

# RESEARCH ON KINETICS OF IR-DRYING OF RAPE SEEDS

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*Key words: IR-drying, duration, flow density, temperature, constant and variable heat supply.*

*The article considers the results of rapeseed drying, which was carried out by convective method on mine, mounted, bunker, as well as recirculation dryers designed for grain drying. Impulse IR drying allowed to intensify the process while preserving the seed quality. Combined method of IR-drying is more effective, in particular, in a fluidized layer at low intensity of the IR-flow, when irradiation is combined with air heating, including oscillation, alternating the supply of heated and outside air in case of continuous IR-irradiation. The duration of IR-drying is calculated for both constant and oscillating heat supplies. The modes of combined IR-drying are experimentally defined. The object of the study was the technological process of drying of rape seeds in a fluidized layer with intensive mixing of the material. The total power of the IR flow and convectively heated heat-transfer agent did not exceed the limiting seed temperature. The calculation of the combined drying duration was carried out similarly to convective drying, and the effect of IR radiation was estimated by the equivalent temperature of the drying agent. A range of experiments was carried out with the IR flow impact on damped rapeseeds when blowing with external and heated air with formation of a fluidized layer. The thickness of the rapeseed layer was changed from 0.05 m to 0.1 m, the speed of the drying agent was 0.65 m / s. The power of the IR lamp varied from 400 W / m<sup>2</sup> to 900 W / m<sup>2</sup>. Seed germination was determined before and after the experiments. The combined IR-drying duration of rape seeds in a fluidized layer was calculated. Well-known calculation expressions for convective drying were*

used, which included the heat transfer coefficient, moisture removal, specific heat of moisture evaporation, the temperature difference between the drying agent and the mean of the material, as well as the proportion of heat that was used for moisture evaporation, but with an equivalent temperature of the drying agent. The duration of IR drying was calculated in the same way as for convective drying, taking into account the equivalent temperature of the drying agent. It was established that a rational mode of rapeseed IR-drying requires the power of the IR-flow of  $0.65 \text{ kW} / \text{m}^2$ , with a variable 5-minute blowing of a rapeseed layer with a height of 0.1 m heated by  $25^\circ \text{C}$  and outside air with a temperature of  $15 \dots 20^\circ \text{C}$ .

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# SUBSTANTIATION OF AERODYNAMIC PARAMETERS OF THERMAL VACUUM EXTRUDER EJECTOR

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*Key words: extruder, energy efficiency, thermal vacuum extrusion, modeling, aerodynamic parameters, air flow, vacuum pump.*

*The article describes a new structural and technological scheme of a thermal vacuum extruder, where chambers for preliminary and final dehydration of the finished product interact with each other by means of an ejector. The steam pumped out of the final dehydration chamber by means of a vacuum pump moves to the high-pressure part of the ejector and is removed outside for regeneration of the thermal energy spent on machine technological process. Simultaneously, this air flow ensures the steam movement from preliminary dehydration chamber of the extruder to the low-pressure part of the ejector. In order to substantiate the aerodynamic parameters of the ejector by computer simulation methods, an ejector model of a thermal vacuum extruder was obtained on the basis of Solidworks Flow Simulation package, and its finite element analysis was also performed. The aerodynamic study of the ejector enabled to check the scheme operability and analyze the degree of steam removal from the chamber for preliminary dehydration of the extrudate. The air flow in the ejector was studied to obtain data on the required capacity (supply) of the vacuum pump and a map of distribution of air flows and pressures. Maps of pressure distribution inside the ejector and the pressure at the inlet to the low-pressure nozzle were obtained in the process of modeling the object of the research. We considered a model of an ejector with the initial volume parameters of the flow rate of  $4 \text{ m}^3 / \text{h}$  and  $8 \text{ m}^3 / \text{h}$  for the incoming*

*high-pressure flow. The obtained results made it possible to substantiate the required flow rate of the vacuum pump and evaluate the degree of steam removal from the preliminary dehydration chamber. The ultimate goal of the data presented in the work is to increase energy efficiency of thermal vacuum treatment of plant raw materials and to simplify technological equipment adjustments for its implementation.*

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## **COMPUTATIONAL STUDY OF HYDRAULIC DRIVE OF INTERNAL COMBUSTION ENGINE VALVES**

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*Key words: automotive machinery, engine, valves, hydraulic drive, computational model, "time-section" factor.*

*The efficiency of agricultural automotive machinery largely depends on the engine quality. The characteristics of an internal combustion engine depend on the quality of gas exchange between its cylinders and the environment. The mechanical drive of the valves of the gas distribution mechanism does not allow to improve gas exchange for all operating modes of the engine. To improve the performance of the internal combustion engine, an electronically controlled accumulator hydraulic valve drive, independent of the crankshaft position, is proposed. Such drive provides flexibility in controlling the valve open time and the moment of its opening, while possessing sufficient compactness and speed. The scheme of such drive with a two-way hydraulic power cylinder which is controlled by a slide valve with a piezomechanical drive is proposed. The choice of the distributor drive is conditioned by its high speed. This actuator is powered by the electronic unit of engine control. The drive working body is the engine oil. To study the influence of various factors on hydraulic drive operation, a computational model was compiled in Simulink environment. It takes into account the path and local losses of oil pressure, inertial phenomena of the liquid column, friction in the drive elements of the engine valve, fluid leakage through the gaps. Computational studies of hydraulic drive were carried out on the basis of the model. The influence of oil leaks and wave phenomena in the drive lines, oil temperature, crankshaft rotation speed and pressure drop on the engine valve plate on its operation was revealed. It is proved that the actuator remains operational down to  $-20^{\circ}\text{C}$  when using SAE 10W-30 oil, has sufficient response speed and provides greater valve capacity compared to valves with a traditional drive up to 5700 rpm.*

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## **SUPPLY SYSTEM OF LIQUID GAS-ENGINE FUEL TO DIESEL ENGINE COMBUSTION CHAMBER**

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*Key words: liquid gas, diesel engine, adaptation system, nitrogen oxides, ecological parameters.*

*The existing methods of diesel engine start up using gas engine fuel imply either introduction of design changes to implement spark ignition, or maintaining the supply of a certain proportion of diesel fuel in the air-gas mixture. The second method is more preferable, since it leaves the possibility of an easy return to the initial state, allows work only on the diesel process and does not require significant changes in the design. This method attracts the greatest attention of modern researchers, however, the final technical solutions and methods of work on such a gas-diesel process have not yet been developed, and the existing practices are expensive to implement or are not effective enough. The issues of ensuring high ecological parameters also remain in abeyance. Studies show that in order to reduce nitrogen oxide emissions, it is necessary to achieve the elimination of residual oxidant in combustion products, which is possible due to formation of a stoichiometric mixture in the cylinder. For this purpose, as well as to increase the overall combustion efficiency and improve the thermal balance of the engine, the authors propose a system for injecting gas in the liquid phase directly into the combustion chamber at the compression stroke. The described system assumes the maximum usage of standard engine components of MMZ D-245 type with seats for glow plugs in the cylinder head, where nozzles for supplying liquid gas will be installed. In this case, gas injection is possible by standard means of the Common rail system. Concurrently, there are already the necessary technical solutions that improve the operation control of the injection pump and ensure prevention of detonation combustion. The appropriate balance of the amount of both fuel types is calculated according to the known relationships. The analysis of the results of early studies showed that such a scheme deserves attention. Thus, the authors*

