AGRONOMY, FORESTY AND WATER MANAGEMENT

General Farming and Crop Production

UDK 633.15:631.524.84(574.22)

The influence of sowing dates and stand density on the productivity of corn hybrids for grain and green mass in the northern region of Kazakhstan

Mukhtar Zh. Ashirbekov, Yuri M. Shogenov

Abstract. The study on the effect of sowing dates and stand density on the productivity of corn hybrids for grain and green mass was conducted in 2022–2024 at the Uchkhoz field station in the Zerendinskiy district of the Akmola region. The experiments were conducted on leached chernozem. The soil of the experimental field is medium-thick ordinary chernozem, heavy loam with a slightly alkaline reaction; the pH of the water extract is 7.8. The area of the experimental plot was 100 m^2. The research is aimed to study the influence of sowing dates and plant density of hybrid corn plants on the yield of green mass and grain in the conditions of the Republic of Kazakhstan. It was established during the studies conducted in 2022–2024 that the plant density and sowing dates affect the formation of the yield of green mass, grain and the quality of corn grain in the conditions of the Republic of Kazakhstan. It was also found that the highest grain and green mass yields of the Krasnodarsky 194 MV and Ross 195 MV hybrids were obtained in the second sowing period (30 April) (with a density of 80,000 plants per hectare) (70.1 and 95 centners per hectare; 314.3 and 427.4 centners per hectare, respectively). The regression equation calculations conducted during the study allowed us to establish a pattern and dependence of grain and green mass yields on plant density.

Keywords: corn hybrid, Krasnodar 194 MV, ROSS 195 MV, Rodnik 179, plant density, sowing time, yield, grain, green mass, regression equation

UDK 635.21:631.5(470.64)

The influence of agrotechnical methods on the yield of early potatoes in the conditions of the Kabardino-Balkarian Republic

Abdulmalik A. Batukaev, Zalim-Geri S. Shibzukhov, Beslan B. Beslaneev

Abstract. Development and implementation of modern cultivation technologies using drip irrigation, organic fertilizers and biopreparations can significantly increase potato yields, and also ensure maximum minimization of the use of chemical pesticides and mineral fertilizers. For the development of potato growing, it is necessary to use modern technologies adapted to specific soil and climatic conditions, providing for minimization of costs with maximum profit. In this regard, the purpose of our research is to optimize the technology of potato cultivation in the soil and climatic conditions of the foothill zone of the Kabardino-Balkarian Republic using natural sources of raw materials.. For its implementation, the following tasks were set: 1. Study of the features of potato cultivation in the conditions of the foothill zone of the KBR; 2. Determination of the optimal composition of fertilizers from irlites to increase the yield and quality of potatoes; 3. Identification of the most productive varieties of potatoes. The studies

were carried out in the conditions of Yug-Agro LLC located within the territory of the Nalchik urban district (foothill zone of the KBR). The agricultural technology on the experimental plot was as close as possible to the production one. The predecessor was winter wheat. During our research, no significant differences were found in the timing of the onset of potato development phases depending on the planting density. The shoots appeared almost simultaneously, with a difference of 1–2 days, which indicates a high adaptability of plants to the conditions. The intervals between the development phases also remained the same on average, which confirms the stability of biological processes in potatoes. In the variant with dense planting, the yield for most varieties was lower than the average long-term data, with the exception of Bellarosa, which is due to its high drought resistance and heat resistance. The highest yields were achieved at a planting density of 47–48 thousand/ha (options 3 and 4 using irlits and manure), where the yield was from 150 to 170 t/ha for the varieties Bellarosa, Zhukovsky early, Udacha, Adretta, Vladikavkazsky, Predgorny, Lilly and Colette.

