

## THE IMPORTANCE OF RESEARCH EXPERIMENT WHEN DEVELOPING A CONTACT GRAIN DRYER

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*Key words: research studies, contact heat exchange, parameters, energy consumption, seeds, moisture removal, conveying working body.*

*When conducting experimental studies, it is necessary to carry out a number of experiments sufficient for obtaining an adequate process improvement model. The process of grain heat treatment in a contact type grain dryer is influenced by a large number of different factors. The study of the total influence of a large number of factors, combined in arbitrary correlation, often leads to unclear patterns and erroneous conclusions. In this regard, all factors that influence the process of grain heat treatment in the developed installation were ranked into the main ones, which have the greatest influence on process development, carrying the greatest information, and additional ones, which are of secondary importance. Applying the method of a priori information formalization, as well as taking into account the requirements for factors (controllability, homogeneity and lack of correlation between them), we identified those of them that have the greatest impact on the process of grain heat treatment in the developed installation: the temperature of the heating surface and the rotation frequency of the conveying working body. Based on the study of previously performed studies on grain heat treatment, research experiments, and also, based on the design features of the developed installation, the factor variation ranges were identified. When conducting the main experiment, we chose the total specific energy consumption for evaporation process of 1 kg of moisture from seeds  $q$ , kJ / kg as a criterion for improvement. This parametre combined the process energy parametres, as well as*

*heat, mass transfer, as it depends on the amount of energy consumed and moisture removal. Methodologically correct research experiment allowed us to narrow the field of experiments and, with the minimum required number of experiments, to obtain adequate and reliable results of the main experiment. Improvement of the heating surface temperature and CWB rotation frequency during drying of camelina seeds made it possible to provide the total specific energy consumption for moisture evaporation of 4.40 ... 4.55 MJ / kg with a one-time moisture removal of 2.6 ... 3.1 %.*

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## **RESULTS OF EXPLORATORY RESEARCH OF THE SEPARATING SYSTEM WHEN CLEANING SUGAR BEET ROOT**

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Key words: experimental research, root crops, sugar beet root, exhaust gases, separation system.

*The most important problem of implementation of technology for production of agricultural crops is reduction of labor costs, energy and resource saving with a simultaneous increase of cultivated crop yield and, as a consequence, a decrease of production cost, which cannot be ensured without specification and subsequent reduction of energy costs for agricultural production operations. To improve quality of sugar beet root harvesting in the conditions of high humidity, it is proposed to use a separating system in the design of the combine harvester, providing energy efficiency with possibility of simultaneous operations of digging, separating root crops from soil and plant impurities, blowing of the separating*

*surface with hot exhaust gases from the power plant of the harvesting machine. The aim of the study is to provide the possibility of improving the quality of separation of sugar beet root in the conditions of high humidity by using blowing of the working surface of the cleaning devices with exhaust gases from the power plant of the self-propelled combine harvester. The separation system of a combine harvester was adopted as an object of the research; it is represented by a cleaning star with installed deflectors for blowing of the working surface with the exhaust gases of the power plant. A method of conducting exploratory research of the separating system to determine quality parameters of cleaning is presented. The results of the research indicate the prospects for further theoretical and experimental work of the proposed separation system to improve individual elements of its design.*

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**EFFICIENCY OF APPLICATION OF BIOLOGICALLY ACTIVE PRODUCTS ON SOYBEAN CROPS IN THE CONDITIONS OF THE NON-BLACK SOIL ZONE OF THE RUSSIAN FEDERATION**

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Key words: soybean, biologically active substances, "Floravit", rhizotorphin, germination energy, germination capacity, symbiotic activity, plant productivity.

*Ecologically sustainable and economically feasible crop cultivation technologies, including application of biologically active substances, are required for formation of a consistently high and excellent soybean yield. These substances, when used in minimal doses for pre-sowing treatment of seeds and vegetative plants, provide high field germination and plant resistance to unfavorable environmental factors, promote an increase in productivity by ensuring accelerated germination of seeds, their increased germination capacity and resistance to unfavorable agro-climatic conditions of the growing season. The aim of the research was to determine the degree of influence of various combinations of biological products and treatment methods on growth processes and productivity*

*of soybean of the northern ecotype. The influence of various types of pre-sowing seed treatment on germination energy, germination capacity and morphometric parameters of soybean shoots was studied. The biological product "Floravit" was used in the experiments in combination with rhizotorphin, seeds were treated before sowing; the germination energy, laboratory and field germination capacity were found. Also, additional treatment of vegetating plants was carried out with the biological product "Floravit". Observations of the symbiotic activity of plants were carried out, the productivity of plants was recorded at the end of the growing season. It was found that soaking of soybean seeds in water solution of "Floravit" (concentration -  $1.4 \cdot 10^{-4}$  g / ml; consumption - 1 l / kg) with subsequent treatment with rhizorophin (consumption - 3–5 g / kg) has a growth-stimulating effect at the initial stages of plant development, promotes fast and friendly shoots. Afterwards, the plants form a more powerful symbiotic apparatus and higher productivity. The obtained results - an increase in germination energy, laboratory and field germination capacity, symbiotic activity of plants and parametres of crop yield structure indicate a fairly high efficiency of "Floravit" application.*

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## **AGROPHYTOCENOSIS FORMATION AND PRODUCTIVITY OF SPRING DURUM WHEAT IN CASE OF APPLICATION OF MINERAL FERTILIZERS**

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Key words: durum wheat, Megamix, mineral fertilizers, photosynthetic potential, productivity.

*The article shows the results of the research on the development of methods for increasing spring durum wheat yield (Triticum Durum) in the system of application of liquid mineral fertilizers: Megamix for pre-sowing seed preparation, treatment of crops during the growing season with mineral fertilizers  $N_{16}P_{16}K_{16}$  for pre-sowing soil preparation in the forest-steppe conditions of the Middle Volga region. The research was carried out on the experimental field of Samara State Agrarian University in 2017-2020. In the course of a three-factor field experiment, the main biometric parameters were assessed: sprout density and plant survivability in crops, formation of aboveground mass and accumulation of dry matter, photosynthetic activity with analysis of leaf area, formation of photosynthetic potential and photosynthesis net productivity. It was found that the best parameters are formed on the variants with seed treatment of with Megamix Seeds or Megamix Profi, followed by two-fold treatment during the growing season with Megamix Profi 0.5 l / ha (tillering phase) + Megamix Nitrogen 0.5 l / ha (flag leaf phase), with application of  $N_{16}P_{16}K_{16}$  fertilizer. It was revealed that, in this case, the sprout density is formed at the level of 78.0 ... 77.7%. The usage of Megamix for seed treatment system + treatment of crops with Megamix stimulants ensures the maximum increase of the aboveground mass in the variant of seed treatment with Megamix Seeds and treatment of crops with Megamix Profi - 1582.0 g / m<sup>2</sup>; as well as a mixture of Megamix Profi + Megamix Nitrogen - 1614, 0 g / m<sup>2</sup> after applying  $N_{16}P_{16}K_{16}$ . In these variants, the maximum leaf area and photosynthetic potential of 0.776 ... 0.981 million m<sup>2</sup> / ha days are formed and, as a consequence, the maximum yield with the parameters of 2.89 ... 3.03 t / ha. It was found that application of liquid mineral fertilizers in all variants of the experiment significantly increases spring durum wheat yield.*

