

THEORETICAL DESCRIPTION OF THE MOTION OF SOYBEAN SEEDS IN COAXIALLY POSITIONED CYLINDERS

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Key words: *particle, bulk material, the angular velocity, torsional critical speed.*

The work is aimed at studying the process of moving a single particle of bulk material in the vertical direction by a spiral-screw working tool of the conveyor and substantiating its technical characteristics. A single particle of granular material is considered the equivalent of a material point. A spiral-screw conveyor is used as a device for moving bulk material. The transportation process is carried out when the device is in a vertical position. The construction of this device implies that the drive of the working tool is located in the lower part, so that during operation the material is moved from the bottom to the top. When determining the parameters of the process of moving bulk material using a conveyor with a spiral-screw working tool, modeling using the d'Alembert equations is applied. These equations describe the steady flow of particles in a cylindrical coordinate system. The applied d'Alembert principle makes it possible to use static methods to solve problems of dynamics. For a mechanical system, you can write the equations of motion in the form of equilibrium equations. Such equations can be used to determine unknown forces, in particular, constraint reactions, as well as conditions acting on a single particle of bulk material being moved by a transport device. The particle, when moving, directly interacts with a complex system that includes: a fixed inner part of the outer casing generatrix; a fixed outer part of the inner cylinder generatrix; a movable spiral-screw working tool with certain geometric parameters (the wire diameter of the spiral, the spiral pitch, the average diameter of waps).

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KINEMATICS FEATURES OF HAMMER PERFORATED TILLAGE ROLL

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Key words: *rolling, tillage roller, kinetic parameters, Lagrange equation, angular velocity, angle acceleration*

The task of improving the quality of agricultural tools by improving the technological processes of their functioning, taking into account the kinematic features of the combined impact of working elements of tools on the soil environment is important from a scientific and technical point of view. To form the required structure and density of the soil layer at the depth of sowing, a hammer perforated tillage roller (HPTR) has been developed. The study aim is to improve the quality of post-sowing compaction and structuring of the soil layer in the seed location zone based on the development of an innovative design of HPTR that combines different effects on the treated environment. The object of research is the kinematic mode of operation of the HPTR, equipped with cylindrical hammers installed at the ends of the rod, which, in turn, are radially and pivotally installed on the axis of the gun. Feature of offered HPTR is the excitation of hammer vibrations, which changes the kinematic parameters of the tillage tool as a whole. Lagrange equations of the second kind are used to describe the process of HPTR operation, which is represented as a system of material objects with several degrees of freedom. The conducted studies revealed the periodic nature of changes in the strength of the impact of HPTR on the soil. The obtained equations allow us to determine the features of the HPTR movement at different masses of a hollow perforated cylinder and cylindrical hammers. This is of great importance for increasing the efficiency of soil bolter destruction and creating the soil structure recommended for winter crops sown in the Middle Volga region.

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DETERMINATION OF THE QUALITY OF RAPID ENGINE BREAK-IN BY CHANGING THE CRANKCASE GAS FLOW RATE, OIL PRESSURE AND TEMPERATURE

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Key words: *tests, wear, surface-active agents, resource, quality, efficiency, internal combustion engine*

Stabilization of the crankcase gas flow rate and its reduction in comparison with the corresponding engine break -in mode on pure oil serve as indicators of the effectiveness of the additive for running-in. In addition, in the process of engine break-in there is a decrease in oil pressure. Reducing the rate of pressure drop and oil temperature in the engine lubrication system characterizes the quality of run-in. The use of various oils with pre-processing compositions containing surface-active agents (SAA) and chemically active substances (CAS), accelerate the process of break-in and improve its quality and reduce repair costs in general. Internal combustion engines of the UMZ-421 brand were studied, speed run-in of which was carried out at the run-in section of OJSC «Ulyanovsk automobile repair plant № 2» and in the internal combustion engine testing laboratory of the Ulyanovsk SAU. It is established that the efficiency of additives and oils in relation to M-8-B oil is distributed as follows during speed-up run-in: OMD-8; M-8-B SINTEC + 3 % BAPKC; M-8-B SINTEC + 2 % OGM-3 respectively in 3,52; 3,25; 3,07 times.

According to the results of the research, it was concluded that the use of fast run-in on various pre-production compositions M-8-in SINTEC (GOST 17479.1-85) + 2 % OGM-3; M-8 - in SINTEC (GOST 17479.1-85) + 3% VARS; OMD-8 reduces the volume of crankcase gases released up to 3.5 times, reduces the pressure drop in the engine lubrication system during fast run-in from 2.38 times to 1.17 times.

Also, the oil temperature in the engine lubrication system decreases at the end of hot running under load by 1.15 times, from 433 K to 376 K. These studies confirm the assumption that the use of rolling oils with additives to accelerate running-in of rubbing surfaces has a positive effect not only on the alignment of the cylinder group, but also other critical friction pairs of the engine UMZ -421.

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RESEARCH OF PROPERTIES OF MAGNETIC LUBRICANTS BASED ON ORGANOSILICON LIQUID

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Key words: lubricant, equipment reliability, service life, magnetic field, adhesion

The results of research on lubricants which are magnetic fluids are presented. The positive effect on the characteristics of the lubricant of pondemotor force that

occurs when an external magnetic field is applied is noted. The purpose of this work is to study the properties of magnetic lubricants based on polyethylsiloxane liquids and confirm the previously stated theoretical assumptions. The main objectives of the research are to develop the composition of a lubricant based on a polyethylsiloxane magnetic fluid, to determine the characteristics of adhesion of this material to a metal base, to obtain an adequate mathematical model describing the characteristics of adhesion of the lubricant to the surface, and to determine its stability during operation. Experimental installations and methods for determining the characteristics of the coupling of magnetic fluids with the friction surface, as well as the stability of magnetic fluid itself during operation, have been developed. The prospects of introducing oleic acid into the organosilicon base of the magnetic liquid are noted. A decrease in the adhesion coefficient with an increase in the rotational speed of the samples at loads from 160 N to 320 N was revealed by an average of 1.6...2.7 times. It is proved that the magnetic lubricant adheres to the metal base more strongly than Litol-24 by an average of 6 times, which prevents the rolling elements from slipping during the operation of the samples. Different patterns of changes in adhesion to metal surfaces of Litol-24 and magnetic fluids are noted. An increase in the adhesion coefficient of magnetic fluids under the conditions of applying a constant magnetic field at loads on samples from 480 N to 800 N due to the magnetorheological effect by 20...30% is established. A mathematical model is obtained that adequately describes the change in the adhesion coefficient of the obtained magnetic lubricant. The composition of the magnetic liquid is recommended, consisting of a polyethylene siloxane carrier liquid, a surfactant-oleic acid, and a ferromagnetic phase-magnetite with a particle size of 7.5 nm. High stability of the developed magnetic fluids during long-term operation has been experimentally established. The stability coefficient of the magnetic fluid decreased by 2.51 times in 366 hours.

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USE OF LEGUMES FOR ECOLOGICAL RECLAMATION OF STEPPE DEGRADED PASTURES OF KULUNDA

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Key words: *Fabaceae, ecological reclamation, degraded pastures, steppe ecosystems, forage grasses*

Intensive development of the steppe communities of Kulunda, located in the southern part of the West Siberian lowland in the XX century led to a significant anthropogenic transformation of all steppe ecosystems. Representatives of the legume family, which is the most important component of steppe grasses, have almost disappeared from the grasslands. The research was conducted on the territory of the Mikhailovsky district of the Altai territory, on the lands of LLC KKH «Partner» in the environs of Poluyamki village since 2013-till present days climatic conditions of dry steppe zone of Western Kulunda. The aim of the work was to evaluate representatives of the legume family for ecological reclamation of Kulunda steppe pastures. The experiment was performed on 2 degraded fenced steppe areas (10 x 10 m) corresponding to the third stage of pasture digression. Winter sowing of legumes was carried out: cicer milk vetch (*Astragalus cicer L.*), sainfoin milk vetch (*A. onobrychis L.*), furrowed milk vetch (*A. sulcatus L.*), bird's foot trefoil (*Lotus corniculatus L.*), sickle alfalfa (*Medicago falcata L.*), hop alfalfa (*M. lupulina L.*) and late spring sowing: cicer milk vetch and sainfoin, bird's foot trefoil by tapping into the sod. Monthly growth dynamics of sown plants (number

of shoots per m², height, phenology) was recorded, and the feed value of aboveground biomass was established. It was found that the drought-resistant species of alfalfa sickle has a significant biomass, is short-lived in the grass stand and requires re-sowing every 4 years. Hop alfalfa is recommended for improving degraded pastures, but due to its short ontogeny, it needs to be re-sown every three years. Among milk vetches, sainfoil milk vetch is the most promising – a long-rooted, rod-rooted polycarpic that increases its area due to numerous underground rhizomes. The greatest nutritional and energy value was possessed by the phytomass of bird's foot trefoil and sickle alfalfa.