*substantiated the currently absent approach, which makes it possible to improve the environmental performance of an engine operating on a gas-diesel process, implemented by available means.*

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**AGROCLIMATIC CHARACTERISTICS OF REGIONS OF THE  
NON-BLACK SOIL ZONE OF THE RUSSIAN FEDERATION AND  
SUITABILITY ESTIMATION FOR CULTIVATION OF MODERN EARLY  
SOYBEAN VARIETIES**

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*Key words: soybean, Central Non-Black Soil Region, agroecological regions, climate warming, sum of active temperatures, hydrothermal coefficient, northern boundary of soybean cultivation.*

*An increase of warm period duration has been recorded in the Central Non-Black Soil region in recent years, which occurs due to a rise of the number of days with positive temperatures: the transition through 0 ° C towards an increase in temperatures occurs earlier, and towards a decrease - later than the accepted average long-term values. The aim of the research was to analyze the parameters of climate change in the Central Non-Black Soil Region and to indicate the displacement of the northern border of the acceptable distribution of soybean crops in the region. As a result of studying of agrometeorological database for a 40-year period from 1981 to 2020, the Central Economic Region of the Non-Black Soil Zone of the Russian Federation was notionally divided into 3 agroecological*

*regions: northern, central and southern. The division was based on climatic temperature factors - the average temperature during the vegetation season and the sum of active temperatures during the growing season. Along with temperatures, the amount of precipitation and the value of HTC for the vegetation season were analyzed. Changes of agroclimatic conditions in the agroecological regions of the Central Economic Region of the Non-Black Soil Zone of the Russian Federation are currently significantly different: as for the northern agroecological region (Tver, Yaroslavl, Kostroma regions), the sum of temperatures is 2000–2200 ° C, the HTC is 1.4–1.7, the amount of precipitation is 285– 295. The sum of temperatures in the central agroecological region (Smolensk, Moscow, Kaluga, Vladimir, Ivanovo regions) is 2200–2400 ° C, the HTC is 1.1–1.4, the amount of precipitation is 265–285. And the sum of temperatures in the southern agroecological region (Bryansk, Oryol, Ryazan, Tula regions) is 2400–2600 ° C, the HTC is 0.7–1.1, the amount of precipitation is 255–265. In general, the local climate change in the Central Economic Region of the Non-Black Soil Zone of the Russian Federation led to a shift of the sum isotherm of active temperatures by 150–200 km towards high latitudes. Early varieties of soybeans are able to form a stable yield in the changed weather conditions of the Central Economic Region of the Non-Black Soil Zone of the Russian Federation. Biological temperature minima are maintained at all stages of growth and development, maturation occurs in August - early September.*

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**CHANGE of PRODUCTIVITY AND QUALITY OF CROP PRODUCTS UNDER THE INFLUENCE OF ELEMENTS OF BIOLOGICAL AGRICULTURE**

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*Key words: manure, green manure, biodestructor, winter wheat, corn, annual grasses, gluten, protein.*

*To increase productivity and quality of crop production, it is necessary to develop ecologically safe and economically sound technologies for cultivation of agricultural crops, including elements of biological farming. The purpose of the research was to comparatively evaluate the effect and aftereffect of manure, cabbage and legume green manures in combination with Ecostern biodestructor of crop residues and non-commercial part of the harvest on productivity of crops of grain-fallow crop rotation and the quality of crop products. It was found that green manure fallow is not inferior to fertilized fallow in terms of influence on productivity of agricultural crops and crop production quality in the conditions of the forest-steppe of the Middle Volga region on leached meadow-black low-humus medium-thick light loamy soil. The most significant impact on productivity and quality of winter wheat, corn and annual grasses was exerted by the use of manure and leguminous green manures in combination with non-commercial part of the harvest of subsequent crops of the crop rotation and Ecostern biodestructor of crop residues. Winter wheat productivity was 5.20-5.22 t / ha of credits on their background in the conditions of 2018, corn productivity was 7.02-7.03 t / ha of credits in the conditions of 2019, productivity of annual grasses - 5.01 t / ha of credits in the conditions of 2020. The increase was significant in relation to the control variant and amounted to 0.51-0.53 t / ha of credits in the agroecosis of winter wheat; as for corn agroecosis, it was 1.03-1.04 t / ha of credits and in the agroecosis of annual grasses - 0.67 t / ha of credits. Gluten content of winter wheat grain exceeded the control by 0.9-1.3%, protein content in corn agroecosis - by 100.5-101.5 kg / ha, content of crude protein in the agroecosis of annual grasses - by 173,8 - 181,9 kg / ha.*

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**THEORETICAL SUBSTANTIATION AND APPLICATION OF  
BIOCLIMATIC POTENTIAL IN PRODUCTIVITY EXPLICIT OF  
WINTER WHEAT ON SOD-PODZOLIC AND GRAY FOREST SOILS OF  
THE BRYANSK REGION**

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*Key words: winter wheat, bioclimatic potential, productivity, dispersion of factors, photosynthetic active radiation.*

*The article presents results of the research of scientists from Bryansk State Agrarian University, where data on yields in production conditions and results of intervarietal yields of winter wheat in two agroclimatic regions of the Bryansk region were used: the first (northern) agroclimatic region - Dubrovskiy state variety plot and the second (southern) agroclimatic region - Starodubskiy state variety plot. The purpose of the study was to substantiate the formation and explicit of the potential of winter wheat yield depending on agro-climatic resources in the Bryansk region. Significant differences in influence of agroecological conditions of the year (vegetation season), varieties and their interaction in yield formation were established. The potentialities of winter wheat varieties in formation of highly productive yields, accumulating up to 2.5 % of the incoming photosynthetic active radiation, were proved. It was revealed that the efficiency coefficient of using the bioclimatic potential of the territory by winter wheat was, on average, 42.9 %, and the maximum value was 58.5 %, which indicates significant reserves of the region unused potential.*

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## **EFFICIENCY OF GRAIN CORN CULTIVATION METHODS IN THE CONDITIONS OF THE MIDDLE VOLGA REGION**



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*Key words: grain corn, crop structure, corn hybrids, protection of plants from weeds, leaf-feeding.*

*The article presents results of the studies carried out in a 3-factor field experiment to assess the comparative productivity of grain corn hybrids, methods of plant protection from weeds and the effectiveness of leaf feeding with nitrogen and zinc-containing products. Studies showed that NK Gitago FAO 200 and SI Fenomen FAO 220 hybrids are distinguished by higher productivity. In protecting plants from weeds, the application of herbicides is more effective in comparison with mechanical treatment of corn row spacing, while the yield increased by 0.59 - 1.10 t / ha or 7.9 - 14.7%. Leaf dressing with Isagri Nitrogen at a dose of 2 l / ha at the phase of 3-5 leaves increased the yield by 0.18 t / ha or 2.3%, the variant with Izagri Nitrogen at a dose of 2 l / ha + Izagri Zn at a dose of 1 l / ha - by 0.58 t / ha or 7.4%. Relations between the grain yield and the duration of interfacial periods were established, as well as adic factors and conditions of growth and development of corn plants in agrocenoses (content of productive moisture in the soil, plant density, number and weight of weeds before harvesting).*