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## **THE INFLUENCE OF COMPLEX FERTILIZERS AND GROWTH REGULATOR ON SEED RODUCTIVITY OF AWNLESS BROME**

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Key words: awnless brome, height of generative shoots, inflorescence length, number of generative shoots and seeds in an inflorescence, weight of 1000 seeds, seed yield.

*The article presents results of the experiments carried out on leached black soils of the Republic of Mordovia to identify the effect of liquid complex fertilizers and Albit on awnless brome seed productivity. For this purpose, a two-factor field experiment was laid on crops of awnless brome on the experimental field No. 1 of OAO "Mordoviyagosplem" in Ozerny village of urban district of Saransk city in 2018 - 2020 according to the following scheme: Factor A – Time of application of liquid complex fertilizers and Albit. 1 - At the beginning of spring growth, 2 - In the phase of stalk-shooting, 3 - In the phase of spring growth + in the phase of stalk-shooting. Factor B - Liquid complex fertilizers and Albit. 1. - Without usage of liquid complex fertilizers and Albit (control). 2. - Megamix-profi. 3. - Megamix nitrogen. 4 - Albit. The results of the research revealed that the height of generative shoots (99 - 105 cm) and the length of panicles (14.6 - 16.9 cm) did not change significantly in case of application of fertilizers and Albit; the maximum number of inflorescences was, in comparison with the control, in case of application of Megamix-profi (28.4 %), Megamix-nitrogen (28.9 %), Albit (27.8 %) at the time of spring growth and at the beginning of stalk-shooting with Albit application ( 30.6 %); the usage of Megamix - profi in the phase of stalk-shooting and growth + stalk-shooting led to a greater seed number in inflorescences (68.2 and 68.6 %). Albit contributed to an increase of the number of generative shoots at all periods of application (141, 137, 144 pieces / m<sup>2</sup>); the largest number of seeds in an inflorescence was noted when spraying plants with Megamix-profi and Albit at the time of spring growth (101.3 and 100.4 pcs.), Megamix - nitrogen – in the*

*phase of stalk-shooting (101.6 pcs.); the application of Megamix-nitrogen at the time of spring growth promoted the maximum mass of 1,000 seeds (4.17 g); spraying with Megamix-nitrogen (531 - 466 kg / ha) and Albit (507 - 466 kg / ha) at the beginning of spring growth and shooting, as well as with Megamix-profi (508 kg / ha) in the phase of stalk-shooting led to the maximum seed yield , with an advantage over the control by 35.1 - 29.0 %; 18.6 - 17.8 % and 29.2 %.*

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## **EFFICIENCY OF MALTING BARLEY CULTIVATION IN CASE OF DIFFERENT TYPES OF MINERAL NUTRITION AND SEEDING AMOUNT**

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Key words: fertilizers, seeding amount, grain yield, net income, profitability, grain cost, energy income, bioenergy coefficient, energy efficiency coefficient, grain energy intensity.

*Of the field crops cultivated in Mordovia, the leading position belongs to barley, which is used for food, feed and brewing purposes. The latter option of its use is economically feasible and many varieties are used for these purposes. Knowledge of the influence of individual technology elements (mineral fertilizers and nutritional area) on productivity, economic and energy parameters and grain*

*quality of new intensive type varieties in specific soil and climatic conditions is very important. The experiment was carried out to establish the possible parameters of productivity of malting barley of Grace variety in case of different types of mineral nutrition and plant density, with the task to identify the impact of the studied factors on grain yield and economically and energy efficient variants. Experimental work was carried out on the educational and experimental farm at Ogarev National Research University named after N. P. Ogarev in 2012, 2014 and 2015. The article shows the features of grain yield formation, economic and energy parameters, depending on technology elements. The suitable doses of fertilizers and seeding amount of malting barley cultivation were identified. The results of impact studies of fertilizers and plant density on grain yield and cost; net and energy income, profitability, bioenergy efficiency of Grace malting barley when cultivated on leached black soils of Mordovia are presented. It was found that the highest grain yield (3.84 t / ha), conditional net income (26277 rubles / ha) and energy balance (49.3 GJ / ha) are observed when fertilizing with  $N_{60}P_{60}K_{60}$  and sowing 5.5 million seeds per hectare; with the same planting density, but without fertilizer application - profitability (374 %). The maximum bioenergy efficiency coefficient (4.6) and the minimum grain cost (2214 rubles / ha) were noted with a seeding amount of 5.5 million / ha, but the predominant energy efficiency coefficient (3.0) and the lowest grain energy intensity was 94.8 GJ / t) - with a seeding amount of 4.0 million / ha.*

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## **PROPERTIES OF ORGANOMINERAL FERTILIZER BASED ON CHICKEN MANURE AND ITS APPLICATION IN THE TECHNOLOGY OF SPRING RAPE CULTIVATION FOR SEEDS**

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Key words: chicken manure, natural zeolite, micro element composition, yield, spring rape.

*The article presents the results of work aimed at developing a new type of organomineral fertilizer and effectiveness of its use in crop production. The usage of organic fertilizers based on chicken manure is an effective way to utilize organic waste. The quality parametres of fertilizers based on natural zeolite and chicken manure in various combinations made it possible to state that fertilizers with microbiological product Tamir were of the highest quality (variants 3-5). It was found that usage of zeolite as a sorbent together with a microbiological complex contributed to a significant decrease in concentration of micro elements in organic waste. The application of these fertilizers in spring rape crops promoted biometric*

*parameters of plants, photosynthetic activity and, in general, the productivity of oilseeds. The highest yield was observed in the variants with application of these fertilizers at a dose of 30 t / ha, the average yield of which was 21.4 dt / ha, which provided an increase relative to the control by 7.4 dt / ha. The conducted agroecological experiments confirm that the proposed fertilizer can be used in agriculture, both for obtaining high yields of spring rape and for restoring soil fertility.*

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## **PRODUCTIVITY STRUCTURE OF MOSCOVSKAYA 39 WINTER WHEAT VARIETY DEPENDING ON TREATMENT WITH BIO- AND HUMIC PRODUCTS**

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Key words: winter wheat, biological product, organic fertilizer, harvest structure, yield.