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**INFLUENCE OF THE METHOD OF PROCESSING LIGHT-GRAY
FOREST SOILS ON THE CLOVER LAYER OF THE FIRST YEAR OF
USE ON THE YIELD OF WINTER WHEAT OF « MOSKOVSKAYA 39
VARIETY»**

IN THE CONDITIONS OF THE NIZHNY NOVGOROD REGION

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Key words: *Clover, winter wheat, crop rotation, density and moisture content of the soil, the contamination of crops, glyphosate and traditional tillage, Min-till, No-till.*

The research aim is to identify the most energy-saving and cost-effective technology for winter wheat cultivation. The maximum moisture content of soil was recorded when it was processed using Mini-till technology – from 17.2% to 17.9%, and the lowest - with traditional technology – from 15.7% to 16.4%. The lowest soil density with traditional winter wheat technology is both on the background with fertilizer (1.18%) and on the background without fertilizer (1.21%). The lowest contamination of crops with traditional technology without mineral fertilizers (42 pcs/m²). With the Mini-till technology, the total blockage increased to 51 pcs/m², and with the No-till technology, it was maximum- 128 pcs/m². Against the mineral fertilizers, the same tendency of total blockage-from – from 40 pcs/m² to 132 pcs/m², respectively. With No-till technology, the total plant damage increased from 17.0 % to 14.6 %, with traditional treatment – from 12.4% to 10.1%, and with Mini-till technology-from 12.7% to 9.6%. The yield of winter wheat when using traditional plowing against the background of mineral fertilizer is 3.59 t / ha, and against the background without mineral fertilizer – 2.24 t / ha. The yield of Mini-till technology for mineral background is 3.13 t / ha, and without fertilizers-1.81 t / ha. With the No-till technology, the winter wheat yield is 1.69 t/ha, and without fertilizers – 1.11 t/ha. The highest level of profitability with Mini-till technology against the background of mineral fertilizers-73.2%.

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ENERGY ASSESSMENT OF AGROTECHNOLOGY OF LEGUMINOUS CROPS IN IRRIGATED AGROCENOSSES

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Key words: *irrigation, leguminous crops, productivity, mineral fertilizers, inoculation, bioenergetic efficiency.*

The research was conducted in the irrigated stationary crop rotation of FSBEI «Omsk agricultural research center» in the southern forest-steppe of Western Siberia. The aim of the research was to determine the bioenergetic efficiency of agricultural technology of seed peas, feed beans and soybeans on irrigated lands. The experiments studied influence of various conditions of mineral nutrition and inoculation of seeds with rhizotorphin on seed productivity of seed peas, feed beans and soybeans under irrigation. It was established that when cultivating peas, phosphorus (in action and aftereffect) increased energy cost per 1 ha from 14.10 to 17.23 GJ or 22%, the introduction of nitrogen fertilizers and microelements against increased phosphorus content – up to 17.14 GJ or 22%, and the pre – sowing introduction of mineral nitrogen, phosphorus and microelements against an increased content of P₂O₅-up to 20.26 GJ or 44%. At the same time, the increase in seed productivity of the crop provided an increase in gross energy in these variants by 39, 50 and 52%, respectively. It is shown that the improvement of conditions of mineral nutrition of beans provided an increase in energy from 31.32 to 44.84-47.66 GJ/ha or by 43-52%; soybeans-from 14.21 to 20.09-21.03 GJ / ha or by 41-48%. A weak effect of seed inoculation on the yield of various varieties

of peas, beans and soybeans, and, as a result, on changes in bioenergetic efficiency indicators, was found. Of all the studied pea varieties, it is worth noting the varieties aksaysky usatyi 55, whose energy coefficient was at the level of 3.03, Yamalsky-2.92 and Blagovest – 2.49. The energy coefficient of various soybean varieties selected by the Omsk ASC was about 2.55-2.87. Feed beans surpassed peas and soybeans in this indicator – 3.55-3.77. Due to high seed productivity, beans have the lowest energy consumption per 1 ton of seeds-about 4.83 GJ.

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**PRODUCTIVITY OF CORN HYBRIDS FOR GRAIN DEPENDING
ON CULTIVATION METHODS IN THE CONDITIONS OF THE VOLGA
FOREST-STEPPE ZONE**

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The article presents the results of evaluating the productivity of corn hybrids for grain with different vegetation periods, depending on the method of protecting plants from contamination and the level of mineral nutrition on leached chernozem of the Volga forest-steppe zone. Studies conducted during 2017-2019 showed that the early-maturing hybrids of Gitago maize FAO 200 and the phenomenon of FAO 220 fully realized their potential and provided yield of 8.31 and 8.55 t / ha of grain. These hybrids are characterized by a higher collection of raw protein, the output of exchange energy and feed units in comparison with the hybrids Talisman FAO 180 and Novatop FAO 240. Systems of crop protection from weeds had an impact on both the yield and productivity of corn, which is explained by the

different effectiveness of inter-row processing and herbicide in protecting plants from weeds. Thus, when inter-row processing was used, the number of weeds in hybrids averaged 8.4 PCs/m², while when applying herbicide, it decreased to 5.1 pcs/m², a similar pattern was found when assessing the air-dry mass of weeds, which was 65, 2 g/m² and 27.5 g / m², respectively. On average, the corn grain yield in hybrids increased by 0.92 t/ha when applying herbicide compared to mechanical tillage. The use of leaf fertilizing during the growing season with Izagri Azot and Izagri Zn preparations led to an increase in the yield of corn hybrids: Talisman by 0.57 t/ha, Gitago by 0.48, Phenomenon by 0.81 and Novotop by 0.44 t/ha of grain, as well as an increase in protein collection, exchange energy and feed units when using leaf fertilizing.

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ANTI-STRESS EFFECT OF ORGANO-MINERAL FERTILIZERS IN WINTER WHEAT AGROTECHNOLOGY

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Key words: *winter wheat, urea, organo-mineral fertilizers, development phases, catalase, aboveground mass, leaf area, nitrogen and protein, sugars and fiber*

To study the effect of urea mineral fertilizer and new organo-mineral fertilizers Stimulife and potassium glutamate containing humic acids (humates) and

selenium bioelement, which can affect the plant's protective system, enhancing adaptive potential, winter wheat crops were treated with prima herbicide at a dose of 500 ml/ha. Visually, the suppression of crops and stress changes in plants were determined. After that, foliar fertilization with urea and organo-mineral fertilizers was carried out. The activity of the catalase enzyme (NF 1.11.1.6) of leaves when treated with organo-mineral fertilizers increased by 20.4% on the first day, then the increase decreased and on the fifth day it decreased to 11.2%. This type of change in catalase activity is caused by the protective and stimulating effect of the drugs Stimulife and potassium humate, and the protection of cells from the destructive effect of oxygen under stress. The aboveground mass of plants and area of leaves per plant increased, both with the use of urea up to 5.5% - as a result of additional nutrition, and with organo-mineral fertilizers up to 2.9% – as a protective effect against stressors, as a result of increased physiological and biochemical reactions. The content of sugars and fiber increased from the tillering phase to the tube exit phase, and by earing it decreased to the initial state. Urea treatment reduced the sugar content by up to 40%, as a result of the outflow of low-molecular metabolites from sugar formation processes to protein biosynthesis. The nitrogen content when using urea increased by 11.6%, which was provided by additional nitrogen nutrition.

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COBALT AND CADMIUM CONTENT IN PLANT TISSUES OF TECHNOGENIC ZONE

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Key words: cobalt, cadmium, heavy metals, medicinal plants, industrial waste water.

The collection of heavy metals in soils is a threat to public health and agriculture. Wild and cultivated plants are able to accumulate significant amounts of heavy metals, which on the one hand allows the use of phytopreparations to correct microelement exchange and eliminate hypomicroelementosis. The work shows the results of study of the content of cobalt and cadmium in wastewater, soil and the aboveground part of medicinal and forage plants in the fields of wastewater irrigation located in the sanitary protection zone of Orenburg gas processing plant. 9 types of plants used in medical and veterinary practice in Russia were selected

for the study. Water, soil, and plant samples were collected at the end of June from 2018 to 2020. The TM content was determined on the basis of the interdepartmental complex analytical laboratory of FSBEI HE «Orenburg state agrarian university» by atomic absorption spectroscopy using the «Spektr-5» atomic absorption spectrometer (Russia). The ability of species to accumulate cadmium and cobalt in the aboveground part (assimilating and generative organs) was determined. According to the results of the research, the ability of the studied plants to control to a certain extent the intake of cobalt and cadmium from the environment to generative and assimilating organs is seen. Specific differences in the nature of accumulation of cobalt and cadmium in the aboveground part of the studied plants were determined. The results of the study may be of interest for planning enterprises for phytoremediation of technogenically polluted soils and evaluating the quality of medicinal and feed plant raw materials.