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## **INCREASE OF CORN YIELD BY MEANS OF LEAF FERTILIZING**

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*Key words: hybrids, harvest, mineral fertilizers, leaf feeding*

*The article analyzes the experimental data obtained in field experiments carried out at All-Russian Research Institute of Corn in 2018-2020 in the zone of sufficient moisture in Stavropol Territory. We studied the effect of mineral fertilizers N30, N30P30K30 applied for pre-sowing cultivation and their*

*combination with leaf feeding of plants with the agrochemical product Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves, as well as sole feeding of plants with Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves. The object of the research was hybrids of different ripeness groups: Mashuk 185 MB, Mashuk 220 MB and Mashuk 355 MB. According to the research results, a positive effect of fertilizers and leaf feeding of plants with Vuksal Macromix agrochemical product at a dose of 2.5 l / ha at the phase of 7-8 leaves on vegetative growth, yield increase of green mass and corn grain was established. The increase of plant height according to the variants of the experiment: hybrid Mashuk 185 MV was 5-9 cm, Mashuk 220 MV - 8-14 cm, Mashuk 355 MV - 9-15 cm. The increase of green mass yield when N30 and N30P30K30 were applied for pre-sowing cultivation was 7.2-22.6% and 16.8-35.5%, N30 for pre-sowing cultivation + Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves - 9.5-27.2%, N30P30K30 for pre-sowing cultivation + Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves - 15.0-33.5%. The application of sole Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves for leaf fertilization increased the green mass yield by 13.3-22.8%. Increase of grain yield when applying N30 and N30P30K30 for pre-sowing cultivation amounted to 4.2-8.3% and 5.0-7.9%, N30 for pre-sowing cultivation + Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves - 4.2-7.5%, N30P30K30 for pre-sowing cultivation + Vuksal Macromix at a dose of 2.5 l / ha at the phase of 7-8 leaves - 3.0-12.1%. The application of Vuksal Macromix fertilizer for leaf fertilization at a dose of 2.5 l / ha at the phase of 7-8 leaves as an independent intake increased the grain yield by 8.0-11.5%.*

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# **INFLUENCE OF COMPLEX ORGANOMINERAL FERTILIZER (COMF) AND BIOPRODUCTS ON PRODUCTIVITY OF WINTER WHEAT AND BIOLOGICAL SOIL ACTIVITY IN ULYANOVSK REGION**

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*Key words: "COMF" complex organomineral fertilizer, Ecoforce, Extrasol-Zh, BisolBifit, biological activity.*

*The article presents results of testing a complex organomineral fertilizer on the fields of Ulyanovsk Research Institute of Agriculture. The tests were carried out for 3 years, in three replications, on two backgrounds. The first background is without fertilizers. The second background is with introduction of granular, complex organomineral fertilizer (COMF) during sowing with an application rate of 100 kg / ha. In the subsequent scheme, four options were used on these two backgrounds: 1 control without bio products, 2 Ecoforce, 3 Extrasol-Zh, 4 BisolBifit. The effect of biological products and "COMF" on winter wheat crops has been studied, and the relationship between soil biological activity and productivity in Ulyanovsk region has been revealed. The highest productivity parameter of Kharkovskaya 92 wheat was obtained by inoculation of seeds with Extrasol-Zh (1 liter per ton of seeds) and BisolBifit on complex fertilizer background during sowing at a dose of 100 kg / ha. Introduction of a complex organomineral fertilizer without application of biological products also contributed to an increase of soil biological activity in comparison with the control background without fertilizers by 5.6%. Our research has revealed a direct relationship between yield and soil biological activity. The regression equation shows that winter wheat yield increases by 0.09 t / ha with an increase of microbiological activity by 1%.*

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## **ECOLOGICAL STATE OF MEADOW-BLACK SOIL IN CASE OF LONG-TERM IRRIGATION**

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Key words: irrigation, mineral fertilizers, crop rotation, biological activity, productivity, soil microorganisms, enzymes, soil nitrification capacity.

The research was carried out on an irrigated stationary crop rotation of the Federal State Budgetary Scientific Institution "Omsk Agrarian Research Center" in the southern forest-steppe of Western Siberia. The aim of the research was to establish the direction and intensity of mobilization biological processes in case of long-term irrigation, their quantitative characteristics, as well as possible adverse changes of biological (ecological) properties of meadow – black soil. The microbial community performs the function of maintaining soil homeostasis, therefore it quickly responds to habitat changes. The intensity of soil mineralization and humus formation processes was determined by a combination of fertilization and irrigation factors. It was found that immobilization processes prevailed in the soil under crops. The highest coefficient of organic matter transformation, i.e. transformation increase of plant residues into organic matter, was noted when introducing nitrogen-phosphorus fertilizers for barley crops. Application of mineral fertilizers promoted an increase of the number of the defined microorganisms, enhanced cellulose decomposition in the soil, potential capacity of soils to accumulate nitrate and enzyme activity, which ultimately increased the yield of cultivated crops. The yield of perennial grasses on a fertilized background was at the control level due to loss of legumes (goat's rue) and predominance of bluegrass species (awnless brome). A strong correlation was obtained between the intensity of cellulose decomposition in the soil, nitrification capacity and crop yields ( $r = 0.67 \pm 0.28$  and  $0.91 \pm 0.16$ , respectively). Long-term irrigation of meadow-black soil did not have a negative impact on its ecological

state, and usage of intensive cultivation technology of crops in crop rotation stimulated an increase of soil microorganisms and their activity.

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**STUDY OF THE COMBINATION ABILITY OF VARIETY  
POPULATIONS OF VARIEGATED ALFALFA (MEDICAGO VARIA L.)  
FOR SUCCESSFUL SELECTION IN THE CONDITIONS OF THE  
MIDDLE VOLGA**

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*Key words: Medicago varia L., initial material, heterosis, early spring growth, total combining ability, feed, seed productivity*

*The article presents results of the research work on assessment of the total combining ability of 14 varieties of variegated alfalfa (Medicago varia L.) of various ecological and geographical origin for identifying the best ones in terms of productivity in order to include them in the breeding process in the Middle Volga region. The study of the original varieties and their hybrid forms was carried out in a field experiment of 2012 sowing year with a three-year usage of the herbage (2013–2015). The characteristics of the varieties are given according to the main morpho-biological characteristics (the intensity of early spring growth, the height of plants at cutting ripeness stage) and economically significant parameters (content of green phytomass, leafiness, seed yield) in comparison with the traditional zoned variety Kuibyshevskaya. According to the green mass yield, the following were identified: KSI 24, Population 8, KSI Super, KSI 13, characterized by an average value of total combining ability (104.2 - 101.9%); Population 4, Izumruda and KSI T / Z provided reliably high productivity for 3 years of grass stand usage (14.0 - 16.0 kg / m<sup>2</sup>), with a high total combining ability effect (108.0-123.5%). According to the seed yield, the most productive varieties with a high*

