Traits of Kalmyk Cattle in the Kabardino-Balkarian Republic

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Abstract. The development of specialized beef cattle breeding to ensure food security and increase the share of beef cattle in the country's meat balance is a pressing issue. In recent years, regardless of the breed zoning plan, many farms have begun breeding Kalmyk cattle, but the

nature of their economically valuable traits remains insufficiently studied. One of the leading Kalmyk cattle breeding farms in the Kabardino-Balkarian Republic is the Dargan breeding farm in the Chereksky District, with a breeding herd of over 300 cows. It has been established that, at all ages, bulls have higher live weights than heifers, due to sexual dimorphism. The difference in live weight between bulls and heifers at birth is 8.0%. With age, the differences between the groups in live weight increase and amount to 9.1% at 8 months, 10.4% at one year, 19.6% at 15 months, and 25.1% at 18 months. Over the entire rearing period from birth to 18 months, the absolute live weight gain of bull calves was 441 kg, which is 19.5% higher than that of heifers. Similar differences were also found in the absolute average daily live weight gain. At all ages, Kalmyk breed animals meet the requiremets of breed standard for live weight. It is recommended to form groups of Kalmyk breed replacement calves taking into account the age of their mothers.

Keywords: Kalmyk breed, meat productivity, live weight, growth rate, age

AGROENGINEERING AND FOOD TECHNOLOGIES

Technologies, Machines and Equipment for the Agro-industrial Complex

UDK 631.372

Selection of optimal weights and speeds of machine and tractor units, taking into account the compacting effect on the soil

Ruslan A. Balkarov, Zaur I. Miziev

Abstract. Improving agricultural efficiency requires not only preserving but also significantly improving all components of the natural environment, including both natural and artificial components in ecological systems. Statistical data obtained for Russia indicate that annual yield losses for grain crops alone, due to excessive soil compaction caused by heavy machinery, reach 20–30 million tons, while excess fuel consumption amounts to 2.5–3 million tons. V.P. Goryachkin noted that when selecting the weights and speeds of agricultural machinery and implements, it is necessary to consider simultaneously the resulting positive and negative effects. Specifically, he notes the need to account for increased energy consumption, as well as soil compaction by tractors. In other works, the author has primarily considered the justification for the weights and speeds of machine-tractor units (MTU) from the perspective of reducing energy consumption. In this article, in accordance with V. P. Goryachkin's ideas, an interconnected solution to the problem of reducing energy consumption due to soil compaction during MTU operation is proposed. Its detrimental impact on the soil is manifested in the deterioration of physical properties such as density, hardness, porosity, structural condition, moisture and air permeability, etc. This ultimately leads to a decrease in agricultural yields while simultaneously increasing specific energy consumption per unit of work performed. The challenge is to select MTU weights and speeds that minimize specific energy consumption and negative impact on the soil under given conditions. Energy consumption and soil compaction issues are most relevant for traction units, so the following discussions are conducted using them as an example.

Keywords: MTU, selection of optimal masses and speeds, consideration of the soil's compaction effect, and minimum specific energy consumption

UDK 631.354.2

Characteristics of grain particle movement during its processing on a conveyor cleaning system in a grain harvester