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RESPONSIVENESS OF SPRING WHEAT TO THE EFFECTS AND AFTEREFFECTS OF ORGANIC AND MINERAL FERTILIZERS

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Key words: *spring wheat, mineral and organic fertilizers, effect and aftereffect of fertilizers, terms and doses of fertilizers, grain quality, yield.*

In 2016-2018, scientific research was carried out on the experimental field of the Ulyanovsk agricultural research Institute on leached heavy loam chernozem to assess the effectiveness and aftereffect of mineral and organic fertilizers in the technology of cultivation of spring wheat varieties, depending on the level of

intensification. Weather conditions over the years of research were characterized as quite favorable, but during the period of germination-tillering plants experienced a lack of productive moisture, which affected the overall productivity of the crop and the effectiveness of organic and mineral fertilizers. Spring wheat crops used the aftereffect of straw of the previous crop (winter wheat) and manure, as well as the effect and aftereffect (introduced under winter wheat) of mineral fertilizers. The responsiveness of varieties to mineral and organic was different, which was explained by varietal features and the conditions of water availability of the year. Separate planting of winter wheat straw in the soil did not lead to a significant increase in crop productivity. High availability of soil by mineral nutrients (natural fertility) allowed to get depending on grade from 2.3 to 2.96 t/ha of grain in the control variant (without fertilizers), on the ground the advantage was with the variety Margarita (2,96 t/ha). The largest grain yield was formed by spring wheat of Margarita variety, but this variety showed less responsiveness to mineral and organic fertilizers. On average, the increase in yield, depending on the level of intensification, was 0.3-0.5 t / ha. The use of complex fertilizers for pre-sowing cultivation and the aftereffect of organic fertilizers led to an increase in the content of protein (up to 14.1-15.9 %) and gluten (up to 25.9-30.0 %).

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**ЭФФЕКТИВНОСТЬ БИОМОДИФИЦИРОВАННЫХ МИНЕРАЛЬНЫХ
УДОБРЕНИЙ ПРИ ВОЗДЕЛЫВАНИИ СЕЛЬСКОХОЗЯЙСТВЕННЫХ
КУЛЬТУР НА ЧЕРНОЗЕМАХ ЛЕСОСТЕПИ ПОВОЛЖЬЯ**

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Ключевые слова: биомодифицированное удобрение, сельскохозяйственные культуры, урожайность.

Исследования по изучению эффективности биомодифицированных минеральных удобрений проводили на базе Ульяновского НИИСХ – филиала Самцентр РАН в течение ротации пятипольного зернопарового севооборота: пар чистый – озимая пшеница – яровая пшеница – ячмень – овес в 2013-2018 гг. Схема полевого опыта включала варианты (кроме контроля): с внесением в почву биопрепарата БисолбиФит (внесение с семенами, которые обрабатывали перед посевом), азофоски $N_{15}P_{15}K_{15}$, в чистом виде, модифицированной биопрепаратом азофоски в той же дозе $N_{15}P_{15}K_{15}$, половинной дозы модифицированной азофоски ($N_{7,5} P_{7,5} K_{7,5}$). Эффективность удобрений и биопрепарата при возделывании культур изучали на трех фонах: естественном (контроль), аммиачной селитры в дозе 40 кг д.в./га (NH_4NO_3) и модифицированной аммиачной селитры в дозе 20 кг д.в./га. Установили, что модификация азофоски биопрепаратом БисолбиФит позволяет значительно повысить коэффициенты использования элементов из нее растениями. Последнее позволяет уменьшить дозы удобрения, не снижая продуктивности возделываемых культур, в два раза. Длительное возделывание культур с применением только

минеральных удобрений и биопрепарата привело к относительному снижению содержания гумуса в почве и подкислению ее. За 6 лет в пахотном слое чернозема выщелоченного содержание гумуса уменьшилось на 0,12 %, кислотность почвенного раствора повысилась на 0,5 единиц $pH_{КСЛ}$. В условиях лесостепи Поволжья при возделывании на черноземах наиболее высокоурожайной является озимая пшеница (до 4,00 т/га и более, в наших опытах 3,88–4,80 т/га). Урожайность яровой пшеницы в среднем составила 2,68–3,31 т/га, ярового ячменя 2,67–3,21 т/га, овса 2,15–2,71 т/га. Наиболее высокую продуктивность севооборота отмечали на фоне с модифицированной аммиачной селитрой в дозе 20 кг д.в./га ($1/2 NH_4NO_3$) при внесении модифицированной азофоски ($N_{15}P_{15}K_{15}$). Сбор зерна за 2013 – 2018 гг. на данном варианте составил 13,36 т/га, превысив контрольный вариант на данном фоне на 1,31 т/га.

EFFICIENCY OF BIOMODIFIED MINERAL FERTILIZERS IN THE CULTIVATION OF AGRICULTURAL CROPS ON THE CHERNOZEM REGIONS OF THE VOLGA FOREST-STEPPE

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Key words: *biomodified fertilizer, agricultural crops, yield.*

Research on the effectiveness biomodified mineral fertilizers were carried out on the basis of Ulyanovsk SRIA – SamSC RAS branch during the rotation grain fallow five fields crop rotation: pure steam – winter wheat – spring wheat – barley – oats in 2013-2018. The field experiment scheme included options (except control): with the introduction of biologics BisolbiFit (introduction with seeds that were treated

before sowing), azofoski N15P15K15, in pure form, modified with biopreparation azofoski in the same dose N15P15K15, half a dose of modified azofoski (N7, 5 P7, 5 K7, 5). The effectiveness of fertilizers and biopreparations in crop cultivation was studied on three backgrounds: natural (control), ammonium nitrate at a dose of 40 kg ai/ha (NH₄NO₃), and modified ammonium nitrate at a dose of 20 kg DW/ha. It was established that modification of azofoski with Bisolbifit biopreparation can significantly increase the coefficients of use of elements from it by plants. The latter allows to reduce the dose of fertilizer, without reducing the productivity of cultivated crops, twice. Long-term cultivation of crops using only mineral fertilizers and biological products led to a relative decrease in the humus content in the soil and its acidification. For 6 years, the content of humus in the arable layer of leached chernozem decreased by 0.12 %, and the acidity of the soil solution increased by 0.5 pH_{KCl} units. In the conditions of the Volga forest-steppe, when cultivated on chernozems, the highest-yielding winter wheat is (up to 4.00 t / ha or more, in our experiments 3.88-4.80 t / ha). The average yield of spring wheat was 2.68-3.31 t / ha, spring barley 2.67-3.21 t / ha, oats 2.15-2.71 t / ha. The highest productivity of crop rotation was observed against a background with modified ammonium nitrate at a dose of 20 kg ai/ha (1/2NH₄NO₃) when applying modified azofoski (N15P15K15). Grain harvest for 2013-2018 in this variant was 13.36 t / ha, exceeding the control variant on this background by 1.31 t / ha.

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DNA MARKING WHEN CREATING APPLE VARIETIES WITH STABLE SCAB RESISTANCE

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Key words: apple tree, variety, selection process, genes, DNA markers, immunity, stacking.

*The use of chemical means of protection against Apple scab is associated with high material costs and causes great harm to the environment. Growing of apple varieties with stable resistance to scab (the pathogen *Venturia inaequalis*) will significantly limit the use of pesticides. On the territory of the Russian Federation, the *Rvi6* gene is considered immune, which determines resistance to five scab races, including the most aggressive fifth. The country has scab-immune apple varieties created by scientists from VNIISPK, NCFSCHWWG, FRC named after I. V. Michurin, VSTISP and other scientific institutions. In recent years, the *Rvi6**

gene has been overcome by scab in many European countries, and the Rvi5 gene, which is immune to four scab races, has been overcome in Russia and Germany. When creating high-yielding apple varieties of a new generation, with good fruit flavor quality, long-term and stable resistance to scab, in addition to the rvi6 resistance gene, the most promising sources are the Rvi5, Rvi11, Rvi12, Rvi14 and Rvi15 genes. The Rvi2, Rvi4, Rvi6, Rvi7 and Rvi9 genes in the apple breeding process are best used in extended pyramids of genetic resistance to scab. This will allow you to combine several scab resistance genes that control the immune system in one apple genotype. The article describes the characteristics of DNA markers, the nucleotide sequence of primers, the size of target fragments of the PCR product, including the size of the dominant allele product for detecting Rvi genes of the Venturia inaequalis pathogen that are promising for apple breeding in varieties and hybrid material. Amplification programs were selected to identify resistance genes to various races of apple scab.