***Keywords*:** early potato, foothill zone of the Kabardino-Balkarian Republic, irlit, productivity, marketability

UDK 633.34:631.54(470.64)

Improving the technology of soybean cultivation in the steppe zone of the KBR

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Abstract. The expansion of soybean cultivation as a food, industrial, and fodder crop contributes to increasing the protein content in the diet. Soybeans attract everyone's attention not only due to their high concentration and completeness of protein, but also due to their cost-effectiveness. The cost of one ton of digestible protein in soybean meal is 15–18 times lower than in cereal grains, moreover, soybeans are capable of not only producing the cheapest and most complete protein, but also to a certain extent providing nitrogen to subsequent crops in crop rotation. A significant increase in the productivity of soybean yields is due to the intensive chemicalization of the agricultural sector. For this reason, the use of special fertilizers containing a complex of essential elements is becoming increasingly relevant. The conducted studies have shown that for soybeans, root nutrition is the main source of nutrients for plants, providing up to 90% of the need for nutrients. The main plant nutrition elements should be added in the fall during the main treatment, for this purpose ammophos and potassium chloride suit perfectly, or in spring during pre-sowing treatment with sulfate ammophos at a dose of 100–250 kg/ha, and also together with seeds, if potassium chloride 16:16:16 (nitroammophoska, azophoska) at a dose of 100–250 kg/ha was not used in the fall. Along with macronutrients, soybeans also need micronutrients. It is recommended to use VRU NPK *Aqualis* 13:40:13 + ME in the phase of 1–3 trifoliate leaves; VRU NPK *Aqualis* 20:20:20 + ME in the budding phase – the beginning of flowering – VRU NPK *Aqualis* 3:11:38 + ME to enhance the growth of lateral shoots and in the bean filling phase – VRU NPK *Aqualis* 3:11:38 + ME, enhancing the outflow of plastic substances from leaves into grains at 3 kg/ha each.

Keywords: soybeans, technology, fertilizers, herbicides, fungicides

Horticulture, Vegetable Growing, Viticulture and Medicinal Crops

UDK 634.13:631.895(470+571)

The influence of microfertilizers on the productivity of pear varieties in the southern gardening zone of Russia

Timur S. Aisanov, Maria V. Selivanova, Aza O. Dolakova

Abstract. The article presents the results of research conducted in 2023–2024 on the land use territory of the educational garden of the Stavropol State Agrarian University. The objects of research were autumn pear varieties Talgarskaya Krasavitsa and Ksenia. The subject of research was foliar feeding with microelement-containing fertilizers. According to the approved experimental design, relative to the control without fertilizers, the efficiency of foliar application of Stimul (3 l/ha), Aquamix, L (2 l/ha) and GO DRIP MICRO (1 kg/ha) fertilizers was studied. As part of the conducted studies, the effect of the studied fertilizers on the average fruit weight, yield and concentration of soluble dry substances in the fruits of the studied pear varieties was analyzed. According to the obtained results, on average for the studied pear varieties, the use of fertilizers provided a reliable advantage in all analyzed indicators relative to the results of the control options. A comparative assessment of the studied pear varieties showed that, on average, for the analyzed fertilizers, the highest average fruit weight was noted for the Ksenia variety (183 g), and the highest yield and dry matter concentration in fruits were noted for the Talgarskaya Krasavitsa variety, which reliably exceeded the indicators of the second variety. The highest indicators for all analyzed parameters of the fertilizers considered, were noted against the background of the use of GO DRIP MICRO fertilizer. The advantage of this variant over other variants in average fruit weight was 15–66 g, in yield – 1.2–6.9 t/ha, concentration of soluble dry substances – 0.4–2.2%. At the same time, it should be noted that for most of the considered indicators, the use of Aquamix, L, fertilizer, providing a reliable advantage over the results of control and Stimul fertilizer, was slightly inferior to the leading variant.

Keywords: pear, fertilizers, top dressing, average fruit weight, yield, crop quality

ANIMAL SCIENCE AND VETERINARY MEDICINE

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

UDK 636.234.1:636.087.7

Prospects for using mineral feed additives to increase the milk productivity of Holstein cows