*total combining ability were identified: Population 2 (113.5%), Population 7 (111.8%), Gyuzel SP 03 (110.8%), Population 4 (109.8%), KSI T / Z (107.3%), KSI 24 (105.6%), KM population (105.1%). According to the results of the study, such varieties of variegated alfalfa as KSI T / Z, KSI 24, KSI 13, Gyuzel SP 03 were included as components of new polycross populations for further breeding work. Currently, these populations are undergoing selection formation in plots of biotypic selection on a field provocative background.*

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## **WINTER WHEAT SELECTION AND RESISTANCE TO LODGING**

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*Key words: winter wheat, selection, variety, plant height, stem length, lodging resistance*

*The resistance of winter wheat plants to lodging contributes to an increase of yield and quality of the obtained grain. The aim of this work is to assess resistance to lodging and its relation (dependence) to changes in morphobiological*



*characteristics of plants of winter wheat varieties in the selection process. The studies were carried out in the southeast of the Central Black Earth Region in 2016-2020. The object of the research is 8 varieties of winter wheat, created at different times of selection work. The place of the research is a competitive variety testing garden. The studied varieties are differentiated by plant height into tall (Stepnaya 135 and Chervonnaya), medium-sized (Basalt, Basalt 2, Chernozemka 115 and Chernozemka 130) and short-stemmed (Krystal and Chernozemka 188). It was established that the selective resistance increase and yield increase are in direct and close relationship. The correlation coefficient between the resistance to lodging and the percentage of plant wintering shows a weak inverse relationship. However, the winter hardiness of modern short-stemmed varieties is high and, taking into account the reliability of differences, corresponds to the level of winter hardiness of tall varieties. Resistance to lodging is in direct proportion to stem diameter and, inversely, to the plant height, stem length and weight, as well as its internodes. The corresponding correlation coefficients have significant values. There are no significant changes in thickness of the straw wall. In this regard, an increase of straw wall thickness is a reserve for further increase of lodging resistance.*

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## **GENOTYPING OF RUSSIAN AND FOREIGN APPLE VARIETIES BY ALLELS OF S-LOCUS (GENES OF SELF-INCOMPATIBILITY)**

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Key words: apple tree, cultivars, genotyping, self-incompatibility, S-locus, S-RNase, molecular markers.

*Most apple varieties have gametophytic self-incompatibility and are not capable of self-fertilization. Cultivars with one common S allele have reduced compatibility and do not reach their yield potential when planted nearby. Full variety compatibility occurs when both S alleles are different in parents. When crossing apple genotypes with full compatibility, all pollen grains of one plant are able to pollinate another plant. Information on the cross-compatibility of varieties is essential when selecting parental forms in selection programs and for matching pollinators in commercial gardens. As for apple varieties of foreign selection from S-locus alleles encoding another S-RNase, the most common allele is S3 (16.9%), followed by S7 (12.3%), S1 and S2 (10.8% each) , S5 (8.7%), S9 (5.6%), S10 (5.4%), S24 and S28 (4.9% each), S20 (3.1%), S25 (2.6% ). In Russia, genotyping of apple varieties is carried out for a limited number of S-locus alleles. The most widespread allele of S locus among the genotypes of apple trees of the Russian selection with a fully established allelic composition is S10 (26.8%), followed by S3 (23.2%), S7 (16.1%), S2 (14.3% ), S5 and S9 (8.9% each). To identify full allelic S-locus status of apple varieties of domestic selection, to establish cross-compatibility and the best pollinators, it is necessary to carry out additional PCR analysis for other S-alleles, especially for the following alleles S1, S20, S22, S23, S24, S25 and S28. The article assesses 195 foreign apple genotypes and 58 Russian genotypes according to their S-allelic composition in order to provide selectors and apple producers with information on incompatibility among varieties. Characteristics of DNA markers, the nucleotide sequence of the primers, the sizes of the target fragments of the PCR product for detection of the most common S-gene alleles in the apple tree, the development of hybridization programs and efficiency improvement of cross-pollination are presented.*

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## **BREEDING AND VARIETY RESEARCH OF SWEET CHERRY IN THE CONDITIONS OF THE FOREST-STEPPE ZONE OF SAMARA REGION**

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Key words: gardening, selection, sweet cherry, variety, productivity.

*Sweet cherry is appreciated among people for its early ripening and high fruit quality. Spring frosts often occur during the cherry blossom period in Samara*



*region and dry and hot weather during flowering damage flowers and ovaries. Sweet cherry productivity can be significantly increased as a result of selection. The purpose of the research is to develop and transfer to the state variety testing adaptive sweet cherry varieties for the conditions of Samara region. Research objective is to study the main economically useful traits and biological properties of the sweet cherry varieties available in the collection. Trees of sweet cherry varieties of different ages at the site of primary variety study were the objects of phenological observations and records. Research on selection and primary variety study was carried out according to the existing methods of work with fruit and berry crops. As a result of intervarietal crosses and sowing of seeds from free pollination of the best varieties, 12 new elite forms of sweet cherry were obtained. One cherry variety called Nyusha was handed over for state testing. As a result of work on primary variety study, the productivity, ripening time and quality of fruits and elites of sweet cherry, resistance of varieties to diseases and pests were studied. The assortment of adaptive varieties available in the collection was determined, the nature of tree damage in winter period was established. The best in terms of productivity are the varieties Bryanskaya Rozovaya, Nyusha, Pervinka, Symphony, Fatezh, the elites TSKHA-1 and TSKHA-2.*

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# EFFICIENCY OF CREATION AND REPRODUCTION METHODS OF FIBRE FLAX SEEDS IN PRIMARY SEED BREEDING

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*Key words: fiber flax (Linum usitatissimum L.), plant, seeds, method, method, sowing.*

*The research was carried out on in the laboratory of breeding technologies of the Federal State Budgetary Scientific Institution "Federal Scientific Center of Bast Crops" (Tver region) in 2014-2017. The purpose of the research is to develop more advanced methods for creating updated (original) fiber flax seeds based on selection of plants according to a new trait - the length (compactness) of the inflorescence, as well as their subsequent reproduction at initial stages of primary seed production. It was found that initial testing on morphological traits, followed by removal of plants that did not fit the inflorescence length typicality interval, increased the yield of updated seeds for Alpha variety by 2.5 times, for Rosinka variety by 1.5 times in comparison with the control variant. The selection of plants by inflorescence length provided better uniformity in terms of the main variety trait - fiber content in the stem, which was characterized by a coefficient of variation of 3.1 - 4.7%, versus 4.2 - 5.4% in the control, as well as a significant reduction of labor costs. It was revealed that the updated seeds created on the basis of fiber flax selection according to a new trait retained their productive properties at the level of the control variant. Sowing with a row spacing of 6.25 cm is the most effective for further reproduction of updated seeds at the initial stage of seed production. In comparison with the wide-row (22.5 cm) sowing method, it provided an increase of seed yield by 0.29 t / ha, or by 30.2%, while maintaining high sowing and varietal*

conditions. With narrow and wide-row sowing methods of fiber flax, the most important morphophysiological parameter - the seed strength, was equal.