*As a result of the research, the influence of biological products recommended for foliar fertilization of crops on winter wheat productivity structure in the conditions of the Republic of Mordovia was revealed. Comparison of the effectiveness of different treatment times of plants is made. The appropriate combination of application time and biological product type has been established, which has a positive effect on winter wheat productivity structure. Appropriately selected elements of cultivation technology play a significant role in increasing crop yields. Research shows that growth stimulators have a positive effect on crops, increasing their yield and grain quality. On average, over the years of our research, the maximum yield of Moskovskaya 39 winter wheat variety in OOO "Lunga" was observed on the variant with two-fold treatment of plants with Potassium Humate in autumn and spring. The increase in comparison with the control variant (without treatments with biological products) was 1.1 t / ha. All products under study significantly increased winter wheat grain yield from 11.6 to 42.6%, but this also depended on the treatment time. The maximum yield parameters were observed on the variants where the crops were double-treated: in autumn and spring. A smaller increase was noted on the variant with spring treatment of crops. In comparison with the control, the number of survived plants by the harvesting time increased by 5.8–10.4% (by 15–27 pcs / m<sup>2</sup>) under the influence of bio- and humic products; the total number of stems - by 11–74 pcs / m<sup>2</sup> or 2.4–16.0%; the number of productive stems - by 20–85 pcs / m<sup>2</sup> or 5.5–23.4%. The number of grains per spike in the variants treated with biological products significantly changed in comparison with the control by 1–2 pcs. The change of 1000 grain mass was 36.3–38.2 g. The smallest value was observed on the control variant, the largest - on the variant with double treatment of crops in autumn and spring with the biological product albite.*

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**PRODUCTIVITY OF FIELD AND CULTIVATED IN CROP  
ROTATION MONOCULTURES DEPENDING ON THE CONTENT OF  
NITRATE NITROGEN AND SOIL BIOLOGICAL ACTIVITY IN THE  
BLACK SOILS OF THE SOUTHERN STEPPE REGIONS OF THE  
SOUTHERN URALS**

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Key words: productivity, hydrothermal index, field crops, soil biological activity, nitrate nitrogen, crop rotation, monoculture.

*This article is devoted to the study of the effect of nitrate nitrogen content in the soil on its biological activity on crops cultivated in the system of six-field crop rotation and mono-crops, as well as the effect of nitrate nitrogen and soil*

*bioactivity on the yield of field crops (corn for silage, peas, millet and barley) in crop rotations and mono-crops. Field experiments were carried out on a long-term plot and the results are objective from the point of view of the data on the yield of field crops, soil bioactivity and the content of nitrate nitrogen on the crops were obtained in various weather conditions, including suitable and very dry years. Very dry years are considered when the hydrothermal index is 0.6 or less, they accounted for 68% of the total number of research years. The question of the forecrop influence and the nutritional background on the field crop yield, the content of nitrate nitrogen and the biological activity of the soil is considered. The lowest biological activity of the soil is noted in the variant with permanent barley sowing on unfertilized background - 6.0 %, on fertilized background - 6.1%. As a result of the research, it was found that the yield of corn for silage is higher in mono-crops compared to crop rotation. Millet slightly reacts to application of mineral fertilizers, and when cultivated in monoculture, it reduces yield. The usage of mineral fertilizers increases the content of nitrate nitrogen and the biological activity of the soil in all variants of the experiment.*

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**EFFICIENCY EVALUATION OF SOIL TILLAGE AND PLANT  
PROTECTION OF GRAIN LEGUMES IN THE CONDITIONS OF THE  
FOREST-STEPPE ZONE OF THE VOLGA REGION**

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Key words: grain legumes, soil cultivation, plant protection, yield, protein yield, economic efficiency.

*The article presents results of studies of comparative productivity and cultivation economic efficiency of soybeans, peas, lupine and chickpeas, depending on main tillage systems in crop rotation and the level of plant protection from harmful organisms. Grain legumes are capable of forming a seed yield of 2.0 t / ha in the conditions of the forest-steppe zone of the Volga region. Three-year experimental studies have shown that the studied leguminous crops can be arranged in the following row according to the yield level: peas - 2.51 t / ha > lupine - 2.12 t / ha > chickpea - 2.11 t / ha > soybean - 2.10 t / ha. Evaluation of the effect of soil tillage in cultivation of grain legumes showed a significant yield increase by plowing for 25-27 cm in comparison with tillage for 12-14 cm for all the studied crops, a yield increase for adaptive-integrated plant protection was also noted in comparison with minimum protection (protection only against weeds). Studies show that lupine crops had an advantage in protein content, its yield is from 533 to 802 kg / ha, as for soybeans, protein yield was 449-666 kg / ha, peas - 430-521 kg / ha, and chickpeas - 346-486 kg / ha with the advantage of the mentioned variants. A higher conditional net income was obtained on soybeans (31555-44584 rubles / ha) and chickpeas (27777-40037 rubles / ha), especially on combined tillage in crop rotation. Plant protection systems had an equal impact on economic efficiency of their cultivation; in some variants, adaptively integrated plant protection was less effective.*

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**APPLICATION EFFICIENCY OF THE COMPLEX OF ORGANIC  
FERTILIZERS IN WINTER WHEAT CULTIVATION TECHNOLOGY IN  
THE FOREST STEPPE OF THE VOLGA REGION**

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Key words: winter wheat, organic fertilizer, productivity, economic efficiency.