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ADAPTIVE PROPERTIES OF NEW OAT VARIETIES IN THE MIDDLE VOLGA REGION

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Key words: *filmy oats (Avena sativa L.), naked oats, line, variety, GGE biplot analysis, yield, stability, adaptability, plasticity, breeding value, ultrastability.*

The research was conducted in 2016-2020 in the Ulyanovsk region. The aim was to assess the yield and genotype-environment interaction of varieties and promising lines of spring oats in the Middle Volga region. The source material was 9 varieties and 4 promising lines of oats created in the Ulyanovsk RAS. Contrasting moisture and temperature conditions provided differentiation of the studied material by yield and level of adaptability. Two-factor dispersion analysis revealed significant differences between genotypes in yield, media, and their interaction. The highest average yield among filmy varieties was formed by the Dragun variety (42.7 c/ha), the lowest by Vsadnik (37.0 c/ha). Naked varieties Azil and Griva showed the same yield (24.3 c / ha). The share of influence of environmental conditions (years) was 51.6%, varieties-33.8%. According to GGE biplot analysis, 2016, 2017, and 2020 were characterized by a high differentiating ability, while 2018 was the most representative. A rank assessment based on six adaptive criteria (regression coefficient (b_i), stability index (S^2_j), coefficient of variation (V_c), Martynov ultrastability (H_i), ultrastability (H_{om}) and selection value of the variety (S_c) V.V. Khangildin revealed the advantage of Grum (17), Dragun (22), Konkur (18), and Kenter (24) varieties, while Troika (64) had the lowest rank. Evaluation and ranking of genotypes by average yield and stability in different environments using GGE biplot analysis relative to the "ideal" genotype showed that the highest average yield was in the Dragun variety, which also has high stability, and practically corresponds to the «ideal» genotype. Next are the lines 479/11, 549/15, and the varieties Grum and Konkur, which are close to the «ideal» genotype. Less stable is the 537/15 line, which produced yields less than expected in 2016, 2018 and 2019 environments and more in 2017 and 2020. Biplot analysis of the yield of film varieties confirmed the results of the rank assessment for adaptability parameters, adjusting the location in the group of the best varieties.

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INFLUENCE OF COLOR OF GRAIN DOURA ON THEIR COLONIZATION BY PATHOGENIC MICROFLORA

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Key words: *doura, phyto expertise, color, protection, fungi, pathogen, mildew.*

*It is important to conduct phytoexpertising of seeds before sowing and after harvesting the crop, this is an integral part of modern production technologies. It makes it possible to determine the infestation of plants and seeds with pathogens, as well as to save a high yield and improve the quality of grain, among other things. The aim of our research was to identify pathogenic microflora on sorghum seeds and determine the degree of their distribution. Place of research: Samara region. According to the phytopathological expertise of 2018-2020, it was found that the mold of grain sorghum seeds is caused by many types of mold fungi, but the most common were *Cladosporium* sp., *Trichothecium roseum*, *Mucor* sp., *Penicillium* sp. To a lesser extent, fungi of the genus *Aspergillus* were found. Pathogenic fungi from the genus *Alternaria* were observed on the surface of 2.0%*

of sorghum seeds, Fusarium sp. - 2.0 %. Among the two varieties of grain sorghum, the most susceptible to infection with pathogens was a sample with a yellowish-white color of seeds compared to orange-red, respectively, 49.3 % and 33.5 % of seeds infected with pathogens. In our opinion, this difference in seed damage may be due to the absence of tannins in the yellowish-white grain and its presence in the orange-red grain, which corresponds to the data of many authors. The number of healthy seeds in the sample with yellowish-white grain color was 50.7% and 66.5% with orange-red. The variety with a yellowish-white seed color was more strongly affected by mold fungi from the genus Cladosporium sp., Trichothecium roseum, Mucor sp., Penicillium sp. - on average, about 40.3 %. The interaction of pathogens in the community of mycobiota of grain undoubtedly affects their vital activity, which ultimately affects the relationship with the host plant. The results obtained will make a significant contribution to local technologies, to the environmentally reasonable integrated protection of sorghum from pathogens.

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RESISTANCE TO PRE-HARVEST GERMINATION OF DURUM WHEAT GRAIN BY THE PARAMETER " FALLING NUMBER»

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Key words: durum wheat, variety, number of falling, germination resistance, selection.

The aim of the research is to identify durum wheat varieties that consistently form grains with a high number of falls (NF). The quality of durum wheat grain is formed under the influence of the genotype and environmental conditions during the period of grain filling and maturity. Abundant rainfall, dew, temperature fluctuations, stimulate seeds already at the root to complete maturation (bypassing or reducing the dormant stage) and germination. This leads to a decrease the main parameters of quality of grain and pasta. Several methods are used for the phenotypic assessment of pre-harvest germination resistance (RPHGG) in wheat, including FN determination by Hagberg-Perten. In RPHGG breeding, this is the main method for evaluating breeding material. The experiment included 19 varieties and breeding lines of the Samara SRIA, studied in the period 2015-2019 according to the method of competitive variety testing. Samples for analysis were taken from two non-contiguous repetitions after harvesting and cleaning the grain. The study showed significant effects on the value of flag indicators of the year (80.3% of the total variation), genotype (10.7%) and their interaction (8.8%). In terms of stability parameters – coefficient of variation (CV), homeostaticity (Hom), the degree of variety superiority (Pi), and value of the trait on average for the experiment, the 1916d-17 breeding line was clearly distinguished. Based on these properties, the lines 1919d-9 and 1916d-10 are considered to be promising genotypes for use as source material.

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AMINO ACIDS AND PROTEINS IN CULTURE FILTRATES OF THE ANTHRACNOSE PATHOGEN FUNGUS *COLLETOTRICHUM LINI*

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Key words: *flax, anthracnose, resistance, selective agent, culture filtrate, amino acids*

The research was carried out on the basis of laboratory biotechnologies of All-Russian research institute of flax (Tver region) in 2010–2012, 2016. The aim of the work was to determine the amino acid and protein composition of culture filtrates of the anthracnose pathogen fungus *Colletotrichum lini* Manns et Bolley in order to adjust the concentration of selective agent in the nutrient medium when

creating in vitro new flax genotypes resistant to anthracnose. It was established that the culture filtrates of strains 527 and 608 contain such amino acids as alanine, glycine, asparagine, cysteine, threonine, aspartic acid, glutamic acid, as well as arginine in strain 527 and traces of tyrosine and lysine in strain 608. It was established that the concentration of amino acids in EC of strain 527 was significantly higher than in culture filtrate of strain 608. It was shown that the toxicity of the culture filtrate depended on the degree of aggressiveness of the anthracnose pathogen strain – culture filtrate of a strongly aggressive strain is more toxic than the culture filtrate of a weakly aggressive strain. Studies have revealed that when cultivating the fungus-causative agent of anthracnose on a nutrient medium, as the mycelium of fungus grew, the concentrations of asparagine, alanine, aspartic and glutamic acids, and glycine decreased in the culture filtrates. It was established that the change in amount of proteins happened during the entire period of cultivation of the mycelium of fungus on a liquid nutrient medium. It is shown that accumulation and content of proteins in culture filtrates of strains of different aggressiveness occurs in different ways. The more aggressive strain is (639), which is more toxic, contains and accumulates more proteins in the culture medium during the entire period of growth and development the less aggressive strain is (419).

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ANALYSIS OF THE EFFECTIVENESS OF PREVENTIVE MEASURES IN THE POSTNATAL PERIOD IN COWS

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Key words: *cows, postnatal period, endometritis, economic damage.*

Currently, many issues related to therapy and prophylaxis have not been solved in the problem of afterbirth detention. There is a high percentage of complications of this pathology with endometritis, which leads to a decrease in the productivity and reproductive function of animals. Based on the above, the aim of our work was to determine the effectiveness of two treatment regimens for the retention of the afterbirth in cows. Scientific research was carried out in IAPC "New Life" of the Cherdaklinsky district of the Ulyanovsk region. Before the diagnosis was made, an obstetric study was performed according to the "Methodological guidelines for the diagnosis, treatment and prevention of obstetric and gynecological diseases of cows". Morpho-biochemical parameters of blood were studied according to generally accepted methods. To determine the effectiveness of conservative treatment of afterbirth retention in animals of the experimental and control groups, different schemes of drug prevention were used. The results of studies show that after calving, the number of white blood cells and total protein increases. A higher indicator in the control group indicated the development of the inflammatory process. Clinical studies have confirmed the assumption. A decrease in the level of alkaline phosphatase and phosphorus with an increase in the content of calcium indicates the risk of developing osteodystrophic processes. As a result of preventive measures in the experimental group, complications in the form of postnatal endometritis were not observed, although cases of subinvolution were recorded (15 %). In the control group of cows, postpartum endometritis (15 %) occurred along with uterine subinvolution (15 %). Thus, the inclusion in the scheme of prevention of a preparation "Uterotsev" reduces the risk of postpartum complications in cows.

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DYNAMICS OF MORPHOMETRIC PARAMETERS OF CICATRICAL EPITHELIUM IN CATTLE IN POSTNATAL ONTOGENESIS

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Key words: cattle, calves, cicatrical tissue, rumen papillae, ontogenesis, gastric morphology, mucosa

The aim of the study was to study the morphological adaptation of the epithelium of rumen papillae under the influence of age-related changes in the type of nutrition. The research was conducted on the material taken from the slaughteries of the Stavropol territory from 60 heads of black-and-white cattle of six age groups: newborns (1, 3, 7 days), 30 days, 3 months, 6 months, 18 months, 3-5 years. Histological and immunohistochemical methods (marker of proliferating cells Ki-67) and morphometric methods were used. It was established that the thickness of epithelial ridges of interstitial zones significantly increases from birth to six months of age by 1.64 times and from eighteen months of age to 3-5 years by 12%. The thickness of the epithelium above the papillae of the mucosal lamina proper remains stable. With age, the ratio of the thickness of the epithelium above connective tissue papillae of the mucosal plate to the thickness of epithelial ridges of the interstitial zones decreases twice: from 81.42% in newborns to 41.69 % in lactating cows 3-5 years old. The thickness of the surface layer of the papillary epithelium of the scar changes in waves with the maximum values of this indicator in newborns at the age of 1 day (10.01 ± 0.19 microns) and in animals of eighteen months of age (9.96 ± 0.57 microns). High proliferative activity of basal epithelial cells is observed in the first day after birth (64.8 %), significantly decreases from three to seven days of age (32.7 %), there is a significant decrease in this indicator also at six (23.9 %) and eighteen months (15.6 %), and then it remains stable.