Orest A. Basonov, Sergey V. Chelyshev, Anna S. Kulatkova

Abstract. The analysis of the use of feed additives in the diet of dairy cows over the past decades was carried out. There has been a significant increase in interest in the health and welfare of farm animals, which is associated with increasing requirements for the quality of livestock products and the need to ensure sustainable development of the agricultural sector. However, despite the

wide range of existing additives, the problem of lack of effective and safe solutions remains relevant, especially in the conditions of modern animal husbandry. One of these is the mineral feed additive "Animax", which was the subject of a study in the Nizhny Novgorod region on Holstein cows. The purpose of the study is to analyze literary sources on feed additives with a detailed description of the mineral feed additive "Animax" for use in animal husbandry. In conditions of intensive animal husbandry, where cows are exposed to various stress factors, including changes in diet, housing conditions and diseases, the use of safe and effective feed additives becomes especially important. This paper presents an overview of existing feed additives, taking into account the mechanisms of action and impact on animal health (physiological and hematological parameters), as well as on cattle productivity. It was found that Animax can improve the immune defense of cows and reduce morbidity and increase productivity. The main attention is paid to the results of the study, which demonstrated how Animax affects the physiological state of cows, including changes in glutathione activity, erythrocyte intoxication index and the number of pathogenic microorganisms, which are analyzed in the context of their significance for cow health and their productivity. Discussion of the results will identify key aspects that emphasize the importance of using Animax in modern animal husbandry, as well as its potential to improve animal health and welfare. The article presents the prospects for the use of the mineral feed additive Animax in animal husbandry and possible directions for further research and implementation of the additive in practice.

Keywords: feed additives, Holstein breed, mineral additive Animax, animal health and welfare, productivity, safety of use, naturalness.

UDK 636.52/.58.082.4(470.57)

Productivity and composition of the intestinal microflora of chickens at different dosages of feeding the probiotic Vetosporin-active

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Abstract. The article discusses the results of including the probiotic Vetosporin-active in the diet of the parent stock chickens of the Ross-308 cross. The studies were conducted on the following accounting parameters: weighing the live weight of the bird, analyzing the microflora of the large intestine of chickens, considering the digestibility of nutrients in the feed, conducting a hematological analysis of the blood of the experimental bird and calculating the economic feasibility of this inclusion in the diet of meat-producing chickens. To conduct the study, various dosages of feeding the probiotic Vetosporin-active were selected, namely 0.6, 0.9, 1.2, 1.5 kg per 1 ton of complete feed, respectively, in the experimental groups. The use of the probiotic Vetosporin-active had a beneficial effect on the productive performance of chickens, as well as on the microflora of the large intestine of chickens, reducing the amount of microbial contents. Based on the results of the experiment, it was found that the most optimal dosage of the probiotic for the parent stock chickens of the Ross-308 cross was 0.09% of the feed weight. In this group, the best results were obtained in egg production and an improvement in the condition of the microflora of the large intestine of chickens was observed. In general, the use of the probiotic Vetosporin-active in the diets of chickens from the parent flock of the Ross-308 cross contributed to an increase in production profitability by 3.6%.

Keywords: chickens, cross "Ross-308", probiotic, Vetosporin-active, live weight, intestinal microflora, hematological parameters of blood, economic efficiency

UDK 636.5.082.474

The effect of the treatment of hatching eggs of chickens from the parent flock of the Ross-308 cross with a microbiological complex on egg incubation rates

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Abstract. The article presents a study on the assessment of the effect of the probiotic drug Bonaka-APK-N on the egg incubation rates of chickens from the parent herd of the Ross-308 broiler cross. The aim of the work was to study the effectiveness of probiotic treatment and determine the optimal concentration of the drug. To achieve this goal, the task of identifying the most effective concentration of probiotic in the treatment of hatching eggs was solved. The scientific novelty lies in the application of the domestic probiotic preparation Bonaka-APK-N at the incubation stage and the determination of its optimal concentration. The study was conducted in the conditions of the farm of Bazdugov in the Tersk district of the Kabardino-Balkarian Republic. The experiment used eggs from 33-week-old chickens weighing 60,5-62,5 g, stored for 7 days before incubation. Four groups were formed: a control group and three experimental groups (4032 eggs each). For a detailed analysis, 378 eggs were placed in each group on different levels of the incubator cart. The experimental groups were treated with 3%, 5% and 7% probiotic solutions by spraying. Incubation was carried out in the STIMUL IP-16 M1 industrial incubator according to the approved regime. The study assessed the parameters of embryo development: egg weight before incubation, shrinkage on days 12 and 18, the weight of day-old chicks and their proportion of the initial egg weight. Incubation parameters were also analyzed: fertilization (on average 94.11%), false and true neoplod, blood ring, fight, incision, frozen embryos, suffocation, cripples, egg hatchability, duration of the hatch window and the exit of viable chickens. It has been established that the use of probiotics has a positive effect on the development of embryos, reduces the level of embryonic death, accelerates and balances the hatching of chickens. The highest efficiency was achieved when using a 5% solution of "Bonaka-APK-N". In this group, there was a decrease in false neoplod by 0.25%, blood ring by 0.42%, egg hatchability increased by 1.99%, and the yield of viable chickens increased by 1.84%. The duration of the exit window has been reduced by 48 minutes. The obtained results confirm the prospects of using probiotics as an environmentally safe alternative.