*The paper presents results of studying the effectiveness of a complex of organic fertilizers (straw, green manure, biological product) in the technology of winter wheat cultivation. Experimental field studies were carried out on the experimental field of Ulyanovsk State Agrarian University in 2018 - 2020 in a five-field grain-green manure crop rotation: green manure fallow - winter wheat - millet - spring wheat - barley. The experiment scheme included 6 variants: 1. Control, 2. Forecrop straw (barley) + green manure (vetch-oat mixture), 3. Straw + 10 kg N / t straw + green manure, 4. Straw + biological product + green manure, 5. Biological product + green manure, 6.  $N_{64}P_{32}K_{54}$  (NPK). The experiment was carried out in a 4-fold repetition with a randomized placement of plots, the record area of which was 72 m<sup>2</sup> (4x18), total - 120 m<sup>2</sup> (6x20). Mineral fertilizers are calculated for the planned yield of winter wheat of 4.5 t / ha. "Biocomposite-correct" product produced by AO Shchelkovo Agrokhim was used as a biological fertilizer. The experiment focused on the change of soil agrochemical parameters (typical medium-thick medium-loamy black soil) depending on application of fertilizers, grain yield, its quality and environmental safety; economic assessment of winter wheat cultivation technology with application of fertilizers was conducted. A significant improvement of the soil nutrient regime was found in case of application of a complex of organic methods, which was slightly inferior to the variant with full fertilization. The yield increase of winter wheat grain in case of combined usage of straw, green manure and a biological product was 0.67 t / ha (control - 5.83 t / ha). The usage of a complex of biological techniques for winter wheat cultivation is environmentally safe and cost effective.*

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**POTENTIALLY PRODUCTIVE SELECTION DEVELOPMENT  
DIRECTIONS OF HASHISH - FREE VARIETIES OF THE CENTRAL  
RUSSIAN HEMP**

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Key words: hashish – free hemp, selection, Diana, Ingreda, Antonio, Juliana varieties

*The article considers and presents the main economic and biological parameters of new hashish-free varieties of androgenous hemp of the Central Russian type. The authors studied four zoned and recommended the following varieties of androgenous hemp into production: Diana, Ingreda, Antonio and Juliana. The research was carried out in 2013-2015 on the experimental base of Chuvash Research Institute of Agriculture. The objects of the research were androgenous hemp varieties: Diana, Ingreda, Antonio and Juliana. A comparative study of the varieties by a complex of economically valuable traits was carried out on a control seed plot. Experimental plots were 2-row, row width - 0.45 m, row length - 5.0 m, plot area - 4.5 m<sup>2</sup>. Repetition was sixfold. Sowing was carried out with a hand marker, the seeding scheme was 5x45 cm. According to the analysis, it was revealed that androgenous hemp has a high population uniformity by gender. It was established that early maturity of androgenous hemp varieties allows them to be cultivated both for seeds and fiber, which significantly increases the economic production efficiency. Androgenous hemp plants ensure simultaneous maturation of plants, which, in turn, allows mechanized harvesting to be carried out. A promising and noteworthy direction of hemp selection work is development of the so-called unisexual hybrids. It was revealed that the basis for creation of unisexual hemp is hybridization: dioecious varieties are taken for the maternal*

*form, and monoecious varieties - for the fatherly one. In this regard, the question of creating the so-called unisexual hemp hybrids has been and remains an eternal topic of scientific research.*

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## **INDIVIDUAL AND INDIVIDUAL-FAMILY SHORT-STEM SELECTION AS A METHOD FOR CREATING NEW SELECTION MATERIAL OF WINTER RYE**

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Key words: winter rye, individual and individual-family selection, internodes, short stemming, productivity elements.

*Modern composition of diploid winter rye is represented mainly by hybrid varieties, and in spite of high productivity level, good baking qualities of flour, resistance to diseases and lodging, most of them are split according to plant height, which leads to uneven crops. A long-term study of the material selected for seed production has shown that plants of the same height of the spike-bearing stem differ in length of internodes. The length of the upper internode varies most considerably from 20 to 45 cm, and selection of plants with lower parameters of this feature leads to a decrease of the overall plant growth and increases resistance to lodging. Research work was carried out at Novozybkovskaya Agricultural Experimental Station - a branch of the Federal Research Center "Federal Scientific Center of Feed Production and Agroecology named after V.R. Williams " in 2012-2019; Novozybkovskaya 150 winter rye variety was under study. The presence of the source of dominant short-stemming (k-10028) in the synthetic population of the initial material made it possible to carry out multiple selections with an intensity of 2 b according to the planned traits. The method of annual sequential exclusion of plants with a height of more than 120 cm, with a lower internode length of 5-7 cm and an upper one over 35 cm from the seed material formed a fairly constant form of a short-stemmed (up to 120 cm) population with a lower internode of 1-4 cm - 97%, with the upper - up to 30 cm - 50%. Family material combined according to the height of the stem showed high resistance of this trait in seed-plot testing. A long-term cycle of targeted individual selection for short stems increased the number of productive stems to 16 pcs. with grain mass of 2.0-3.0 g per ear. Self-pollination reduced the number of spike-bearing stems to 3-6 pcs., the weight of grain per spike was 2.6-3.5 g. The*

*combination of short stemming, increased bushiness, and different types of spike gives a variety of material and is of great interest for winter rye selection.*

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## **USAGE OF CULTURAL FILTRATES IN *IN VITRO* SELECTION FOR ANTHRACNOSE RESISTANCE**

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Key words: flax, anthracnose, resistance, strain, cultural filtrate, immature embryo, callus cells

*The research was carried out on the basis of the laboratory of selection technologies of the Federal State Budgetary Scientific Institution "Federal Scientific Center of Fiber Crops" (Tver region) in 2018–2020. The aim of the research is in vitro development of new flax genotypes resistant to anthracnose, one of the most harmful fungal diseases. As a result of the research, the composition of the cultural filtrate of the anthracnose causative agent was clarified. It was revealed that toxicity of the cultural filtrates did not depend on the virulence of the strains used in the present studies, the cultural filtrates of strains 784 (highly virulent) and 780 (medium virulent) turned out to be more toxic (decay and death of radicle was observed on the 5th day in 67 - 88% of germinated seeds), less toxic are strains 793 (highly virulent) and 788 (weakly virulent) (decay and death of radicle was observed on the 5th day in 9-15% of germinated seeds). It was found that morphogenic foci were formed more actively in genotypes the morphogenic callus of which was transferred to a medium with a higher concentration of the cultural filtrate; it was shown that in the second passage, when transferring morphogenic calli from a selective medium, which contains 40 ml / L of cultural filtrate on a selective medium also containing 40 ml / L of cultural filtrate, as well as on a selective medium containing 44 ml / L of cultural filtrate, the number of formed morphogenic calli and green buds on the 14<sup>th</sup> day is significantly higher than in case of transferring on a selective medium containing 36 ml / L of cultural filtrate. Viable regenerant plants were obtained and genotypes were isolated, which retained resistance to anthracnose for three generations at a level of 50 - 60%: NO-78 x Lenok, NL-103-2 x Lenok, NL-40-1 x Lenok, NE-38 x Rosinka, NE-36 x Lenok, NE-17 x Lenok, NE-16-2 x Rosinka.*

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## EFFICIENCY OF APPLICATION OF VARIOUS METHODS FOR PLASTICITY AND STABILITY CALCULATION OF VARIETIES ON THE EXAMPLE OF SPRING BARLEY

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Key words: barley, variety, plasticity, stability, rank.