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MORPHO-PHYSIOLOGICAL ADAPTATION

AFRICAN CATFISH TO HIGH PLANTING DENSITIES IN RAS

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Key words: *high-tech aquaculture, african sharptooth catfish, interior, exterior, planting density, morphophysiological indicators.*

The article presents the results of research on the effect of increased planting density on the body of african catfish. Vital organs that play a fundamental role in fish metabolism were studied: heart, liver, kidneys, and spleen. Morphophysiological adaptations of the african catfish to unfavorable environmental conditions were evaluated. The results showed that an increase in planting density causes a number of negative changes in the fish body. In pools

with increased planting density, the average fish mass was significantly less than in the control. The greatest slowdown of the growth rate and biomass set was observed when the planting density increased by 30%. It was established that the liver mass increased with increasing planting density, and males had significantly larger livers than females. Liver indices P and Q increased with increasing planting density in males and females and were higher the higher the planting density. Kidney mass and their P and Q indices in catfish showed that increase in planting density depresses the kidneys, causing a decrease in their mass against the increase in the P and Q indices. With increasing planting density, the absolute weight of fish spleen decreased. A study of the heart mass of the african catfish showed that with increasing planting density, the heart mass and P and Q indices increased, due to the high energy costs of survival.

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HEMATOLOGICAL INDICATORS OF CALVES IN THE PREVENTION OF HYPOELEMENTOSIS IN THE AMUR REGION

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Key words: *calves, blood, selenium, hypoelementosis, Amur region.*

Hematological studies were conducted in calves in dynamics during the prophylaxis of hypo-elementosis in the Amur region. The object of the study was calves (breed-Holstein, age-up to two months). The selected animals were divided

into two equivalent groups: control and experimental. In the control group, planned measures were taken to prevent hypo - elementosis; in the experimental group, complex injectable drugs were used: Se-containing and tissue. Laboratory tests of calves ' blood were performed at the beginning and end of the experiment with determining the number of red blood cells, white blood cells, hemoglobin level, calculating the color index, differential counting of white blood cells and calculating the color index. It was established that the quality of blood oxygenation in calves of the experimental group improved. This is confirmed by the reparation to the standard values of hemoglobin level and color index as a result of their growth by 28 and 17%, respectively. At the end of the experimental period, the percentage of conditionally healthy calves was 80 % in the experimental group and 40 % in the control group. Thus, it should be noted that the proposed scheme of complex application of Se-containing and tissue preparations contributed to the normalization of erythropoiesis processes and increased the resistance of calves to diseases by 40 %.

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MICROARCHITECTONICS OF FEMALE SHARPTOOTH CATFISH GONADS GROWN IN AN ARTIFICIAL ENVIRONMENT

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Key words: *aquaculture, African sharptooth catfish, histological features of gonads, oocyte, disorders of the reproductive system of sharptooth catfish.*

The article presents the research results obtained by use of probiotic «Sporothermin» for the cultivation of females of African sharptooth catfish in an artificial environment. Sporothermin is a probiotic that is a mixture of Bacillus subtilis and Bacillus licheniformis, which provides an increase in the adaptive abilities of fish to the long-term action of various adverse factors, which is relevant when growing in an artificial environment. The histological structure of the gonads of female sharptooth catfish was analyzed using a research motorized universal microscope Axio Imager. M2 (Carl Zeiss, Germany). The results of our research have shown that in sharptooth catfish grown using the probiotic «Sporothermin», germ cells are observed, represented by oogonia and young oocytes of the protoplasmic growth period. Oocytes appear, that finished protoplasmic growth as well as oocytes that have completed trophoplasmic growth. At this stage, oocytes in the cytoplasm contain fat droplets that are part of the yolk grains, coloring from light yellow to orange with various shades. Female sharptooth catfish (Clarias gariepinus) of the control group, grown without the use of the probiotic «Sporothermin», have a violation of the synthesis of yolk granules, as well as edema of the follicular layer of the gonads, resorption of yolk grains and edema of the connective tissue egg-bearing plate, there is no striation of the radial layer, and deformation of the trophoplasmic oocyte is noted. In histological studies

of the gonads of female sharptooth catfish, it was found that the use of the probiotic «Sporothermin» leads to a decrease in disorders in their microstructure, due to the strengthening of the membranes of the gonad cells.

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**THE CONTENT OF AMINO ACIDS IN THE MUSCLES OF THE AFRICAN
SHARPTOOTH CATFISH IN THE INTER-SPAWNING PERIOD**

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Key words: *African sharptooth catfish, inter-spawning period, proteins, amino acids.*

The meat of the African sharptooth catfish has a variability in indicators of nutritional and biological value, depending on the physiological state of fish. The aim of the study was to compare the nutritional and biological value of african sharptooth catfish meat during the spawning and inter-spawning period. The object of the study is muscle tissue of the african sharptooth catfish at the age of 12 months. The assessment of organoleptic properties and indicators of nutritional and biological value of the muscle tissue of the african sharptooth catfish during the spawning and inter-spawning period was carried out. The organoleptic properties of the african sharptooth catfish during the inter-spawning and spawning periods did not differ significantly. It was found that the criteria for the nutritional value of african sharptooth catfish meat in the inter-spawning period significantly exceed similar indicators during the spawning period. The meat of the african sharptooth catfish in inter-spawning period includes more fat and protein, therefore, is characterized by less water content. The biological value of meat is determined by the content of amino acids in it. During the inter-spawning period, the amount of all amino acids in the meat of African clarias significantly increases. The dominant position of essential amino acids is occupied by lysine and tryptophan. This is of exceptional importance for a living organism. Tryptophan is indispensable in the synthesis of vitamin B3, which has a vasoprotective effect, reduces cholesterol and provides prevention of hypoxia of cells and tissues. Lysine is a source of carnitine, stimulates mitosis, provides prophylaxis of osteoporosis, and stimulates bone regeneration. According to research, lysine can prevent the development and ease the course of Alzheimer's disease. Eating foods with high levels of tryptophan and lysine ultimately improves the quality of life. The high

content of lysine and tryptophan makes it possible to attribute african sharptooth meat to an indispensable component of children's and sports nutrition.

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**INFLUENCE OF TEMPERATURE AND PLANTING DENSITY ON
PERIPHERAL BLOOD PARAMETERS OF THE AFRICAN
SHARPTOOTH CATFISH IN THE CONDITIONS OF RAS**

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Key words: *aquaculture, recirculating aquaculture system, African sharptooth catfish, differential blood count, white blood cells, red blood cells.*

The article presents the results of research on the influence of biotic and abiotic factors, in particular, planting density and temperature on the peripheral blood composition of the African sharptooth catfish. It was found that when the water temperature decreases by 4-6°C, compared with the optimal temperature, the structure of differential blood count, the content of red blood cells and white blood cells changes in catfish. The answer to the effect of temperature factor affected polymorphonuclear cells and monocytes in differential blood count, and to a lesser extent, lymphocytes. The other components of differential blood count did not change significantly. Significant changes occurred in red blood system. When the temperature decreased, the content of red blood cells in the blood significantly decreased. At the same time, the content of white blood cells significantly increased. Similar reactions of the blood system were observed with increased planting density. It was shown that the proportion of monocytes with increased planting density increased significantly. It is monocytes that carry out phagocytosis, which allows the body to fight naturally against the penetration of foreign invaders. It should be noted that the proportion of monocytes increased by more than for 76% against the background of increased planting density. This is obvious due to the fact that with a high planting density, the concentration of fish metabolites in water increases.. A high level of organic matter contributes to the development of pathogenic and opportunistic pathogenic microbiota that threatens the body of fish. It is this process that, in our opinion, stimulates mechanism of increased production of monocytes.