Keywords: broilers, probiotic, incubation, hatching egg treatment, hatchability

UDK 636.22/.28.082.084.13

Transformation of dry matter and feed energy into the production of heifers of various breeds

Vasiliy N. Pristupa, **Diana S. Torosyan**, **Konstantin S. Savenkov**

Abstract. The expenditure of dry matter, protein and biological energy of feed per 1 kg of absolute gain, pre-slaughter live weight and various carcass tissues during the period of intensive rearing of Belgian Blue Simmental, Swiss, Holstein, Jersey and Kalmyk heifers was determined. It was revealed that under equal conditions of keeping, Belgian Blue heifers with a daily gain of more than 1600 grams at the age of 13 months obtained a live weight of 545.1 kg, and from 8 to 13 months of age, the expenditure of dry matter per 1 kg of absolute gain is 13.8–31.9% less than that of peers of the Simmental, Swiss, Holstein, Jersey and Kalmyk breeds, which have a live

weight of 24–105 kg less even after their 2-month rearing. In terms of dry matter consumption per 1 kg of pre-slaughter live weight, carcass weight and its pulp, 15-month-old peers of the Simmental, Swiss, Holstein, Jersey and Kalmyk breeds had a convincing advantage. They transformed dry parts of the feed into pre-slaughter live weight by 8.2–92.8%, and into pulpy parts of the carcass by 19.0–41.0% lower than 13-month-old heifers of the Belgian Blue breed. A similar pattern was manifested in them in the transformation of protein and energy of the feed into absolute gain (13.7–31.6%), into pre-slaughter weight (6.9–23.2) and into carcass weight (17.3–38.6%). Simmental and Swiss 15-month-old heifers took the second and third places in these indicators, surpassing Belgian Blue heifers by 0.03–0.21 kg, but inferior to their peers of the Holstein, Jersey and Kalmyk breeds by 0.01–0.2 kg. Heifers of the Belgian, Simmental and Swiss breeds have the most advantageous position when reared for meat. Heifers of other breeds, having an average daily gain of 1200–1400 g during rearing, were inferior to the leaders in feed energy transformation. In general, the studied heifer breeds, with intensive rearing at the age of 13–15 months, reached a live weight of 435–545 kg, and the profitability of production was 14.46–20.23%.

Keywords: heifers of different breeds, meat productivity, daily gain, nutrient conversion, feed energy