*Spring barley is a key grain-fodder and feed crop, which forms an increased yield (in comparison with other grain-fodder crops) due to early maturity and drought resistance. Many different methods for assessing environmental plasticity and stability have been developed, they are reliable and informative. The purpose of this study is a comparative characteristic of plasticity and stability parameters calculated with application of various methods on the example of barley varieties. The experimental part of the work was carried out in 2013-2017 on the experimental fields of the Omsk Omsk Agrarian Scientific Center (southern forest-steppe, Omsk). The parameters of ecological plasticity were calculated:  $Y_{min}$ - $Y_{max}$  - resistance to stress,  $Y_{comp}$  - compensatory ability (according to Rossielle, Hemblin); CV is the coefficient of variation (according to Dospekhov); K.A. - coefficient of adaptability (according to Zhivotkov's method);  $b_i$  - coefficient of linear regression of productivity of varieties (according to Eberhart, Russell). Also, parameters of environmental stability are as follows: SI - stability index,  $H_{om}$  - homeostaticity (according to Khangildin); PVSL - parametre of variety*

*stability level (according to Nettevich); – regression coefficient (according to Eberhart, Russell). The research results show that the parameters of plasticity and stability of varieties calculated by various methods differ significantly. Obviously, it is necessary to use a methodology that will bring all the scattered results to a single denominator. In this case, it is more convenient to use the principle of ranking varieties according to parameters and to evaluate them according to the sum of the ranks obtained by each variety. Thus, according to the rank assessment, the most stable and plastic are varieties that received this assessment according to most of the methods used in the research.*

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**EVALUATION OF SOYBEAN VARIETIES FOR RESISTANCE OF AGROCENOSES TO COTTON BUDWORM (HELICOVERPA ARMIGERA) IN SAMARA REGION**

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Key words: soybean, variety, cotton budworm, crop damage

*Samer-2 is an undoubted leader in terms of attractiveness as a feed plant both in particular years and on average during the study years. A lower pest population, even in a year with a high number of pests, was shown by Cordoba variety. The rest of the studied varieties can be attributed to medium level of feed preference for cotton budworm. The observed pattern can presumably be explained by the difference in chemical composition of different varieties of soybean, which should be confirmed by further research, as well as by density of soybean plants. The best varieties in terms of protein content in our studies were Prudence, Alaska and Protina; the latter variety does not consistently accumulate this protein, which depends on weather conditions and other factors. The lowest grain moisture was shown by Alaska soybean variety, the agrocenosis of which had a low plant*

*density. And conversely, the wettest grain had Samer-2 variety with a high number of plants per 1 m<sup>2</sup>. On average, over three years of observation, the best and consistently high yield was shown by Cordoba variety, due to, for one of the reasons, high resistance to damage by the cotton budworm. An opposite situation was observed for Protina and Samer-2 variants, a significant number of caterpillars of the studied phytophage led to a substantial yield decrease of these varieties, especially in the year favorable for development of this pest. Prudence and Alaska variants can be classified as medium-suppressed varieties with medium yields. To obtain a stable phytosanitary situation and obtain high-quality soybean crop, it is more expedient to cultivate Cordoba (high-yield) and Prudence (high-protein) varieties, with application of Biosleep BV, Zh insecticide (4 l / ha) for effective protection against cotton budworm.*

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**RESULTS OF INTRODUCTION OF MOMORDICA CHARANTIA L.  
WHEN GRAFTING ON PUMPKIN VARIETIES IN THE CONDITIONS OF  
THE MIDDLE CIS-URAL REGION**

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Key words: grafting, pumpkin varieties, stock, compatibility of grafting components, adaptation, biometric characteristic, ascorbic acid

*In the context of tremendous changes in the world community, one of the main factors is introduction of new plant varieties for reliable development of agriculture. To improve the quality of adaptive capabilities of thermophilic pumpkin crops in the Middle Urals, grafting on resistant stocks can be used. The studies were carried out in 2018-2020 on protected ground, at Udmurt Federal Research Center of the Ural Branch of the Russian Academy of Sciences, the city of Izhevsk. The soil is organo-mineral, humus content is 5.0 %, pH - 5.8. The total plot area is 24 m<sup>2</sup>, the record area is 16 m<sup>2</sup>. The repetition was fourfold, the placement of the plots was randomized. The experiment is one-factor. Experimental variants are: 1. Momordica charantia L. without grafting (control), stocks - 2. Cucurbita pepo L., 3. Cucurbita maxima Duch., 4. Cucurbita moschata Duch., 5. Cucurbita ficifolia Bouche., 6. Lagenaria siceraria Molina , Standl. This work presents the stages of the study on compatibility of Momordica charantia when it was grafted onto various types of stocks, based on the analysis of the characteristics of growth and development, survival and productivity of plants. Conclusions were made about the prospects of growing Momordica charantia indoors. The data obtained indicate a high survival rate of Momordica charantia - over 72 % of the studied stocks. At the same time, it should be noted that the highest survival rate among grafts had Cucurbita maxima variant. The dry matter and total sugar content in the fruits of Momordica charantia increased in all variants with grafting (to 26.8 % by dry matter and to 16.2 % by total sugar, respectively) compared to the control, and the accumulation of nitrates was maximum - 384.6 mg / kg in the variant of grafting on Lagenaria siceraria, while there was no excess of MAC.*

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## **ADAPTIVE RESPONSE OF STOMACH TISSUES OF AFRICAN CATFISH TO MICROBIOTA WITH PROBIOTIC PROPERTIES**

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Key words: aquaculture, sharptooth catfish, probiotic "Sporothermin", histological characteristics of the stomach.