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## **GENETIC RESOURCES OF SPRING WHEAT RESISTANT TO BROWN RUST**

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*Key words: spring wheat, genetic resources, brown rust, variety, selection, productivity, growing season.*

*Brown (leaf) rust is the most common wheat disease and is found on all continents and countries where this crop is cultivated. Spring wheat occupies about 9 million hectares in Northern Kazakhstan. According to M.K. Koishybaev, brown rust and Septoria spot often appear together in the northern region, when they spread during the shooting-earring period and in case of wide progression, yield losses reach 30-40%, at the beginning of the filling- grain milk ripeness period - 7-10%. Among plant protection measures from various diseases caused by parasitic fungi, bacteria, viruses, as well as from damage by various insects, the most effective is introduction of immune varieties into the culture. The aim of our research is to study the genetic resources of spring crops and to identify new sources and donors of leaf rust resistance in northern Kazakhstan. In total, 150 varieties of spring bread wheat of various ecological and geographical origin were selected. The collection seed plot of spring soft wheat was sown in 2 replications, with a plot area of 2m<sup>2</sup>. The brown rust plot was laid according to the methodology of the State Variety Testing of Agricultural Crops. As a result of the work carried out, thirty-one new sources of resistance to leaf rust were identified: k-29288 (Georgia), Stendal (Italy), Sriblyanka, PKHRSV 02 (Ukraine), Frontana (Brazil), Marquis (Canada), etc. Seven varieties were characterized by resistance to leaf rust and a complex of economically valuable traits: Lutescens 415/00; Lutescens 120-03; Lutescens 16-04; Haamam 4; Sigma; Sibirskaya 17;*

*Chelyaba early. The selected samples are of great interest for practical breeding and will be used to create new varieties of spring wheat with high productivity and resistance to leaf rust.*

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## **. ASSESSMENT OF OBESITY INFLUENCE ON DOGS' FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM**

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*Key words: obesity, cardiac dysfunction, dogs, tonometry, troponin, electrocardiography, echocardiography.*

*Dogs' obesity is a common pathology and is associated with genetic factors, feeding, housing conditions, physical inactivity. Many pathogenesis aspects of obesity development of small domestic animals are poorly studied, in particular, the development of dysfunction of the cardiovascular system is an insufficiently explored issue. The aim of this study was to study clinical, electrocardiographic, echocardiographic and biochemical parameters of blood serum of obese dogs. The objects of the study were Dachshund dogs with obesity (n = 12) and clinically healthy animals (n = 16). All animals went through a complex clinical examination, electrocardiographic, echocardiographic and laboratory studies. Parametric and nonparametric methods of statistical analysis were used in the study. It was found that dogs' obesity is characterized by a significant increase of the respiratory rate at rest and during sleep, pulse rate, systolic, diastolic and mean arterial blood pressure. It was shown that in case of dogs' obesity, there is a slight increase of the end-diastolic size and thickness of the free wall of the left ventricle, a shortening of the PQ interval, and voltage decrease of P, R, T deflections on electrocardiograms. There were no violations of contractility and systolic function of the left ventricular myocardium of obese dogs. It was found that the activity of alkaline phosphatase, alanine and aspartic aminotransferases, the concentration of cholesterol, triglycerides, total protein, malondialdehyde and ceruloplasmin significantly increased in blood serum of obese dogs. Dogs' obesity does not form dogs' syndrome of cytolysis of cardiomyocytes, as evidenced by unchanged serum activity of lactate dehydrogenase, creatine phosphokinase and cardiac troponin concentration.*

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**INFLUENCE OF VITAMINS AND AMINO ACIDS ON CRITICAL PERIODS OF EMBRYONIC DEVELOPMENT OF AFRICAN SHARPTOOTH CATFISH**

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*Key words: aquaculture, African sharptooth catfish, vitamins, reproductive products, eggs, embryos, fish larvae.*

*The work is devoted to the study of critical stages of embryonic development of African sharptooth catfish and the assessment of the effect of biologically active substances, amino acids and vitamins on African sharptooth catfish. The object of the study was incubated roe of African catfish at different stages of development. The aim of this work was to assess the effect of the vitamin-amino acid complex on embryogenesis of the African sharptooth catfish. Chiktonik was the source of vitamins and amino acids. The appropriate concentration of vitamins and amino acids was selected, which would ensure higher survivability of embryos. In the current standards of the fish-breeding process, a certain amount of waste is allowed from 10 to 40%, therefore, the search for reserves for increasing the yield of fish-breeding products associated with a decrease of waste at different stages of embryonic development is relevant. Timely and high-quality biological control is a measure of early detection of any disruptions in the fish breeding process and is necessary for their prompt elimination. As shown by the research results, the vitamin-amino acid complex reduced the death rate at different stages of African catfish embryogenesis. Higher survivability rate of embryos in the experimental groups that received the vitamin-amino acid complex proves its effectiveness. The highest rates were obtained when "Chiktonik" was used at a dose of 1.5 ml / l. The second stage of our study was carried out at the larval development stage of African catfish. When using Chiktonik vitamin and amino acid complex at a dose of 1 ml / l and 1.5 ml / l, the yield of larvae increased significantly compared to the control.*

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## **EVALUATION OF THERAPEUTIC EFFICIENCY OF INSAKAR TOTAL K IN CASE OF OTODECTIC MANGE OF CATS**

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*Key words: otodectosis, acariform mites, cat, acaricides, extensibility, Insakar Total K, hematological parameters, biochemical parameters.*

*Otodectosis of various animal species is quite widespread in different climatic and geographical zones. Currently, there is a tendency towards otodectosis increase among small domestic animals. It is caused by various factors – a rise in the number of animals, lack of preventive treatments. The disease is highly contagious. In addition, there is a risk of developing serious complications such as meningitis, brain abscess, which can lead to animal death. In this regard,*



*the problem of otodectosis therapy is an urgent issue. Presently, the market for antiparasitic medications is diverse. However, it should be noted that not all of them have a pronounced therapeutic effect and are safe for the animals. We tested the new medication Insakar Total K, developed by the employees of the All-Russian Research Institute of Fundamental and Applied Parasitology of Animals and Plants - a branch of the Federal State Budgetary Scientific Institution "Federal Research Center - All-Russian Research Institute of Experimental Veterinary Medicine of RAS (Moscow). The studies were carried out on cats of "Lapa pomoshchi" shelter for homeless animals at Ulyanovsk State Agrarian University. The aim of the study was to evaluate the therapeutic efficacy of Insakar Total K and its effect on parameters of cats' homeostasis. It was established that Insakar Total K has a pronounced therapeutic effect in otodectosis of cats. The application of this medication in accordance with the instructions ensures complete recovery of animals. The extensibility of Insakar Total K in otodectosis of cats was 100%. It was shown that the tested medication has no local toxic effect on the skin and mucous membranes. The effect of Insakar Total K on hematological and biochemical blood parameters of cats was evaluated. It was found that hematological and biochemical parameters of blood of animals remain within the physiological norm in case of application of this medication.*