Breeding, Selection, Genetics and Biotechnology of Animals

UDK 636.32/.38.082.262

Meat productivity of young fine-wool sheep of different origins

Vasily V. Aboneev, Yuri A. Kolosov, Anna Ya. Kulikova, Ekaterina V. Aboneeva

Abstract. In the process of improving the breeding and productive qualities of agricultural animals, an important role is played by animals of breeding herds, which, along with a high level and nature of productivity, have stability of transmission of selected traits to the offspring. In breeding herds, the producers used, the continuers of outstanding lines, depending on the conditions created in the farms, are characterized by different indicators of the implementation of traits to the offspring. Scientific and production experiments to study the level and nature of the manifestation of meat productivity of young fine-wool sheep have shown that the offspring of Manych merinos of the 815 and 214 lines and Caucasian breed ewes of the commercial herd are distinguished by lower feed costs per unit of production, higher average daily gains, slaughter weight and slaughter yield, as well as the meat coefficient and varietal composition of the studied carcasses. At the same time, the highest live weight when removed from fattening was in the ewes from the 815 and 214 lines, which exceeded their Caucasian breed peers by 3.6 and 1.5 kg, or 10.0 and 4.2%. The highest slaughter yield was noted in the ewes from the 815 line, which amounted to 45.6%, and in the offspring of the 214 line and Caucasian breed animals, these figures were 42.7 and 42.1%, respectively. At the same time, among the crossbreeds, the best indicators of the listed traits were characteristic of the offspring from the 815 line.

Keywords: sheep, breed, Caucasian, Manych merino, lines 815, 214, average daily gain, slaughter weight, slaughter yield

UDK 636.32/.38.082

Meat productivity of mixed merino sheep

Inna V. Zasemchuk, Natalya N. Kolosova

Abstract. The article discusses the prospects of using the genetic resources of the Dzhalginsky merino breed to improve the meat qualities of Salsk sheep. Animals of a new genetic combination were obtained, formed by combining the genotypes of the Salsk and Dzhalginsky merino breeds, as well as assessing their biological and productive qualities, against the background of the original population of Salsk sheep.The young animals of improved genotypes were characterized by higher absolute and relative indicators of meat productivity. The maximum slaughter weight was noted in group 2 (17.32 kg), which is 6.8% more than in the control. The carcasses of the rams in group 2 weighed 6.4% more than the carcasses of the control animals, and the content of internal fat was 10.1% higher. The highest slaughter yield was noted in the rams from group 2 (45.2%), which is 0.6% more than in the control group. The young animals of groups 2 (1/2CA + 1/2DZ) had the highest yield of first-grade cuts (93.47%). In terms of the weight of the most valuable cuts, namely, the shoulder-dorsal, hip and lumbar, the rams of group 2 were superior to those of group 1 by 6.4%; 6.7; 6.8%, respectively. Animals of improved genotypes differed from their purebred peers in higher indicators of the weight of internal organs. Thus, the weight of the lungs, heart and liver in the rams of group 2 was 5.9 (P> 0.999); 7.3 and 4.2% (P>0.999) compared to the rams of group 1.

***Keywords*:** Salsk breed, Dzhalginsky merino breed, slaughter weight, slaughter yield, varietal composition of carcasses, development of internal organs

UDK 636.32/.082.262

Reproductive capacity of Stavropol breed sheep when crossed with Manych merinos

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Abstract. The aim of the research was to study the meat qualities of young rams obtained by selecting stud rams to ewes of the Stavropol breed of different constitutional and productive types. The research was conducted at ZAO Novaya Zhizn, Novouzensky District, Saratov Region. The object of the research were young rams obtained by crossing purebred Manych merino rams of the wool-meat line Em 815 with ewes of the wool type (Group 1); wool-meat type (Group 2). The experimental animals were kept in the same feeding and housing conditions from birth to 8 months of age, after which three young rams from each group were slaughtered. The wool-meat constitutional-productive intrabreed type rams significantly surpassed their wool-type peers in pre-slaughter live weight by 6.6%, fresh carcass weight by 9.9%, and slaughter yield by 1.4% (P>0.999). Analysis of the morphological and varietal composition of carcasses showed that the rams of group 2 (wool-meat constitutional-productive intrabreed type) had 1.12 kg or 11.4% more meat (P>0.99) compared to their group 2 peers (wool type), and in terms of meat content the excess was 0.31 kg or 9.4%. The carcasses of crossbred rams of the wool-meat constitutional-productive intrabreed type, in contrast to their peers of the wool type, were distinguished by a better commercial value and contained 1.0% more grade 1 cuts and 0.6% less grade 2 cuts.