*The article presents specific features of adaptive response of stomach tissues of African sharptooth catfish bred in artificial environment with application of "Sporothermin" probiotic. Probiotics influence metabolism of the host organism due to their participation in digestion processes, they also promote synthesis of proteins and increase the degree of absorption. The microorganisms that compose the probiotic contribute to better assimilation of incoming nutrients into the fish organism, they synthesize biologically active substances due to their fermentation activity. Histological slides were analyzed and documented applying a universal microscope Axio Imager.M2. Differences were found in structural features of the stomach of fish bred with application of "Sporothermin" probiotic and without it. Thus, fish that did not receive the probiotic had edema of the stomach inner muscular layer, epithelial layer detachment from the gastric mucosa and disorder of structural organization of the gastric fields. These changes were not observed in fish bred with application of "Sporothermine" probiotic. The conducted studies indicate the prospects of using the microbiota with probiotic properties when breeding *Clarias gariepinus* in an artificial environment. The spore forms of bacteria (*Bacillus subtilis*, *Bacillus licheniformis*), which are part of the probiotic*

*"Sporothermin", contribute to improvement of microbiocenosis of fish gastrointestinal tract, triggering a mechanism that stimulates a complex of adaptive reactions in stomach tissues of Clarias gariepinus. At the same time, conditionally pathogenic and pathogenic microbiota in the gastrointestinal tract is suppressed, ensuring effective digestion and increasing the degree of nutrient absorption. As a result, the productivity of the fish stock increases and the costs of breeding it in an artificial environment are reduced.*

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**ADAPTIVE CHANGES IN THE BLOOD PICTURE OF  
SHARPTOOTH CATFISH IN CASE OF TRECRESAN APPLICATION  
WHEN BREEDING IN ARTIFICIAL ENVIRONMENT**

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**Key words:** aquaculture, sharptooth catfish, trecresan adaptogen, hematological parameters of sharptooth catfish, antioxidant system.

*The work is devoted to the study of trecresan adaptogen effect on hematological parameters of sharptooth catfish bred in an artificial environment. In particular, the effect of trecresan on general hematological parameters and antioxidant system of African sharptooth catfish was assessed, since breeding in an artificial environment is accompanied by stress, in which oxidative processes increase, leading to damage of biological membranes and disruption of cell functioning. Blood samples were analyzed using an Axio Imager.M2 microscope (Carl Zeiss, Germany). The analysis of enzymatic activity (units / mg of protein) was carried out on a UV-1800 double-beam spectrophotometer (Shimadzu, Japan). The obtained results indicate that in case of trecresan adaptogen application, there was a tendency to a proportion increase of monocytes, platelets and stab neutrophils. There is an increase of the total amount of intracellular*

*hemoglobin, superoxide dismutase and catalase activity in erythrocytes and in the blood of fish bred with application of trecresan adaptogen. Trecresan induces production of interferons, increases the body immune status, activating cellular and humoral immunity, leads to a decrease of toxic products formed during lipid peroxidation by increasing the activity of enzyme unit in the antioxidant system and ensures antioxidant defense improvement of sharptooth catfish bred in an artificial environment. It strengthens the body immune system and increases resistance to adverse environmental factors. In our studies, trecresan revealed itself as a mild, effective immunomodulator.*

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### **ANALYSIS OF A.YA. KAPLAN HRV PARAMETRES OF JERSEY BREED COWS WITH DIFFERENT VEGETATIVE STATUS**

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**Key words:** cows, heart rate variability, initial vegetative tonus, cardiointervalometry, respiratory modulation index, sympathoadrenal tonus index, slow-wave arrhythmia index.

*The article reveals the possibilities of cardiointervalometry using the modern complex electrophysiological laboratory "CONAN - 4.5". In modern economic conditions, the intensification of animal breeding requires deep and all-sided knowledge of many sciences, especially biology and physiology. The body of an animal consistently undergoes interrelated morphological, biochemical and*

*functional changes that provide functional reserves such as energy, metabolic and informational resources. The adaptation mechanisms and cattle economic use duration in modern conditions of industrial production of livestock products depend on the nature and severity of these reserves. The estimation of slow and fast-wave components of variability of the cardiointervals is carried out - the numerical values of A. Kaplan's parameters of heart rate variability (respiratory modulation index (RMD), sympathoadrenal tonus index (SATI), slow wave arrhythmia index (SWAI)) of Jersey cows, which reflect the activity of the sympathetic and parasympathetic vegetative nerve system. Mathematical processing of heart rate variability with application of R.M. Baevsky's method was used in the study. The test group of Jersey cows was divided into subgroups based on the tension index, and initial vegetative statuses were established on its basis. The distribution of the studied group of Jersey cows based on the tension index of regulatory systems was confirmed by statistical processing using the classification matrix, which was 91.26% and with the square degree of Mahalonobis distance  $D^2$  between the groups. The obtained statistically processed data in the course of the scientific research have true meaning. In this work, the analysis of the obtained numerical values of of A.Ya. Kaplan's parameters was carried out and the relationship between the initial vegetative tonus of Jersey cows and the obtained values was considered.*

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# ESTIMATION OF SIMMENTAL COWS FOR MACHINE MILKING SUITABILITY

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**Key words:** udder shape, milking completeness, udder capacity, intensity of milk flow, morphological characteristics, udder functional properties, udder measurements, correlation coefficient, notional udder size, udder index

*The paper presents results of studies on evaluating Simmental cows for machine milking suitability. It was found that 78.7% of cows had a bowl-shaped udder, round - 14.7% and goat - 6.6% of cows at 'agricultural production cooperative "COMBINE". Bowl-shaped cows are more productive. Their milk yield was 4724 kg for 305 days of lactation with a fat content of 3.97% and a protein content of 3.30%. Their udder index was 47.7%. As for cows with a rounded udder shape, milk yield per lactation was 4246 kg with fat and protein content of 4.08 and 3.26% , respectively, and an udder index of 46.1%. Cows with a goat udder shape were characterized by low milk yield (3181 kg) and the worst parametres of milk fat content (3.88%), milk protein (3.20%) and udder index (2.2%). Approximately the same pattern is observed in the herd of the agricultural cooperative "Abodimovskiy" with slightly worse parametres of cow productivity. The intensity of milk production of cows of agricultural production cooperative "Abodimovsiy" with a bowl-shaped udder was 1.42, round - 1.35 and goat - 1.18 kg / min. Cows with a rounded udder shape had higher milk flow rate, which was equal to 1.65 kg / min, with a bowl-shaped one - 1.24 and with a goat udder shape- 1.09 kg / min in agricultural production cooperative "Combine". No relation was*

*found between udder index and milk composition. There is also no conjugation between the intensity of milk flow and fat and protein content for udder quarters and for the udder as a whole, whereas a positive correlation was found between the intensity of milk flow and daily milk yield.*

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# THE CORRELATION OF ECONOMICALLY USEFUL TRAITS AND THEIR USAGE IN PRACTICAL BREEDING

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Key words: breeding, exterior, live weight, milk productivity, fat, protein,  
measurements, correlation.