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## **EVALUATION OF THERAPEUTIC EFFICIENCY OF INSAKAR TOTAL K IN CASE OF OTODECTIC MANGE OF CATS**

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*Key words: otodectosis, acariform mites, cat, acaricides, extensibility, Insakar Total K, hematological parameters, biochemical parameters.*

*Otodectosis of various animal species is quite widespread in different climatic and geographical zones. Currently, there is a tendency towards otodectosis increase among small domestic animals. It is caused by various factors – a rise in the number of animals, lack of preventive treatments. The disease is highly contagious. In addition, there is a risk of developing serious complications such as meningitis, brain abscess, which can lead to animal death. In this regard, the problem of otodectosis therapy is an urgent issue. Presently, the market for antiparasitic medications is diverse. However, it should be noted that not all of them have a pronounced therapeutic effect and are safe for the animals. We tested the new medication Insakar Total K, developed by the employees of the All-Russian Research Institute of Fundamental and Applied Parasitology of Animals and Plants - a branch of the Federal State Budgetary Scientific Institution "Federal Research Center - All-Russian Research Institute of Experimental Veterinary Medicine of RAS (Moscow). The studies were carried out on cats of "Lapa pomoshchi" shelter for homeless animals at Ulyanovsk State Agrarian University. The aim of the study was to evaluate the therapeutic efficacy of Insakar Total K and its effect on parameters of cats' homeostasis. It was established that Insakar Total K has a pronounced therapeutic effect in otodectosis of cats. The application of this medication in according with the instructions ensures complete recovery of animals. The extensibility of Insakar Total K in otodectosis off cats was 100%. It was shown that the tested medication has no local toxic effect on the skin and*

*mucous membranes. The effect of Insakar Total K on hematological and biochemical blood parameters of cats was evaluated. It was found that hematological and biochemical parameters of blood of animals remain within the physiological norm in case of application off this medication.*

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## **CHANGES IN ACTIVITY OF GAMMA- GLUTAMYLTRANSFERASE IN LIVER TISSUES OF RABBITS AT DIFFERENT PHASES OF POSTNATAL ONTOGENESIS**

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Key words: liver lobes, gamma-glutamyltransferase, enzyme activity, feeding phase, rabbits.

This work describes the patterns of changes in activity of gamma-glutamyltransferase (GGT) in tissues of various liver lobes (caudate, mastoid, right outer, left outer, left inner, and square) of gray giant rabbits at different phases of postnatal ontogenesis. The enzyme activity was determined by spectrophotometric method in the scientific laboratory of Chuvash State Agrarian University. It was revealed that rabbits are born with different enzyme activities in the studied liver lobes, and the intensity of age-related changes of GGT activity in the studied rabbits' periods of life in the tissues of liver lobes is diverse, which is connected with change of vegetable feed composition and with unequal need for enzyme participation in metabolic processes in the body tissues during the studied early postnatal period. The most intense changes in enzyme activity with age of rabbits

occur at colostrum-milk phase in the square lobe; as for the first phase of milk nutrition - in the right and left outer lobes; the third phase of milk nutrition - in the left inner and in the square lobes; in the second phase of transitional nutrition - in the left inner lobe. Stabilization of GGT activity does not happen by the age of two months.

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**REPRODUCTION OF THE RABIES VIRUS OF “RV-97” STRAIN IN  
THE SUSPENSION CULTURE OF VNK-21 / SUSP / ARRIAH AND VNK -  
21 / 2-17 CELLS**

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*Key words: rabies virus, RV-97 strain, VNK -21, suspension cell culture, VNK -21 / SUSP / ARRIAH, infectious activity, KKID50 / cm<sup>3</sup>.*

*The study of new suspension cell lines for rabies virus cultivation is a topical area of biotechnology. The article presents results of specification of sensitivity of VNK-21 / SUSP / ARRIAH subline to the rabies virus of "RV-97" strain. A comparison of two highly potential suspension cell cultures of VNK 21 for production of viral material with a high titer of infectious activity is shown [1]. The estimation of the titers of the rabies virus of "RV-97" strain (lg'T, CCID 50 / cm<sup>3</sup>) was carried out, the titers were established after 48 hours of cultivation in the suspension subline of VNK -21 cells, according to the cell suspension concentration and the multiplicity of infection. Suspensions of VNK-21 cells with concentrations of 700 and 1000 (thousand cells / cm<sup>3</sup>) were tested. The multiplicity of infection was 0.01; 0.1 and 0.5 CCID 50 / cell. It was found that VNK-21 / SUSP / ARRIAH subline at a concentration of 1 mln. cells / cm<sup>3</sup> has advantages over VNK-21 / 2-17 subline and allows, at a multiplicity of infection of 0.1 CCID 50 / cell, to achieve the accumulation of the rabies virus of "RV-97" strain up to 8.25 lg CCID 50 / cm<sup>3</sup>. The listed conditions were considered suitable for cultivation of this strain. Statistical analysis of the data for substantiation of the shortest cultivation time, which allows to obtain the largest virus yield was carried out. It was determined that the peak titer value, established after 48 hours of cultivation (lg'T<sub>48</sub> = 8.250), significantly exceeded all previous values. However,*

there were no significant differences from the peak estimate ( $p > 0.05$ ) in subsequent samples ( $\lg T_{58} = 7.917$ ;  $\lg T_{72} = 7.833$ ).

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## **HEMODYNAMICS IN HIND LIMBS IN CASE OF SPINAL CORD INJURY UNDER CONDITIONS OF ANTI-ADHESIVE HYALURON- CONTAINING GEL APPLICATION**

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*Key words: Spinal cord, injury, anti-adhesions, pelvic limbs, hemodynamics, thermoregulation, heart rate.*

*It is possible to reduce the degree of systemic complications arising in response to spinal cord injury by providing timely medical care. Positive therapeutic effect of intrathecal administration of hyaluron gels is known for such injuries. In turn, these medications can be used as carriers of other medical substances. The aim of the research is to study hemodynamics in hind limbs in case of traumatic spinal cord injury using an anti-adhesion gel which contains Na-carboxymethyl cellulose. Rats' spinal cord injury at the level of the thoracic section of the spine was simulated and a hyaluronic-containing anti-adhesion*

*absorbable gel was injected into the injury area. Hemodynamics and temperature response of pelvic limb tissues were studied. Heart rate dynamics and general body temperature were assessed. The quantitative data were compared with the physiological norm. The animals were observed for 90 days. No heart rhythm disturbances were noted. During the experiment, hyperthermy of central genesis was recorded, which was characterized by an increase of the total body temperature to a maximum of  $37.11 \pm 0.6$  ° C ( $p = 0.004$ ) and local temperature - up to  $34.48 \pm 2.24$  ° C ( $p = 0.002$ ). The phenomena of vasodilatation of the arteries were observed, which were more pronounced after 60 days of the experiment. Further on, the visco-elastic properties of the vessels improved. Difficulties in venous outflow in the created conditions were not found. According to available literature data, when modeling a spinal cord injury without application of anti-adhesion hyaluronic medications, vascular disorders are more explicit. Conclusion. The application of a hyaluronic anti-adhesion gel for traumatic spinal cord injury can reduce the intensity of emerging pathological conditions.*