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BIOLOGICAL CHARACTERISTICS OF BACTERIOPHAGE PHAGUM B.C. 11 UGSHA

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Key words: *Bacillus coagulans*, *B. bacteriophage Phagum gr. 11 UGSHA*, *biological properties, molecular genetic characteristics, biopreparation.*

The article presents the results of research on the biological properties of the bacteriophage Phagum B. c. 11 UGSHA. Bioinformatic sequence data of *Bacillus coagulans* phage Phagum B. c. 11 UGSHA: length: 42609 bp, GC content: 37,1 %, molecular weight: 27 014 203,97 Da, the molarity of 1 µg/µl: 0.04 µm, the number of molecules in 1 g: 2.23×10^{10} , And 260 of 1 µg/mql after 100-fold dilution: 0,259. Experimentally technological parameters of cultivation system phage/host were selected (0.2 ml of bacteriophage to 0.2 ml of the indicator culture *B. coagulans*), passage time-6 hours at the cultivation temperature- $35 \pm 2^{\circ}\text{C}$. It is recommended to use Millipore membrane filters of 0.22 µm GV for cleaning Phagum B. c. 11 UGSHA. It was determined that the lytic activity by Appelman was 10^{-9} , by Grazia the indicator was $4,0 \pm 0,1 \times 10^{10}$ ((BFU / ml); Phagum B. c. 11 UGSHA had strict specificity in relation to *B. coagulans* strains; morphology of plaque-forming units (rounded shape with a transparent center, zones of incomplete lysis, diameter 1-4 mm, secondary growth was not observed). It is empirically established that Phagum B. c. 11 UGSHA did not lose its lytic activity after 3 months when stored at a temperature of $2-4^{\circ}\text{C}$, and after 12 months the indicator decreased to 10^8 . The studied biological properties of bacteriophage Phagum B. c. 11 UGSHA isolated from fresh tomatoes with signs of spoiling, specific for 46 out of 50 bacterial strains of *Bacillus coagulans*, allow us to recommend Phagum B. c. 11 UGSHA for the production of phage biopreparations used not only in the laboratory for the indication and identification of *Bacillus*

coagulans bacteria specific to it, but also for decontamination of food raw materials and food products, prevention of food poisoning, since the data of our genetic and proteomic mapping allow us to conclude that the Phagum B. c. 11 UGSHA bacteriophage does not contain pathogenicity locuses and their homologues.

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DEVELOPMENT OF AN INDICATION SCHEME FOR *AEROMONAS SALMONICIDA* BACTERIA USING BACTERIOPHAGES

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Key words: *Aeromonas salmonicida*, indication scheme, biological properties, furunculosis, bacteriophages, RSF.

The causative agent of furunculosis Aeromonas salmonicida is widely spread around the world and usually affects many cold-water fish (trout), salmon, and less often fish from other families. Currently, there is no scheme for indicating the bacterium of the species A. salmonicida from objects of the external environment, using bacteriophages and accumulation media, which complicates the study of the distribution area of the mentioned microorganism and rapid indication of the pathogen. For this reason, the aim of the study was to develop a scheme for the indication of A. salmonicida bacteria using bacteriophages. To identify field strains of A. salmonicida, we examined 56 samples of water objects in Ulyanovsk and the Ulyanovsk region. Using the environment of accumulation of A. Sl.1 and the differential diagnostic environment A.Sl.2.7 A. salmonicida strains were isolated and typed from 56 samples. We have developed a scheme for the indication of A. salmonicida bacteria based on the modification of the phage titer increase reaction (RSF) using the accumulation medium A.Sl.1. This scheme allows detecting A. salmonicida in the amount of 10³m.K./ml within 24 hours. The proposed scheme has the potential to be modified and applied to a whole range of

microorganisms, sensitive and specific, allowing to detect bacteria in the substrate in a short time, in the presence of foreign microflora without isolation of pure cultures.

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DEVELOPMENT OF QUICK SCHEME IDENTIFICATION OF LISTERIA USING PHAGE BIOPREPARATION *L.M 4 УИТАУ*

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Key words: *Listeria*, *Listeria monocytogenes*, *listeria*, *listeriosis*, *food pathogens*, *phage*, *bacteriophages*, *bacteria*, *multiplicity of infection*, *MOI*, *identification*

The causative agent Listeria monocytogenes causes listeriosis, a severe foodborne illness associated with high mortality. Rapid and sensitive methods are required to detect and identify this pathogen in the food production process.

The article presents the results of research on the development of technological parameters for the production of biopreparation based on the bacteriophage L. m 4 ULSAU for quick identification of bacteria of the genus Listeria with its help.

It was established that for the production of L. m 4 phage of ULSAU with maximum titers, the optimal parameters are: multiplicity of MOI 1 infection, cultivation temperature-28°C, incubation time of the phage/ culture system – 6 hours. Based on these results, we have offered technological scheme for the production of phage biopreparation L. m 4 ULSAU, which includes the following steps: confirmation of biological properties of indicator phage and increasing its titer (if necessary), verification and confirmation of biological properties of indicator culture, production of phage biopreparation and control of its indicators.

Accelerated scheme for Listeria identification was offered with the help of prepared biological product based on L. m 4 bacteriophage of ULSAU. The scheme was tested on samples of chicken meat and minced meat semi finished products artificially contaminated with Listeria monocytogenes bacteria in concentrations 10^1 - 10^5 CFU/ml.

It was established that the proposed scheme of listeria identification allows to reduce the duration of studies by 84 hours in comparison with the traditional bacteriological method and to detect listeria at a concentration of 100 CFU/ml (g) in 82 hours. The phagoidentification time at the pure culture typing stage is 18 hours.

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COMPLEX TREATMENT OF COWS WITH PURULENT- NECROTIC ULCERS OF THE DISTAL PART LIMBS'

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Key words: *purulent-necrotic ulcer, treatment, cow, sorbent, lameness, productivity, clinical picture, healing*

The search and implementation of the simplest, most accessible, effective, and economically justified means and methods of treating limb diseases in veterinary medicine is an urgent task today. This research paper shows data on the clinical picture and dynamics of planimetric indicators of healing of purulent-necrotic ulcerative lesions of hooves in sick cows. Experimental studies were conducted on the basis of LLC IWC "Krasnaya Zvezda" of the Ulyanovsk region, on cows with purulent-necrotic ulcers in the hoof area before treatment, the picture of ulcerative lesions of the extremities in all experimental animals was

identical. Ulcers were localized in various areas of the pelvic limbs: the interdigital fissure, crumb, aureola, rudimentary fingers, etc. Thus, all animals were marked with severe and moderate lameness, deformed hooves (had a sharp-angled shape) and support on the hooked part of the hooves. The shapes and sizes of ulcerative lesions were different: from irregular oval-elongated to rounded, on average, the area of ulcerative defects before treatment was within 12,87...21,14 cm². The surrounding tissues in the area of defects were tense, swollen, painful and hyperemic. Studies have shown that the use of synthetic sorption and antiseptic drugs in the complex treatment of cows with purulent-necrotic ulcers in the hoof area contributes to a faster localization of the inflammatory process in the hoof area in cows (in the experimental groups, clinical signs of lameness in patients disappeared on 10.20 ± 1.937 and 11.00 ± 1.065 days, and complete recovery of animals was recorded on 16.8 ± 2.342 and $16.60 \pm 1,185$ days, respectively), with simultaneous intensive reduction of the area of affected purulent-necrotic focus (by 7 days of treatment, the reduction of the area of ulcerative defects in the hoof area varied within 50.6... 61.1%).

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THE APPLICATION OF STATISTICAL METHODS IN EVALUATING THE RESULTS OF CLINICAL FINDINGS OF THE DRUG

BOVHUALONIDASE AZOXIMER IN CATS WITH UROLOGICAL DISEASES

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Key words: *urethrostomy, catheterization, cystotomy, statistical processing, Bovhualonidase azoximer.*

In the period from November 2018 to August 2020, we conducted a randomized blind placebo-controlled confirmatory clinical trial in parallel groups on the basis of network of veterinary clinics in Saint Petersburg and Saint Petersburg state university of veterinary medicine. The purpose of the study: to evaluate the effectiveness of Bovhualonidaze azoximer(BA) in patients subjected to surgical intervention on the urethra and bladder, to prevent postoperative complications and relapses of the underlying disease. The frequency of complications was taken as an indicator of effectiveness. 80 cats were evaluated according to the criteria for inclusion in the study, after evaluation and randomization, 53 patients (24 and 29 cats in the experimental and control groups, respectively) who had indications for surgery on the urethra and/or bladder were included in the study. After the withdrawal of some patients, 38 cats were analyzed (17 and 23 cats in the experimental and control groups, respectively). Animals in the experimental group received BA drugs in addition to conventional therapy, and animals in the control group received placebo. The rate of complications in the experimental group was 11.8 %, in the control group-61.9 %. The relative risk was 19.0 %, and the relative risk reduction was 80.9 %. The chance of developing complications in the animals of the experimental group is 12.2 times lower than in animals of the control group.. Absolute risk reduction — 50.1 %, and the number of patients to be treated — 2 patients. The confidence interval for the risk of side effects of BA drugs in cats was 0.0-10.1 %. Based on the results of our clinical study, we proved that the use of BA drugs is effective for preventing complications

during surgical interventions on the urethra and bladder, and the risk of side effects when using BA drugs in cats is insignificant.