Alamakhad D. Bekarov, Vladislav Kh. Mishkhozhev, Aliy Kh. Gabaev

Abstract. The conveyor cleaning system is an innovative mechanism for separating grain heap in combine harvesters. This mechanism is equipped with a vibrator, which causes low-amplitude localized vibrations in various sections of the upper working branch of the conveyor sieve. These vibrations significantly accelerate the heap separation process. The vibrator is equipped with passive rollers mounted under the carrier chains of the upper working branch of the sieve, located on the left and right side panels of the combine. As the sieve moves, the carrier chain rollers collide with the vibrator rollers, causing them to bounce. Since the vibrator has several rollers on each side (5–7) and the distance between the carrier chain rollers is 19.05 mm, virtually the entire length of the sieve is subject to localized vibrations. This intensifies the separation process. This article examines various options for the conveyor sieve position in a combine harvester: horizontally or at an angle to the horizontal plane (inclined), as well as when the combine is moving on a flat field and on a field with slopes (longitudinal or transverse relative to the combine's direction of travel). The authors propose analytical expressions for determining the key parameters of grain particle movement, ejected from the sieve when the vibrator is activated, depending on the above conditions. These parameters include the maximum distance and height of movement, the average speed, and the duration of movement relative to the sieve. The analytical expressions show that the key parameters depend on the sieve speed, as well as the angles characterizing the moment of impact of the rollers of the carrier chain and the vibrator. The magnitude of these angles is determined by the size of the contacting rollers and the position of the sieve in the combine harvester –horizontal or at an angle.

Keywords: combine, cleaning, heap, impurities, grain, completeness, separation, section, flow, content, purity, losses

UDK 631.372:621.43

Improving the efficiency of using MTZ tractor

Anzor L. Bolotokov, Astemir A. Tanashev

Abstract. The analysis of the effect of changes in fuel equipment parameters on the fuel efficiency of a diesel engine is presented. To improve the efficiency of diesel engines, an upgrade of the nozzle spray needle has been proposed. The use of diesel nozzle sprayers with an upgraded needle makes it possible, due to the presence of fuel in the screw channel and the gap, to lubricate and soften the impact of the needle cone on the housing seat instead of a direct hard impact than in serial sprayers. The volume of fuel in the screw channel depends on the volume of fuel in the slot. As the gap increases, the gap resistance coefficient does not decrease below 0.4, so the volume of the screw channel will be 0.5–0.9 of the gap volume. As a result, the dependence of the gap resistance coefficient on the volume of the screw channel is obtained. With the total gap increased by 2 times (due to the screw channel), the liquid flow rate is reduced by no more than 20%, and the gap overgrowth coefficient is 0.8–0.9. The effect of the rotation speed of the fuel pump shaft on the cyclic supply and the unevenness of fuel injection is determined. At an angular velocity of 850–1100 rpm, the fuel supply unevenness did not exceed

1–2%. When the angular velocity of rotation decreases to 400–800 rpm, the unevenness increases to 2.7–16.1%.

Keywords: diesel engine, nozzle, sprayer, efficiency, modernization, fuel consumption

UDK 631.371

Energy-efficient electric drive in the agro-industrial complex: analysis, modelling and optimization of operation modes

Aslan A. Kumakhov, Zalimkhan R. Kudaev, Kushayev S. Khasanovich, Yuri S. Khapov

Abstract. Energy in the agro-industrial complex (AIC) is a key component of sustainable agricultural development. Modern agricultural enterprises are characterized by high energy intensity in technological processes, which is due to the use of a wide range of electromechanical equipment – from pumping and ventilation systems to conveyors, mills, feed dispensers, milking machines, and climate control systems. According to the Russian Ministry of Agriculture, electric drives for various purposes account for 60 to 75% of total energy consumption in agricultural production. Under these conditions, improving the energy efficiency of electric drives is becoming a priority for the technical modernization of the agricultural sector. The problem is that most electric motors in operation operate at partial load, with a low power factor and a lack of adaptive control systems. This leads to: significant losses of active and reactive energy; accelerated equipment wear; increased operating costs; and a decrease in the overall energy efficiency of enterprises. Modern research shows that by implementing variable-frequency electric drives (VFDs) and optimizing the operating modes of asynchronous motors alone, it is possible to achieve potential energy savings equal to (0.1–0.25) of a company's current energy consumption. This approach is aimed at reducing energy costs. However, in practice, the implementation of such solutions is hampered by a number of factors: the lack of comprehensive models for the energy efficiency of electric drives under changing loads; the absence of intelligent monitoring systems for operating parameters; and insufficient integration with digital production management platforms (SCADA, IoT, MES).