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## **SHEEP PRODUCTIVITY REDUCTION AND EFFECTIVE MEASURES IN CASE OF INTERDIGITAL GLAND IMPAIRMENT**

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*Key words: sheep, inflammation, gland, limbs, productivity, disease control*

*The usage of pastures in sheep feeding technology leads to frequent cases of limb lesions caused by inflammation of the interdigital gland. The aim of the research was to carry out a comparative assessment of clinical manifestation and various methods of inflammation treatment of sheep interdigital gland. The work was carried out in economic and production conditions of sheep breeding enterprises in Stepnovsky district of the Stavropol Territory. In order to identify sick animals with interdigital gland inflammation, a surgical clinical examination of the animals was carried out in summer and winter periods. After medical examination, the sick animals were isolated into separate cages and divided into 3 groups: Group I with the initial stage of the disease; Group II with purulent inflammation; Group III with complications (corolla phlegmon, purulent pododermatitis, purulent laminitis). It was found that during the illness and treatment period, depending on the time of year and the severity of the disease, the animal loses up to 10% of its live weight with I and II treatment methods and with*



method III - up to 25%. At the end of the study, it was noted visually that wool shearing per animal decreased by 0.9 kg as a result of depletion in groups I and II, and in the third - by 0.5 kg. It is caused by the animal lameness, appetite decrease and increased body temperature. According to the results of the work, 68 animals with interdigital gland inflammation were detected from 1000 heads of sheep in the summer, which amounted to 6.8%. In winter, 18 sick animals out of 720 heads were identified, which is 2.5%. The interdigital gland impairment was found in adult sheep (4.5% in summer, 1.9% in winter) more often than in lambs (2.3% and 0.5%, respectively). We determined that the most effective way to treat interdigital gland inflammation is its extirpation using a complex powder.

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## **EVALUATION EFFICIENCY OF SIMMENTAL LINES IN HERDS OF DIFFERENT BREEDING ADVANTAGES**

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Key words: selection, lifelong productivity, selection effect, line, correlation, regression, heredity, variability, heritability, selection.

*The submitted article presents materials on assessment of Simmental breed lines, used in farms of different breeding qualities, as well as on relationship between milk yield of cows for individual lactations and life-long productivity. It was found that milk yield correlation is the most explicit between the average parameters for three lactations and the average lifetime productivity in breeding herds (agricultural production co-operative "Combine" and experimental production farm "Tsentralnoye"). In the studied herds, the relationship between milk yield and milk fat content varies greatly in size and direction in many lines (from  $r = - 0.25$  to  $+ 0.17$ ). The relationship between mothers and daughters is*

*insignificantly expressed in terms of milk yield in all lines. The variability of milk yield of daughters is characterized by lower rates in comparison with mothers in three lines - Floriana 374, Brazil 141, Krepysh 50. Low "mother - daughter" correlation in milk yield and homogeneity of daughters in milk yield indicates a significant influence of daughters of prepotent bulls on milk yield. The highest heritability of milk yield was established in Zipper 085 line ( $h^2 = 0.44 - 0.66$ ), which reveals a large genotypic diversity of animals in these lines.*

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## **EXTERIOR AND CONSTITUTIONAL FEATURES OF FIRST-CALF HEIFERS OF BLACK-AND-WHITE CATTLE WITH DIFFERENT COMBINATIONS OF SELECTION**

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Key words: young cattle; growth and development; dynamics of live weight; *black and white breed; cattle; measurements; body build indexes; selection combinations.*

*The development of dairy cattle breeding largely depends on the culture of young cattle breeding. It is very difficult to obtain and preserve young animals. Correct rearing of young cattle of dairy breeds contributes to the appropriate exhibition of genetically inherent productive abilities of animals during the first stage of their growth and development. When organizing breeding and feeding, animal growth and development characteristics are taken into account, which are determined by heredity and environmental conditions, especially feeding. The article provides a comparative analysis of the dynamics of live weight, measurements and body indexes of first-calf heifers of various selection combinations. First-calf heifers of the fifth experimental group, obtained from fathers and mothers belonging to the cross lines, exceeded animals in the control group, whose parents belonged to pure lines, in live weight and gains. Under the same housing and feeding conditions, the heifers of the studied groups did not grow in the same way, and certain differences were revealed in the process of ontogenesis. The first-calf heifers of the 5th group had the greatest live weight in different age periods and exceeded the peers of the 1st, 3rd and 4th groups from 10 to 23 kg with relevant difference. The animals of the 5th experimental group had the highest average daily gains till 6 months old. For the entire growing period (18 months), the animals in the control group had the highest relative gain, which was significantly higher than the gain in the experimental groups. The following body indexes were calculated: long-legged, elongation, pelvic-thoracic, thoracic; blockiness and bone index, as well as milk production coefficient which determined the direction of productivity of animals. First-calf cows were included into dairy-meat productivity direction according to the long-legged and elongated index. According to blockiness and thoracic index, animals of all groups belong to dairy direction of productivity, and according to bone index, to meat direction.*

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## **GENETIC VARIABILITY OF CONSTITUTION ASSESSMENT OF FIRST-CALF COWS OF HOLSTEIN BLACK-SPOTTED BREED OF DIFFERENT LINES**

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*Key words: first-calf cows, heritability, black-and-white breed, breeding value, genetic correlation, selection, lineage.*

*Exterior assessment is important for specification of constitutional strength of an individual animal and its acclimatization ability, as well as its productive orientation. The object of our research was Holstein first-calf heifers of the black-and-white breed prevailing on the farms of Moscow region. Studies were conducted with application of linear estimation of the animal body type of 54,170 animals. Animals are divided into 5 groups depending on the lineage: Vis Back Ideal 1013415, Reflection Sovering 198998, Pabst Governer 882933, Montvik Chieftain 95679 and other lines. Most of the animals had parameters in the range of 4 ... 6 points. With greater reliability ( $p \leq 0.001$ ) and in the course of the*

dispersion analysis, it was found that it affects the rump bone height, position of the quarters, the height of the back lobes, the length of the nipples, the width of the quarters and the angle of the back legs from the side ( $p \leq 0.01$ ). The heritability of the rump bone height (0.27 ... 0.38) and milk type (0.16 ... 0.36) in almost of all studied lines was within moderate limits. A high occurrence of such constitutional defects as soft ankles (4.16 ... 13%), oblique udder bottom (1.78 ... 5.02%), high tail (2.75 ... 8.07%) and roof-like quarters (1.08 ... 3.77%) was noted in such lines of first-calf heifers as Vis Back Ideal 1013415, Reflection Sovering 198998 and Montvik Chieftain 95679. Animals of all the studied groups have high genetic correlations between the rump bone height and other parameters of constitutional assessment: Montvik Chieftain line has 95679 positive pairs 8 ( $0.63 \pm 0.0032$  ...  $0.97 \pm 0.0005$ ) and 5 negative pairs ( $-0.66 \pm 0.0041$  ...  $-0.97 \pm 0.0045$ ); Vis Back Ideal 1013415 - 2 positive pairs ( $0.48 \pm 0.0007$  ...  $0.66 \pm 0.0006$ ); Reflection Sovering 198998 - 4 positive pairs ( $0.41 \pm 0.0009$  ...  $0.62 \pm 0.0007$ ); Pabst Governer 882933 - 3 positive ( $0.55 \pm 0.0092$  ...  $0.74 \pm 0.0071$ ) and 2 negative pairs ( $-0.62 \pm 0.0174$ ). The obtained results reveal wide selection possibilities in dairy herds.