Keywords: selection, intrabreed type, Manych merino, Stavropol breed, rams, meat productivity

UDK 636.32/.38.033

Productive indicators of sheep of the Aktobe intrabreed type of the Kazakh fat-tailed semi-coarse-wool breed

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Abstract. The study of economically useful traits of Kazakh fat-tailed semi-coarse wool sheep of the Aktobe type is of great scientific and practical importance. The objective is to study the influence of semi-coarse wool producers of different genotypes on the meat and wool productivity of the offspring of the Aktobe type semi-coarse wool sheep. The work was carried out in the Aktobe region of the Republic of Kazakhstan. In the process of improving the breeding and productive qualities of sheep of the Kazakh fat-tailed semi-coarse wool breed of the Aktobe type, the selection of one and a half year old rams-producers of the Kazakh fat-tailed semi-coarse wool breed of the Aktobe type of different live weight to adult ewes of this breed is carried out. As a result of such work it was established that the offspring obtained from the use of one and a half year old stud rams of the Kazakh fat-tailed semi-coarse wool breed of the Aktobe type with lightened semi-coarse wool in the selection were characterized by fairly high indicators of live weight and wool productivity. The resulting young animals have the body structure inherent in semi-coarse wool sheep, sufficient precocity, live weight and shear of lightened semi-coarse wool. The selection of one and a half year old rams with a higher live weight to the ewes of the Kazakh fat-tailed semi-coarse wool breed of the Aktobe type contributes to the production of young animals that are superior to the offspring of rams with a lower live weight. The established difference between the offspring of stud rams with different live weights is 4.0 and 4.7% for live weight at weaning of rams and ewes, 5.3 and 4.3% at one year of age, and 10.5 and 6.4% for wool yield, respectively.

Keywords: semi-coarse wool breed, Aktobe type, live weight, wool clip, semi-coarse wool, exterior

AGROENGINEERING AND FOOD TECHNOLOGIES

Technologies, Machines and Equipment for the Agro-industrial Complex

UDK 631.31

Improving the operational reliability of joints of parts of tillage machines and aggregates

Artur M. Egozhev, Mukhamad Kh. Misirov, Asker A. Egozhev, Khasan A. Apkhudov

Abstract. In ordinary working conditions of tillage machines, there is a problem of frequent overstretching or replacement of fasteners. To solve this problem, agricultural enterprises spend tens of thousands of repair hours each season and scrap up to 40% of fasteners. Theoretical and experimental studies show that when using standard fasteners, dynamic shear loads cause displacement of the connected elements, even if the initial tightening reaches 250–300 MPa. To increase the reliability of connections operating under difficult loading conditions, it is necessary to achieve uniform distribution of contact stresses in the areas adjacent to the fasteners. The main factors reducing the initial tightening stress in threaded connections of agricultural machinery are

corrosion-mechanical and friction-mechanical damage to the parts. Thus, the development of high-strength fasteners and promising structures with improved strength and performance characteristics remains a key task in agricultural engineering. A promising fastening compound of increased strength and durability is proposed in relation to machines for mechanical soil treatment, protected by patents of the Russian Federation for the invention.

Keywords: fastener, mechanical processing, dynamic load, strength, durability

UDK 620.22

The effect of carbon fibers on the thermal conductivity coefficient of polymer composites for structural purposes

Zaira M. Zhirikova, Vladimir Z. Aloev, Kantemir V. Aloev

Abstract. The article is devoted to the current problem of creating high-strength structural materials with increased thermal conductivity. Parts and assemblies made of polymer materials experience thermal stress during operation, which leads to their overheating. The generated heat must be removed to the surrounding space, otherwise the parts and assemblies made of polymer materials overheat, which reduces the reliability of their operation. This problem is solved by using polymer materials with a high coefficient of thermal conductivity. An effective way to increase their thermal conductivity is to modify the properties of the base polymers by introducing fillers with high thermal conductivity. Changing its content and morphology by choosing the type of filler, it is possible to change purposefully the thermal conductivity of the polymer composite. Phenylene-based carbon plastics filled with short carbon fibers are the most promising for these purposes. The thermal conductivity of polymer composites based on phenylene filled with carbon fibers is investigated. It is shown that the value of the thermal conductivity coefficient of carbon fiber plastics based on phenylene is due to the thermal conductivity of phenylene, well described by the Debye equation and the nature of the spatial distribution of carbon fibers.