*The work was carried out on three-breed hybrid Simmental x Ayrshir x Holstein animals in the conditions of the Federal State Unitary Enterprise "1<sup>st</sup> May" of Mordovia Republic. Correlation of the main economically useful traits was carried out on crossbred animals bred with different energy nutritional value of the ration. The excess of the ration nutritional value of the test group was 7.0%. The heifers of the test group significantly exceed in terms of live weight the analogues from the control group at the age of 6 months by 11 kg, at 12 months - by 19 kg, at 18 months - by 26 kg ( $P < 0.001$ ). The highest milk productivity had the cows of the test group, which gave 7543 kg of milk, which is 8.5% more than in the control group. The superiority of cows in the test group is also preserved in terms of milk fat and protein yield, respectively, by 8.5-6.6% ( $P < 0.01$ ). Significant differences were noted between the groups of animals in the main exterior dimensions. As for height at the withers and sacrum, heifers from the test group exceeded their analogues from the control group by 5.7 - 6.3 cm, chest girth by 9.5*

*cm, oblique body length by 4.8 cm ( $P < 0.001$ ). The study of correlation of the main economically useful traits shows a certain dependence of live weight in different periods with milk production. This relationship is clearly seen in heifers of the test group at the age from 2 to 5 months and 12-18 months. The correlation coefficient in these age periods was + 0.685 ... + 0.734, which indicates a high dependence between live weight and milk productivity. The correlation between the main measurements of heifers and their future milk productivity was higher for heifers bred with improved feeding. It is advisable to use this regularity in practical selection.*

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## **BREEDING INDEX MODELING FOR AIRSHIRE DAIRY CATTLE WITH APPLICATION OF EXTERIOR PARAMETRES**

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Key words: index selection, exterior, BLUP, variance, covariances, correlation, heritability coefficient, Ayrshire breed

*The article presents results of selection efficiency of potential parents in Ayrshire breed using  $I_{AYR}$  multiple-factor selection index, which includes productivity traits such as milk yield, fat and protein yield and integrated exterior parametres: UDC udder index and FLC leg index. As an original data array, a sample was generated with parameters for milk productivity and exterior*

*characteristics of 574 Ayrshire first-calf heifers, which are daughters of 21 bulls from the leading breeding farm of Leningrad region. Calculation of phenotypic and genetic correlations was carried out in the course of the study, which revealed the greatest paratypical relationship between milk yield and fat yield  $r_p = 0.912$  at  $p < 0.001$ , and the highest genetic relationship was noted between milk yield and protein yield  $r_g = 0.960$  at  $p < 0.001$ . A high value of heritability coefficient for milk yield was established, which amounted to  $h^2 = 0.506$ , which is connected with usage of imported servicing bulls with high genetic potential for herd reproduction. To determine the values of index weight coefficients, the variance and covariance components of variability of the studied parameters were calculated. Economic components of the parameters included in the developed equation are formed. As a result of selection modeling with an intensity of 10% according to the constructed equation of the productive-exterior index  $I_{AYR}$ , a significant and reliable advantage in milk production by 1899 kg of milk was established in comparison with other animals, in terms of fat yield - by 64.7 kg and protein yield - by 51.7 kg.*

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## **THE INFLUENCE OF THE MONTH OF THE YEAR ON SPERM CULLING INTENSITY OF SERVICING BULLS**

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**Key words:** servicing bulls; sperm cell concentration; ejaculate volume; sperm cell activity; month of the year, culling of the native sperm.

*The article analyzes the influence of the season of the year on qualitative and quantitative sperm parameters of servicing bulls, it also considers the structure of reasons for culling of ejaculates. The research was carried out on bulls of Holstein, Black Spotted, brown Swiss and Hereford breeds at the age of 2-6 years in OOO "Nizhegorodskoe" for breeding work". Statistically significant influence of the month of the year on concentration and activity of spermium, the*

*ejaculate volume, the proportion of rejection of ejaculates that do not meet the requirements was established. The sperm concentration was 0.592 billion / ml at the beginning of the year. In spring, there was an increase in concentration and a sharp jump in June to 0.886 billion / ml, then it gradually decreased. The average volume of ejaculate at the beginning of the year was quite high 7.69-8.45 ml, in June there is a sharp decrease in volume, in subsequent months there was a gradual increase in volume to 7.68 ml. The sperm activity parameters change slightly during the year. At the beginning of the year, sperm activity was 5.98 points, in March there is an increase to 6.33 points, and in July to 6.47 points. After July, there is a decrease in activity to 5.95 points. The month influence on sperm concentration was 28.18 %, on the average volume of ejaculate - 19.73 %, on sperm activity - 6.36 %, on the number of frozen semen doses - 10.49 %. The most intensive culling of native sperm occurs in winter-spring months - 16-18 %, in summer culling is reduced to 3-8 %. Thus, in June, the maximum number of semen doses per a servicing bull was received - 887.4. The main reason for culling throughout the year was a low concentration of sperm in the ejaculate, more than half of the culled ejaculates (54.3 %) had this cause, 26.6 % - low activity, 13.6 % - both defects at the same time, 5.5 % were culled for other reasons.*

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## **MODERN FEEDING ASPECTS OF DAIRY COWS**

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**Key words:** feeding, dairy cows, dry period, highly productive cows, average daily milk yield, finish condition, rations.

*Research on the study of differentiated feeding of cows was carried out in the conditions of OOO "Krasnoe Sormovo" of Krasnoarmeyskiy district of Chuvash Republic. For the experiment, one control and experimental groups of cows were formed, each containing 150 heads. The control animals remained on the farm ration. The cows of the experimental group were fed with differentiated diets according to their productivity and physiological state. The first experimental*

*group consisted of cows with a daily milk yield of 25 kg and more, the second - from 18 to 25 kg, the third - below 18 kg. The diets of dry cows were also revised: we proposed dividing the drying-off period into two stages: far-off dry period (from 8 to 3 weeks before calving) and close up dry period (from 3 weeks before calving). The principal feature of feeding in the experimental groups was that the rations were balanced directly in terms of crude protein and energy. The share of basic or bulk feed was 50% in the structure of the ration. The amount of concentrated feed was calculated taking into account the eatability of the main feed. Maintaining of balanced feeding was achieved through constant monitoring of the diet for quality parameters of milk, body condition and feces consistency. The research focused on a comparative assessment of milk productivity of cows in the control and experimental groups. Analysis of productive parameters of the cows showed a significant increase of milk yield of experimental animals for 305 days by 472 kg, an increase of daily milk yield by 1.8 kg per head. The results obtained indicate that the application of differentiated feeding of cows is advisable, as it contributes to an increase of their milk productivity. Therefore, we recommend using this strategy in feeding of dairy cows.*

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**PHYSIOLOGICAL AND BIOCHEMICAL STATUS OF COWS IN  
CASE OF INTRODUCTION OF A SILICON-CONTAINING  
SUPPLEMENT INTO THEIR RATION**

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Key words: silicon, feed additive, cow, zeolite, amino acids, blood, organic products.