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## **APPLICATION OF THE FEED ADDITIVE WITH S.CORONATA IN THE RATION OF CALVES AND COWS**

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*Key words: Serratula Coronata, blood, milk productivity, calves, cows*

*The aim of the research is to study the effect of "Phytocomplex S. coronata" supplement on clinical and biochemical status of calves, blood morphology and productivity of dairy cows. The content of ecdysteroids in the additive was determined by highly-efficient liquid chromatography. The experiments were organized in Kirov region. One control and three experimental groups of calves at the age of 1.5 months were selected. Each group included 10 heads. Phytocomplex S. coronata was mixed with water and given to calves for 30 days: group 1 - 10 g, group 2 - 20 g, group 3 - 30 g / calf. Phytocomplex S.coronata was given in the experiment on lactating cows once a day for 60 days: group 1 - 50 g, group 2 - 100 g and group 3 - 150 g / head. Animals in the control were kept on the farm ration*

*without additives. Blood tests of calves (total protein, albumin, ALT, urea, total cholesterol, sublimate test, reserve alkalinity) and cows (erythrocytes, leukocytes, hemoglobin) were carried out at the beginning and at the end of the experiments. It was found that the concentration of ecdysteroids is 500 mg / kg in Phytocomplex S. coronata. The amount of total protein in the blood of calves from the experimental groups increased to  $65.7 \pm 4.2 - 68.0 \pm 2.5$  g / l ( $P < 0.05$ ), albumin to  $31.5 \pm 1.2 - 33.2 \pm 1.2$  g / l ( $P < 0.05$ ). By the end of the experiment, the average daily milk yield of cows in the experimental groups exceeded the result in the control by 3.7%, milk fat by 0.3%, protein by 0.6%. ( $P < 0.05$ ). By the end of the experiment, the number of erythrocytes and hemoglobin in the blood of cows of the experimental groups significantly ( $P < 0.05$ ) exceeded these parameters at the beginning of the experiment, while in the control there were no significant changes ( $P > 0.05$ ).*

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## **SPECIAL COMPOUND FEEDS AND IMMUNOSTIMULATOR FOR BREEDING OF SUCKLING PIGS**

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*Key words: compound feed, suckling pigs, live weight, milk production, survivability, growth.*

*One of the main problems in rearing and organization of feeding of suckling piglets is early training of eating various feeds and special compound feeds, prevention of various diseases (diarrhea, anemia). The only food for sucking pigs is sow milk for the first two weeks, thus, the piglets receive the required amount of nutrients up to 3 weeks of age. However, they need to be additionally fed from the first days of life. The aim of the study was to study the effectiveness of usage of special compound feeds (superstarter, prestarter, starter) as creep feeding and feeding of suckling piglets, as well as an immunostimulant to maintain their health, better growth and development. As a result of the research, it was revealed that suckling piglets which received special superstarter, prestarter and starter feed*

*depending on age, as well as young animals, which were additionally injected i.m. with an immunostimulant, had higher survivability by 6.97% in the 1st experimental group and by 7.3% - in the 2nd experimental group, as well as higher growth rate. Suckling pigs of the second experimental group grew much better in the experimental period (60 days), their weight was 17.68 kg, which was higher than in the control group by 1.2 kg or 7.28% and 0.63 kg or by 3.7% in the first experimental group, respectively. The milk yield of sows in the 2nd experimental group was 59.0 kg, which is more than in the control by 11.1 kg or 23.2% and in the 1st experimental group - by 2.75 kg or 4.9%. The deviation between the experimental piglets of the control and the 1st experimental group for this parameter was 8.35 kg or 17.4% in favor of the 1st experimental group.*

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## **ASSESSMENT OF THE WELL-BEING OF ANIMALS IN THE CONDITIONS OF A PIG BREEDING FARM**

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*Key words: animal welfare, welfare criteria, welfare principles, piglet, digitization, points.*

*Recently, many works devoted to the study of animal welfare have appeared in Russia. This topic has long been of great scientific interest in foreign countries. Problems related to the welfare of animals lead to a decrease of their productive longevity, an increase of morbidity, impaired reproductive abilities and quality deterioration of the obtained products. Particular attention should be paid to the study of animal welfare on agricultural farms and complexes where the most severe exploitation of animals takes place. Based on this, studies were carried out on the level of animal welfare on a farm of Penza region, engaged in pork production and processing. The object of the study was a crossbred rearing stock. Well-being was assessed based on the EC Welfare Quality assessment protocol for pigs algorithm. This algorithm was developed at Wageningen University and Research Center in the Netherlands. The essence of the methodology is to assign points to the criteria and principles of animal welfare. In the course of the research, an integral assessment of the level of animal welfare on the farm was carried out, a complex score was calculated and a “welfare category” was assigned. It was established that the animals on the farm are provided with a sufficient amount of balanced food and water, are kept in rooms with an appropriate microclimate, there is a place in the crates for rest and movement, there is also demonstration of species-typical behavior and social communication. The results obtained with the help of the EU Welfare Quality algorithm also identified vulnerable aspects in animal housing that affect the welfare.*

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**INFLUENCE OF BLOOD GROUPS, ALLELES AND ANTIGENS OF  
ERYTHROCYTES ON TOTAL PROTEIN CONTENT IN MILK OF  
HEAVY BREED MARES**

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*Key words: protein content in milk, erythrocyte antigens, alleles, genotypes, blood groups, mares.*

*In recent years, more and more attention has been paid to the study of polymorphic genetic systems of blood proteins and their application as indicators of the most objective assessment of breeding qualities of farm animals.*

*Specification of blood groups of Russian and Lithuanian heavy breed mares was carried out according to the methodological recommendations developed by R. M. Dubrovskaya and I. M. Starodumov. The erythrocyte antigens of A and D blood groups of horses were typed with the help of monospecific sera. By the method of family analysis, the alleles and genotypes of mares were determined according to the D blood group system. Using the Hardy-Heinberg formula, the frequencies of genes were determined by simple counting. An AM-2 analyzer was used to analyze mare milk for total protein content. The studied breeds of mares are characterized by a high occurrence frequency of Dad, Dde, Ddghm alleles. Great significance of antigenic similarity in D blood group system between the Lithuanian and Russian heavy breeds indicates genetic similarity of these breeds. The relationship between total protein content and immunogenetic parameters was determined. High protein content of Lithuanian heavy breed mares is associated with the presence of DdkDcgm genotypes; as for Russian heavy mares - genotypes DbcmDdghm. Taking into account the revealed positive relationships of immunogenetic indicators with the milk protein content of mares of heavy breeds, it is possible to recommend application of the results obtained to adjust the selection for breeding work.*

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