Keywords: polymer composite, phenylene, carbon fiber, thermal conductivity coefficient, carbon fiber, orientation factor, fractal dimension

UDK 631.6.02(470.64)

Technical and technological support for combating erosion processes in the Kabardino-Balkarian Republic

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Abstract. Modern global trends in obtaining environmentally friendly products require abandoning chemical means of weed control. The working bodies of tillage machines do not provide a rational impact on the soil from the point of view of agronomic science and environmental requirements. Therefore, to improve the processes of soil cultivation, an integrated approach is needed to reduce the destruction of the soil structure by the working bodies of machines and tools and the development of technological processes that optimize its agrophysical properties. The purpose of the work is to study the process of the impact of the working body of the flat-cutting paw of the modernized flat cutter on the roots of weeds and crop

residues and to substantiate its geometric parameters. The studies are based on the methods of physical and mathematical modeling. As a result of the studies, it was found that the modernized working body of the proposed flat cutter has obvious advantages over the existing ones. As a result of the action of the modernized working body on the soil layer at increased speeds due to the use of a curvilinear profile, the absolute speed of its movement is higher, which leads to more intense crushing, cutting and crushing of the soil layer. During the operation of the modernized working body, more intensive cutting of weeds is observed. The treatment with the modernized flat cutter resulted in significant suppression of regrown plants, both from the lower and upper soil layers. At the same time, fewer plants regrown from the upper layer than in the control and in comparison with the use of the serial flat cutter, respectively, by 1.2 and 2 times. The productivity of forage lands increases by 20–25%, and in terms of the mass of eaten mown grass by 2.5–6.7 times. Increasing the angle of inclination of the paws prevents soil displacement to different sides and the formation of ridges. Also, as a result, more intensive self-cleaning of the paws from adhering soil and plant residues occurs.

Keywords: soil, processing, soil-cultivating machines, flat cutter, paw, angle of inclination, operating mode, modeling

Food Systems

UDK 338.439:339.13(675.97)

Consumer preferences in the food market of the Republic of Burundi: trends and determinants

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Abstract. Unbalanced nutrition results from a disparity between actual dietary intake and physiological nutrient requirements. According to data from the FAO HLPE-FSN expert group, over 85% of the population in Eastern, Western, and Central African countries lack the financial means to maintain healthy eating patterns. The purpose of the study is to identify key factors that determine consumer choice in the food market of the Republic of Burundi, in order to develop scientifically based recommendations for improving food supply mechanisms and adapting agricultural policy to the real needs of the population. The study was conducted using a selective survey method using an online questionnaire developed on the Google Forms platform.This study examines consumer preferences in Burundi's food market, with particular focus on socioeconomic determinants of dietary behavior. The findings reveal that the Burundian population primarily consumes plant-based foods, with affordability being the decisive factor in food selection rather than nutritional value. Economic constraints were identified as the main barrier to transitioning to balanced diets, posing significant risks to food security and public health. These results hold important implications for developing public policies aimed at improving access to quality food products in the region. The study contributes to understanding consumer strategy formation mechanisms in low-income food markets.

Keywords: food security, consumer preferences, economic constraints, dietary behavior, Burundi

UDK 664.659:633.112.6

Development of grain bread technology using spelt of the Zdrava variety

Natalia V. Sokol, Nadezhda S. Sanzharovskaya, Nikita A. Epryntsev

Abstract. The recent increase in interest in the revival and use of ancient wheat species, such as emmer wheat, is driven by the necessity to enhance the resilience of grain production and to expand the range of functional food products. The objective of this study was the development of a technology for whole grain bread utilizing emmer wheat grain of the "Zdrava" variety. The research objects included grain of the "Zdrava" emmer wheat variety and hard spring wheat "Yasenka". A comparative analysis of the technological properties of both types of grain demonstrated that, in terms of quality indicators, emmer wheat surpasses hard spring wheat. The dynamics of changes in the activity of the carbohydrate-amylase complex during grain soaking were investigated. It was established that with prolonged grain treatment, there is a decrease in the falling number value, indicating an increase in amylolytic enzyme activity. It was shown that increasing the soaking duration of the test samples of wheat and emmer grains leads to a slight decrease in raw gluten content compared to the initial level, as well as deterioration in its elastic properties. Technological solutions were developed for the production of whole grain bread from emmer wheat, and it was confirmed that the experimental bread samples exhibited superior quality indicators and maintained freshness longer than the control samples. As a result, a technology and recipe were created for the "Zernyshko" whole grain bread, which consists of 60% dispersed emmer wheat grain and 40% emmer wheat flour.