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**USE OF IMMUNOGENETIC BLOOD PARAMETERS OF
SIMMENTAL CATTLE TO IMPROVE THE EFFECTIVENESS OF
BREEDING**

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Key words: *simmental breed, genealogical line, blood type, antigen, allele, genotype, breeding, selection, milk yield coefficient, population*

The article presents the results of immunogenetic studies of Simmental cows both by herd and by individual genealogical lines. During the first survey of the herd, about 100 alleles were identified in the blood B-system, including 15 most common in the herd. Such alleles were compared to 71.0 % of animals, and remaining 28.4 % were of a different rare alleles. Immunogenetic monitoring made it possible to follow the movement of genetic information in generations, to control the gene pool of the herd and to change it in a targeted way. The second survey (after 10 years) showed that the total number of alleles in the herd decreased, but the most common alleles were already 86.7% of animals, the rest (13.3%) had rarely encountered alleles. The ratio and frequency of B - alleles in the main lines of the herd – Florian 374, Fasadnik 642 and Margel 2122-also changed, which is associated with an increase in their genetic similarity. So, if according to the results of the first survey, the index of genetic similarity between the lines of Florian 374 and Fasadnik 642 was equal to 63%, Florian 374 and Margel 2122-51%, Fasadnik 642 and Margel 2122-60%, now these indicators are 74, 61 and 78.5%, respectively. The best milk productivity is distinguished by animals of Florian 374 line, their average milk yield for 305 days of the first lactation is 3878 kg with 3.88 % fat content in milk. In animals of the Fasadnik 642 and Margel 2122 lines, these indicators are 3472 kg and 3.92 %, and 3331 kg and 3.91%, respectively. The maximum difference in milk yield between animals with different blood B-alleles was 994 kg, the fat content in milk was 0.34 %, and the live weight was 85 kg, with a high degree of reliability of these differences.

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**MULTIFACTORIAL REGRESSION ANALYSIS OF COW BODY TYPE
INDICATORS OF FIRST CALF OF THE BLACK-AND-WHITE
HOLSTINIZED BREED OF THE MOSCOW REGION**

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Key words: *exterior, multiple regression, cows, black-and-white-cattle, body type.*

The object of research was 59765 heads (2005...2018) of cows of the first calving of black-and-white Holstein breed, this number is predominant in the complexes of the Moscow region. The database contains 4 parameters of the "A" system assessment and 17 features of the "B" system body type assessment. Based on shown calculations, we have obtained the coefficients of the regression equation $b_{0...n}$ (78.34...-0.02). The studied indicators "milk type", "body" and "udder" have an average level of linear dependence (multiple correlation coefficient $R - \leq 0,70$ and $\geq 0,30$), from the regression statistics, we can see that the "multiple correlation coefficient R " in our case is in the range of 0.67...0.57. The regression equations show that the indicator "milk type" is strongly influenced and interacted with by "height" and "milk type" (according to "system B"); "corpus" depends on "height" and "depth of the corpus"; "limbs" also depends on "height" and "setting of the

hind legs from behind"; "udder" cooperates mostly with the indicators - "central ligament" and " length of the anterior lobes». The dependent variables "milk type", "body" greater than" udder "and" limb "are statistically dependent indicators of the" system b "score the regression line is positive, i.e. when any x_n increases by one in the regression equation, if all other values of $x_1...x_n$ are 0, the value of b_n increases (assuming a positive" + " sign in front of them). The genetic trend of traits for evaluating the physique of the studied animals tended to improve the indicators of the exterior in the direction of greater severity of the dairy type of cattle and in the direction of smaller udders and limbs.

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**INDICATORS OF DAIRY PRODUCTIVITY OF COWS BRED IN FARMS
OF THE VORONEZH REGION WITH THE ANALYSIS OF MAIN
TECHNOLOGICAL REASONS FOR THEIR CULLING**

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***Key words:** cows, milk, technology, productivity, longevity, culling, loose keeping, tie-up housing, cattle.*

The main breeds of cows bred in the Voronezh region are red-mottled, Simmental, Holstein, both domestic and imported selection. The milk productivity of the red-mottled breed is 6247.9 kg, the duration of production use of ncp is 2.9 lactation; the Simmental ncp is 6952.9 kg and ncp is 3.21, and the Holstein ncp is 8845.4 kg and ncp is 1.85, respectively. Imported Simmental and Holstein cattle have a high potential for milk productivity, but the longevity period with the technology of loose keeping is very short. The main reasons for culling imported cattle are transport injuries, metabolic disorders, respiratory diseases, digestive diseases, breast diseases, hooves in general due to adaptation of body and the influence of production paratypical factors. With the technology of loose keeping of dairy herds as a result of intensive load, the main reasons for culling are udder diseases of ncp-19.5 %, diseases of the reproductive organs of ncp-25.1%, and limbs of ncp – 18.5 %. In conditions of year-round tie-up housing of cows, as a result of hypodynamia, metabolic disorders occur. Diseases of reproductive organs make up ncp-32.8%, as well as diseases of distal extremities of ncp-22.3. In a number of farms, protein overfeed is noted, as a result of which the body experiences an intense load, leading to a number of animal diseases. As a result, it is necessary to recommend and follow the technological principles of providing the necessary hygienic conditions that would be close to the physiological or natural requirements of animal's body to ensure the efficiency of raw milk production.

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**MEAT PRODUCTIVITY OF CROSSBREEDS WHEN CROSSING
BESTUZHEV BREED WITH CHARILAIS BREED**

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Key words: *breed, Bestuzhev, Charolais, interbreeding, generation, hybrids, live weight, growth, carcass, fat, carcass yield.*

The article presents the results of research on fattening and meat qualities of bestuzhev-charolaise crossbreeds (bulls) of various bloodlines. At the same time, bulls of the II generation (III group) had the highest average daily growth (1085g), respectively, absolute (216kg) and relative growth (59.34%). In animals of the same group, less feed was spent on 1 kg of growth (6.3 feed units) and the best payment for feed was made with an increase (14.49 kg). All of these indicators of crossbred bulls of I and III generation (II and IV groups) also exceed bestuzhev

purebred bulls, but inferior to the hybrids of II generation (III group). The results of the control slaughter, carried out at the age of 15 months, compared with the pure breed Bestuzhev cattle weight more carcasses crossbred bulls in all three groups have more carcasses, but the hybrid animals have the greatest III generation, then II generation (III group) and I generation.

Economic indicators of growing and fattening bestuzhev-charolaise bulls of different blood types showed that with an increase in blood content for the charolaise breed, the profit per 1 animal sold increases and the level of profitability of beef production increases in comparison with purebred Bestuzhev animals. Therefore, crossing a half-breed bestuzhevskih heifers with bulls Charolais to II and III generation economically feasible. Using this method of crossing will allow farms in the Middle Volga region to significantly increase the production of beef and improve its quality.

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**ANALYSIS OF THE FATTY ACID COMPOSITION OF COW'S
MILK AGAINST THE BACKGROUND OF MODIFIED DIATOMITE
ADDITIVES**

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Key words: *milk, additives, cow, fatty acids.*

The article presents the results of studying the effect of modified diatomite as part of a complex additive at the ratio of saturated and unsaturated fatty acids in cow's milk. Production and physiological tests were carried out on the basis of a dairy farm LLC "Agrofirma Tetyushskoe" in the Ulyanovsk region on black-and-white cows of 2...3 lactation. For the physiological experiment, animals were selected by the method of analogues by live weight, number and month of lactation, pregnancy, and physiological state. The complex additive included modified diatomite, diacetophenonyl selenide containing organic selenium (DAFS), sunflower oil, and feed yeast. Additive based on 250 g/head/day mixed with feed once a day was administered in the diet of animals of the experimental group, the other group was a control and received no additive. The additive had an effect on the fatty acid composition of milk and contributed to an increase in the fraction of saturated fatty acids with a short chain. In the fat fraction, the amount of saturated short-chain fatty acids increases by 4.0% due to an increase in the content of capric (by 6.7%), lauric (by 12.3%, $P < 0.05$), myristic (by 13.3%, $P < 0.05$), palmitic (by 17.1%, $P < 0.05$), which is a positive factor and indicates an active synthesis of volatile fatty acids, primarily acetate and 3-hydroxybutyrate. At the same time, there was a sharp decline in the content of stearic (27.3%, $P < 0.05$) and arachinic (27.6%, $P < 0.05$) acids. The milk of cows in the experimental group showed a decrease in the level of monounsaturated fatty acids by 7.4%.

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INFLUENCE OF FEEDING TYPE IN DAIRY PERIOD ON THE FURTHER GROWTH AND DEVELOPMENT OF CALVES UNDER INTENSIVE CULTIVATION

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Key words: *calves, young bulls, feeding, mixed feed, growth, beef*

The research was carried out in the conditions of the farm of FGUP RPZ "Krasnoarmeysky" named after A. I. Maistrenko of the Krasnoarmeysky district of the Krasnodar territory. The aim of the research was to develop elements of technology of intensive beef production when raising dairy bulls up to 12 months of age with the inclusion of starter feed in the diet and drinking different amounts of dairy feed in the first 5 months of life. For the experiment, black-and-white bulls were selected from the age of 4 days, divided into 2 groups of 12 heads each. Bulls, which in the first five-month period of life replaced half of the dairy feed with starter feed and other feeds, showed increased growth and development of the gastrointestinal tract and other organs in the subsequent 6-12 month period of

cultivation and fattening, they had an increased energy of average daily growth of 1142.8 g, surpassing the animals of the 1st group. In the first 5-month period of growing, the limited replacement of part of the dairy feed with mixed feed starter, abstinence with the supply of coarse feed in the first two months of life had a positive effect on the development of the gastrointestinal tract, heart, lungs, tongue and head, as well as the intensity of growth, compared to analogues that received milk and hay. After the milk period of 6-12 months of growth and development, the positive effect of pre-enhanced development of organs (including the pre-ventricles) continued. Differences in the growing of calves in the first 5 months had an impact on the histological state of the tissues of the scar, mesh and abomasum, which also affected the differences in the growth rate of calves-analogues.