Keywords: power engineering, electric drives, asynchronous motors, variable frequency drives, intelligent systems, and energy audit

UDK 631.51

The influence of the cutting wedge angle on the soil deformation mechanism and energy consumption of the tillage process

Mukhamad Kh. Misirov, Artur M. Egozhev

Abstract. The article presents the results of a theoretical study on the influence of the angle of action ω of a cutting wedge on the deformation mechanism and energy capacity of the soil tillage process. Based on the analysis of classical and modern approaches it was found that the angle of action, defined as the angle between the resultant cutting force and the velocity vector, is a key parameter that determines the predominant type of deformation (tension, shear, or compression). It is shown that for typical operating conditions of tillage tools (cutting angle δ = 15–40°, friction angle ψ = 22–31°) the angle of action is positive and lies in the range ω = 37–71°, which causes

the prevalence of tensile deformation over shear. A classification of five possible deformation mechanisms depending on the angle of action is constructed and their energy intensity is analyzed. It was found that tensile deformation, characterized by the lowest energy consumption, is realized at positive angles of action. The results prove the inconsistency of the exclusive shear model of Time for soils and justify the need to use models that take into account brittle fracture and crack growth. The obtained data are of practical importance for optimizing the geometric parameters of working bodies to reduce the energy intensity of soil cultivation.

Keywords: angle of action, cutting wedge, soil deformation, energy consumption, tension, shear, cutting resistance, fracture mechanics

UDK 621.33:631.3

Traction electric drive of traction modules for agricultural machinery

Rimma I. Sebetova, Emma Yu. Ikoeva, Irma V. Dzaragasova

Abstract. The article discusses the current topic of using electric drives for support and traction modules for agricultural machinery. The use of support and traction modules is advisable at travel speeds of up to 7–8 km/h. When starting off, accelerating, and operating in difficult road conditions, the drive units must provide maximum traction. At the same time, the reduction in the energy performance of the traction motor leads to the need to increase its rated power. However, existing methods do not allow a definitive determination of the motor's nominal power. When selecting a drive type for applications in hard-to-reach areas, reliability and durability should be the deciding factors. The authors concluded that the frequency-controlled drive is the most promising. Such a drive offers a radical solution to the traction drive problem. Therefore, the use of a frequency drive in support and traction modules is absolutely necessary. In a frequency drive, the main part is the frequency converter (FC), which performs two functions: energy – the function of powering the motor and information – controlling the drive units. The results of the study showed that an uncontrolled rectifier based on a three-phase bridge circuit allows a reduction in the number of control thyristors, a significant increase in the power factor of the converter, and a reduction in the negative impact of the frequency converter on the generator. Voltage regulation in it is carried out by pulse-width modulation according to a sinusoidal law. This frequency converter allows to obtain high-quality static and dynamic characteristics, high energy indicators of the use of an asynchronous squirrel-cage motor.

Keywords: traction electric drive, asynchronous motor, frequency converter, rectifier, controlled thyristor, reverse, dynamic braking

UDK 620.95

The use of small mountain streams for electricity supply to livestock farmers in Kyrgyzstan

Nazgul Y. Temirbaeva, Maksat S. Narymbetov, Zhanarbek Y. Osmonov, Chynarkul T. Umetalieva, Shirin A. Abdurakhmanova, Eric M. Mambetov

Abstract. The authors conducted an analysis of the use of energy from small watercourses in Kyrgyzstan for autonomous power supply to livestock farmers during the grazing period, especially since the natural and climatic conditions of the republic are able to provide this.