Keywords: wheat, spelt, grain bread, lecithin, quality, technology, formulation

UDK 664.661.3:543421/.424

Application of FTIR spectroscopy for detection and identification of non-traditional plant raw materials in complex food systems using bakery products as an example

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Abstract. FT-IR spectroscopy is widely used in the food industry, forensics, pharmaceuticals, and environmental monitoring due to its speed, non-destructive testing, and high accuracy. The efficiency of FTIR has been poorly studied in relation to bakery products with additives of non-traditional plant materials. The aim of the study was to investigate the possibility of using FTIR spectroscopy to detect and identify the species of plants in bakery products with the addition of aqueous infusions of *Viola tricolor* L. herb (S_1), *Vaccinium myrtillus* L. leaves (S_2) and *Vaccinium vitis-idaea* L. (S_3). The concentration of phenolic substances in the sample infusions, mg/dm^3, was: S_1 – 1.72; S_2 – 1.85; S_3 – 2.12. Replacing the water for kneading the dough with aqueous infusions helped to reduce the proofing time of the dough pieces by 3-10 min., improve the condition of the crust, crumb, taste and aroma. The color of the crumb due to anthocyanins varied from dark and light gray to beige. In samples S_2 and S_3, an increase in the shape stability and relative plasticity of the dough and a decrease in its relative elasticity were noted. In the IR spectra of the studied samples, absorption bands were revealed that reflect the general chemical composition and have approximately the same set of absorption bands. Specific absorption bands for each species, due to the presence of flavonoids, anthocyanins, phenolic carboxylic acids,

were revealed in the ranges of 1750–1010 cm^{-1} and 3300–2500 cm^{-1}. With the highest probability, the species can be identified by the IR spectrum in relation to *Vaccinium vitis-idaea*, which is apparently due to the high content of condensed tannins. Thus, FTIR technology makes it possible to detect the presence of non-traditional plant materials in bakery products without ensuring acceptable accuracy of species identification. The results of the study allow us to recommend the method of IR Fourier spectroscopy of attenuated total reflectance for identifying non-traditional raw materials of plant origin in the composition of bakery products, detecting falsification of functional products and express diagnostics of their physicochemical parameters during the baking process.

Keywords: food system, bakery product, FT-IR spectroscopy, non-traditional plant raw material, identification, absorption bands, phenolic compounds

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Integration processes in the agro-industrial complex as a factor in increasing the economic security of regional food systems

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Abstract. The article is devoted to the urgent problem of the influence of integration processes in the agro-industrial complex on ensuring the economic security of regional food systems. In the context of sanctions pressure, climate change and volatility of world food markets, agro-industrial integration is considered as a key mechanism for strengthening regional economic security. A comprehensive analysis of theoretical approaches to the study of agro-industrial integration is carried out. Based on statistical data, key trends in the development of integrated agro-industrial structures in Russian regions are identified and factors influencing the efficiency of integration processes are determined. Positive dynamics of the development of integrated structures in the agro-industrial complex of Russia is revealed. Correlation and regression analysis confirmed the presence of a statistically significant positive relationship between the level of development of integration processes and indicators of economic security of regional food systems. Four regional integration models are identified and characterized: vertical integration based on private investment, cluster model, cooperative model and public-private partnership model. The necessity of a differentiated approach to the development of integration processes taking into account regional specifics, ensuring a balance between large agroholdings and small forms of management to maximize the positive impact on the economic security of regional food systems is substantiated. A methodology for assessing the contribution of integration processes to the economic security of regional food systems is proposed.

Keywords: agro-industrial complex, vertical integration, horizontal integration, cluster approach, food security, regional food systems, economic sustainability, import substitution