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RESULTS OF GROWING QUAILS WITH THE USE OF A FEED PRODUCT BASED ON WASTE PLANT RAW MATERIALS

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Key words: feed additive, quail, poultry feeding, beer pellets, bioconversion.

The studies were carried out in the experimental housing room of FSBSI KSCZV on quails of Texas white breed. The purpose of the scientific and economic experience was to study the effectiveness of using a feed additive based on modified beer pellets in mixed feeds for young quail. Feeding of quail chicks was divided into 3 phases - "Start" - from daily to 14-day-old age, "Growth" - from 15 to 28-day-old age, and "Finish" - from 29 to 56-day-old age. The experimental group received an additive in a dosage of 1.5% by weight of complete feed. The research was conducted according to the "Methodology of scientific and industrial research on poultry feeding" (2000). During the experiment live weight, liveweight gain, the safety of poultry, cost of feed was determined. At the end of the experimental period, the economic effectiveness was studied. As a result of studies it was found that the live weight of the birds in the second experimental group significantly increased by 8.6% at 14 days age ($p < 0.01$) and at 28-day age – 6.4% ($p < 0.01$) in 42-day – by 4.7 % ($p < 0.05$), daily gain over the entire period was higher in the experimental group for 4.6 %. The use of the additive did not affect the safety of the bird. Feed costs per 1 kg of growth were lower in the second group by 5.0 %, compared to the control. The cost of 1 kg of live weight gain of quails was less than the control indicator in the experimental group by 2.6 %. Also introduced feed ingredient allowed to get 5.08 rubles of additional profit from 1 head.

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PASSPRO SOY FEED PRODUCT IN THE DIETS OF NEWLY CALVED HIGHLY PRODUCTIVE COWS

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Key words: *soy, protein, cows, feeding, diet, milk productivity*

Studies conducted in farm conditions, the company, OOO PZ «Nasha Rodina» in Sokolovsky village of Gulkevichsky district of Krasnodar region. The aim of the research was to study the use of the PassPro Soy feed product consisting of protected soy protein in the diets of new-bodied highly productive cows. 2 groups of cows of the red-mottled Holstein breed were formed, selected according to the principle of pairs-analogues: by age in calving, calving time, live weight, productivity for the past lactation, fat and protein content in milk. The ration of the first control group was the ration accepted on the farm for new-bodied cows. The diet of the second experimental group was the same as in the first control group, only 1.5 kg of compound feed was replaced with 1.5 kg of PassPro Soy, which is a protected soy protein in the form of a 5 mm granule. During the milking period, the daily milk yield of cows in the control group was 30.80 ± 1.07 kg. The daily milk yield of cows of the second group, where 1.5 kg of compound feed was replaced by 1.5 kg of PassPro Soy, significantly increased by 6.6 %. Due to the increase in the gross milk yield, there is a tendency to increase the amount of milk fat in the milk of cows of the second group by 6.9 %, as well as milk protein by 11.3 %. In the experimental group, when replacing 1.5 kg of feed taken on the farm with 1.5 kg of PassPro Soy, milk productivity increased by 2.03 kg. Additional profit from the sale of milk in the experimental group increased by 48.72 rubles. for 1 head per day. The economic efficiency in the second experimental group was 6.30 %.

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THE GENESIS OF METABOLIC ENERGY USE IN THE LACTATION FUNCTION OF COWS OF DIFFERENT AGES AND PRODUCTIVITY

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Key words: *lactation, metabolic energy, ruminant process, metabolism, adaptation, productivity, selection.*

The formation and development of lactation function as an integral process of reproduction concerns all systems of the whole organism. The influence of heredity and expression of a trait under the influence of the environment

determines the individuality and synergy of traits that determine milk productivity. Thermal conductivity, intracellular cyclosis, membrane potential, neuro-hormonal signals, blood and lymph are the main ways of communication and mutual influence of these signs. The nutrition system is most important for lactation function. Nutrients divided during digestion into amino acids, monosaccharides, fatty acids, and other elementary parts are delivered to the breast cells, where they become a substrate for the enzymatic synthesis of milk. Circadian changes in life processes and, first of all, feed intake reactions determine the circadian frequency of feed intake and the intake of nutrients into the organism. This affects the concentration of the intracellular substrate, the activity of enzymes and the thermal state of the whole organism. For life, as the highest form of existence of matter, thermal energy is particularly important. It not only connects the actions and interactions of all types of matter, it creates order from the chaotic movements of discrete heat sources, determining the measure of irreversible energy dissipation, entropy, and the gradient of changes in the metabolic processes of "outflow and inflow of energy", the state of saturation and nutrient deficiency. The article is based on convergence, biophysical, ethological and animal sciences. Using the Joule as a single estimate of energy consumption and work performed (milk production) increases the scientific reliability of the research.

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ВОСПРОИЗВОДИТЕЛЬНЫЕ КАЧЕСТВА НОРОК ПРИ ИСПОЛЬЗОВАНИИ ВЕТЕРИНАРНЫХ ПРЕПАРАТОВ

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Ключевые слова: *норка, воспроизводство норок, сохранность
молодняка, «Лютрагон», «Пуревитин»*

Звероводство Удмуртии представлено несколькими зверохозяйствами, которые имеют высокие показатели делового выхода молодняка - 5,43-5,77 щенка на основную самку, что выше средних показателей по звероводческим хозяйствам России. Целью исследований являлось изучение эффективности использования разных препаратов в повышении воспроизводительных качеств норок и жизнедеятельности их потомства. При проведении исследований было предложено использовать комплекс препаратов. Первая группа самок получала гонадотропный гормон хориогонин и «Пуревитин», вторая - ветеринарный препарат «Лютрагон» и «Пуревитин». Контрольная группа только гормон хориогонин. Результаты показали, что количество благополучно оценившихся самок первой и второй групп больше, чем в контроле на 10,5 и 21,0 %, соответственно. Плодовитость норок второй

опытной группы составила 5,83 гол., что больше на 14 %, чем у контрольных аналогов. Сохранность в 1-й и 2-й опытных группах была выше на 8,1 и 12,2 процентных пункта по сравнению с контрольными аналогами соответственно. Деловой выход молодняка с учетом сохранности во 2-й группе составил 5,71 гол., к забою выращено 263 щенка, а в первой опытной группе - 5,4 и 227 голов соответственно. Показатель делового выхода молодняка в контрольной группе был ниже на 23 и 29 % по сравнению с первой и второй опытными группами, соответственно. Таким образом, при разведении норок с целью стимуляции и повышения естественной резистентности организма, воспроизводительных качеств самок в период гона, увеличения выхода молодняка и его сохранности целесообразно включать смесь препаратов гормона «Лютрагон» и «Пуриветин», способствующие увеличению рентабельности производства до 110 %.

REPRODUCTIVE QUALITIES OF MINKS

WITH THE USE OF VETERINARY PREPARATIONS

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Key words: *mink, reproduction of minks, preservation of young animals, «Lyutragon», «Purevitin»*

Animal husbandry of Udmurtia is represented by several animal farms that have high rates of business output of young animals - 5.43-5.77 puppies per main female, which is higher than the average for animal husbandry farms in Russia. The aim of the research was to study the effectiveness of use of various preparartions in improving the reproductive qualities of minks and vital activity of

their offspring. When conducting research, it was offered to use a complex of preparations. The first group of females received gonadotropin horigonin and «Purevitin», and the second veterinary preparation «Lyutragon» and «Purevitin». The control group only hormone horigonin. The results showed that the number of successfully foaled females of the first and second groups is greater than in the control by 10.5 and 21.0%, respectively. The fertility of minks of the second experimental group was 5.83 heads, which is 14% more than in the control analogues. Safety in the 1st and 2nd experimental groups was higher by 8.1 and 12.2 percentage points compared to the control analogues, respectively. The business output of young animals, taking into account the safety in the 2nd group, was 5.71 goals, 263 puppies were raised for slaughter, and in the first experimental group - 5.4 and 227 goals, respectively. The rate of business output of young animals in the control group was lower by 23 and 29% compared to the first and second experimental groups, respectively. Thus, when breeding mink to stimulate and improve the natural resistance of organism, the reproductive qualities of females during the rut, increasing the yield of young animals and its safety it is advisable to include a mixture of preparations hormone «Lutragon» and «Purevitin», promoting increase of profitability of up to 110 %.

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