Currently, due to the continuous increase in energy consumption and the rising cost of fuel, more and more attention is being paid to renewable energy sources. The territories where livestock farmers are located on pastures and small watercourses that can be used for their energy supply account for more than 75% of the total area of farmland and are evenly distributed. This period from June to August coincides with a stable temperature regime, when glaciers are intensively melting and the established regime of watercourses for water consumption begins. Electricity supply is limited by high economic costs, seasonal use of networks, and the dispersion of consumers over a large area. To conduct the research, an analysis of the water load in high-altitude areas was carried out to justify the use of a mobile microelectric power station. Studies have shown that cattle breeders on pastures, as autonomous consumers of electricity, have the required power in the operation of technological equipment and household appliances in the range of 15–20 kW. It follows that a micro-hydroelectric power plant with a capacity of up to 25 kW, taking into account the maximum power consumption and starting currents of electric motors, may well provide electricity to the average Kyrgyz farm during the grazing period. The use of renewable energy sources in agricultural production in the mountainous zone of Kyrgyzstan will contribute not only to obtaining additional agricultural products and reducing their cost, but also to improving the living conditions of livestock breeders.

Keywords: small watercourses, micro hydroelectric power plants, pasture period, electricity supply, autonomous consumers, technological equipment, household appliances

UDK 621.313.17

Justification for the selection of a power source for a submersible centrifugal electric pump for low-flow water sources

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Abstract. One of the urgent engineering tasks related to providing autonomous water supply to remote facilities is to select the optimal power source and determine the rational operating modes of submersible centrifugal electric pumps used in conditions of limited water resources. Low-flow springs, shaft wells, and small-diameter wells place high demands on equipment layout, energy efficiency, and reliability. Such systems require the use of compact and highly efficient water-lifting installations capable of operating in the absence of a centralized power supply. The paper considers a comprehensive scheme of autonomous water supply for low–flow sources based on the use of the "heat engine–high-frequency generator–submersible centrifugal electric pump" system. Based on the analysis of domestic research, it has been shown that in the absence of a centralized power supply, the most promising power source is synchronous and asynchronous generators of increased frequency powered by internal combustion engines. It is proved that an increase in the rotation frequency and the frequency of the supply current leads to a significant reduction in the metal consumption and dimensions of submersible electric pumps, promotes the transition to monoblock structures and expands the possibilities of their use in shaft wells of small cross-sections and in wells with reduced diameters. The use of high-frequency generators as part of autonomous systems makes it possible to stabilize the power supply due to higher dynamic stability than low-speed generators.

Keywords: submersible centrifugal electric pump, autonomous water-lifting unit, high-frequency power supply, low-flow water source, generator

Food Systems

UDK 664.661

The use of corn and flaxseed flour in the production of bakery products for baby food

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Abstract. Improving the nutritional value of flour-based products remains a significant focus in the food industry. Incorporating alternative flours into recipes opens up opportunities for creating a new range of products, including those with functional and specialized uses. However, the widespread use of such ingredients is often associated with technological challenges, as they can negatively impact the sensory characteristics, physicochemical parameters, and rheological properties of finished products. This study aimed to develop a recipe and manufacturing process for a bun intended for baby food. A mixture of three types of flour was used as the base: first-grade wheat, corn, and flaxseed. These components were chosen due to their high nutritional value and functional properties. During the experimental study, the relationship between dough quality and baked sample characteristics was analyzed using various proportions of the composite mixture (corn and flaxseed flour) added to first-grade wheat flour. Based on the data obtained, the optimal ratio of mixture components was determined, ensuring the best consumer properties of the final product. The research resulted in a proven recipe and a detailed production technology for baby buns. The finished product, produced using the developed method and a combined blend of corn, flaxseed, and wheat flour, boasts enhanced nutritional and biological value, meeting modern product requirements for this consumer group.

Keywords: bakery products, baby food, composite mixture, wheat flour, flax flour, corn flour, quality indicators, nutritional value

UDK 664.8.022.1

Analysis of the extraction process of plant raw materials under the influence of a microwave electromagnetic field

Aleksandr V. Gavrilov

Abstract. The production and processing of food products is associated with energy intensity. Emissions and waste from food production are pollutants of the atmosphere, hydrosphere, and lithosphere. At the same time, food technologies lag behind in the practical implementation of innovative projects compared to other sectors of the economy. However, the problems of food energy technologies are not comprehensively addressed in the world. They consist of elements of macro-, micro-, and nano-scale dimensions. Moreover, the objects of micro- and nano-scale size are in the focus of food technology in this article. Analysis of the extraction process of plant raw materials under the influence of a microwave electromagnetic field these objects, which have a high diffusion resistance, typically determine the energy intensity of the technology, the degree of raw material utilization, and the preservation of nutritional potential. As a result, up to 15–20% of the target components remain in the waste, trapped in micro- and nano-capillaries that cannot be extracted using traditional technologies. The use of innovative technologies in the food industry will allow the creation of fundamentally new products that do not have modern counterparts. The development of such technologies should be based on a comprehensive analysis of energy, thermophysical, and biotechnological phenomena. The main processes in

food technology that should be intensified are those related to heat and mass transfer. These processes determine both the energy content and the quality of the final product. Experimental study of microwave extractors has been conducted, and it's energy efficiency has been compared with that of traditional equipment. The principle of targeted energy delivery using an electromagnetic field has been proposed. A model has been developed to calculate the efficiency of the mass transfer process for extracting food products in an electromagnetic field. The developed microwave extractor allows for the production of high-quality products with minimal energy consumption and at reduced temperatures.

Keywords: diffusion resistance, food technologies, energy resources, boundary layer, nano technologies, barodiffusion, extraction

UDK 664.64:633.34

The effect of deodorized semi-degreased soy flour on the preservation of bread

Talgat A. Mukhamedov, Zhanna M. Kunasheva, Marina Kh. Kodzokova

Abstract. Providing the population with safe and high-quality food products is currently a top priority and a criterion for the development of food technologies. New and non-traditional types of raw materials make it possible to improve simultaneously the quality and nutritional value of food products. To enrich bakery products and give them new properties, a promising approach to replace part of the traditional main or additional raw materials with non-traditional ingredients is considered, taking into account their interchangeability and favorable technological properties. The purpose of this research was to extend the shelf life of wheat bread made from 1st-grade flour. The main task to be solved in order to achieve the set goal is to choose the most favorable dosage of deodorized semi-skimmed flour from soybeans of the highest grade, in order to prolong the shelf life and slow down the hardening. The objects of the study were: soy flour semi-skimmed deodorized of the highest grade varieties, a control sample of bread made from 1st grade wheat flour using a unified recipe, and a series of experimental samples of bread with varying dosages of soy flour. The technological effectiveness of using deodorized semi-skimmed soybean flour in the recipe for 1st grade wheat bread has been experimentally established. The optimal dosage is 12%, which provides a comprehensive improvement in product quality, including increased nutritional value, slower hardening, and longer shelf life.

Keywords: soybean flour, biochemical composition, bakery products, optimal dosage, quality indicators, hardening, shelf life

ECONOMY

Regional and Sectoral Economy

UDK 338.43:332.1

The state, problems and prospects of artificial intelligence in agriculture

Madina Sh. Gazaeva, Arina Z. Buzdova, Elvira R. Kokova

Abstract. Agriculture is experiencing a systemic crisis, which requires a transition to a new state to overcome. It is obvious that traditional manipulation of land, labor and capital no longer

produces the expected results. If radical changes are not made across the entire spectrum of agriculture from production to marketing, the industry will hopelessly lag behind. As a result, a large-scale non-competitive sector will form in national farms with a large share of traditional agriculture. A certain vision of promising transformations in agriculture and its entry into the advanced sectors of the national economy is associated with the introduction and development of artificial intelligence. Mobile devices, computers, drones and satellites, robotics, agricultural machinery, software are new agricultural technologies. The use of artificial intelligence and big data analytics seems to be a striking example of the introduction of innovative technologies in agriculture. The existing practice (both foreign and domestic) of using artificial intelligence in agriculture indicates encouraging results. At the same time, this very practice demonstrates the formation of problems of both technical and technological, as well as organizational, economic and institutional nature, without the solution of which further development of intelligent agriculture is impossible. These issues are the subject of this study.

Keywords: agriculture, artificial intelligence, problems, dispersed, integrated models