*The article raises questions about development of organic food market in Russia. One of the options for obtaining organic livestock products by using silicon-containing natural minerals as feed additives is proposed. The main carrier in the supplement is a highly activated natural zeolite, the filler is an amino acid complex of animal origin, the supplement is a 100 % natural product. The work was carried out in Ulyanovsk region at OOO "Agrofirma Tetyushskoye" on dairy cows of the black-and-white breed. There were two groups, 10 cows in each were selected: according to live weight, age, productivity, physiological state. The first group (control) received only the ration accepted on the farm. As for the second group (experimental), a silicon-containing additive based on modified zeolite enriched with amino acids was included in the ration once a day at a dose of 250 g per cow. All the animals were kept in the same conditions, there was stable housing. In the course of the experiment, improvement of morphological composition of cows' blood and nitrogen metabolism parameters was revealed when an additive based on highly activated zeolite enriched with amino acids was introduced into the ration. The additive promoted an increase of: erythrocytes by 14.38 %, hemoglobin - by 12.17 % ( $p < 0.05$ ), leukocytes - by 20.44 % ( $p < 0.01$ ); total protein - by 11.84 %, albumin - by 11.11%, globulins - by 12.24 %; decrease of urea by 22.22 and ALT activity by 8.0%. In general, the parameters show protein metabolism intensification and effective usage of feed nitrogen for synthesis processes in the body, including milk synthesis.*

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**FEED ADDITIVES WITH SORPTIVE AND ANTIOXIDANT  
PROPERTIES FOR IMMUNE STATUS CORRECTION AND**

# PRODUCTIVITY INCREASE OF CATTLE IN CASE OF BULK FEEDING TYPE

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Key words: lactating cows, young cattle for fattening, silage, haylage, Lipovitam-beta, Koretron, Biokoretron-forte, blood, immunoglobulins, productivity, reproduction rates

*The article presents results of studies on correction of silage and haylage rations of young fattening cattle and lactating cows by using sorbing, sorption-probiotic and antioxidant vitamin and mineral supplements. The application of such feed additives as Koretron and Biokoretron-forte in hay rations of fattening cattle in the amount of 1.1 % of its dry matter stimulates protein-synthesizing liver function, which is shown by concentration increase of total protein in blood serum of young animals in the experimental groups compared to the control (by 3, 97 and 5.01 %) albumin (6.21 and 9.34 %) and alpha globulins (9.26 and 16.74 %), concentration increase of immunoglobulins of A, M, G classes, all these parameters are reflected in an increase of average daily gains by 11.75 and 14.73 %. Adding the antioxidant vitamin and mineral supplement Lipovitam-beta to silage rations of cows at a dose of 4 g every 5 days increases their productivity by 7.41 %, which is also confirmed by an increase of serum protein concentration in their blood (by 2.04 %), besides, there is a significant increase of globulins by 3.52 % in the fractional spectrum, the fraction increase of gamma globulins (by 4.69 %), which carry the main load for formation of antibodies, is especially pronounced. The application of Lipovitam - beta has an immunostimulating effect during the period of late pregnancy of cows (7-8 months of pregnancy), which is confirmed by a significant increase of immunoglobulins of*

*A, M and G classes in blood serum, by 8.38 %; 9.37 % and 13.01 %, respectively.  
Cow reproduction rates are improved.*

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**CHEMICAL COMPOSITION OF MEAT AND LIVER OF BROILER CHICKENS IN CASE OF USAGE OF "ZASLON 2+" ADDITIONAL NUTRITION COMPLEX IN THEIR RATION**

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Key words: broiler chickens, chemical composition of muscles and liver, additional nutrition complex to reduce toxin impact in feed

*The article presents results of the studies on chemical composition of femoral, pectoral muscles and liver of broiler chickens of Ross 308 cross when using "Zaslون 2+" additional nutrition complex to reduce the impact of toxins in the feed, since meat and liver quality of broilers is mainly determined by the content of protein and fat, the value of the resulting product depends these parameters. The tasks of the study included: specification of moisture, dry matter, protein, fat and leach in the muscles and liver of chickens. Broiler chickens of Ross 308 cross, which were raised up to 38 days were the object of the research. Two groups of 1-day old chickens were formed, 1000 heads in each, without gender division. The control group received the main diet, as for the experimental group,*

*the main ration and a complex of additional nutrition were used at the dose of 0.5 kg per 1 ton of compound feed to reduce the effect of toxins in the feed. On the 14th, 21st and 38th days of the study, a control slaughter of chickens was carried out in order to study the chemical composition of bird muscles and liver. There was a decrease in the amount of moisture with an increase of dry matter, crude leach and protein, while the amount of fat in broiler chickens of the experimental group, where there was the main diet and "Zaslou 2+" decreased in comparison with the control group where only the main diet was used. It indicated positive influence of the studied feed additive of complex action on chemical composition of the muscle tissue and liver of broilers and improvement of dietary properties of the products.*

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**DYNAMICS OF BLOOD PARAMETRES OF YOUNG EGG CROSS CHICKEN IN CASE OF APPLICATION OF A COMPLEX PROBIOTIC FEED SUPPLEMENT**

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Key words: egg cross chickens, blood, antioxidant status, morpho-biochemical and immunological parameters, "Profort".

*The results of morpho-biochemical, immunological studies and data on the antioxidant status of young laying hens of Czech Dominant breed when including "Profort" feed additive in the ration are presented. The study was carried out in the conditions of the poultry farm of Krasnoye Podvorie farm in Belgorod region. The chickens were divided into two groups: experimental and control. Young birds of the control group received the main ration. As for the experimental group, "Profort" feed additive, which contained Bacillus megaterium B-4801 and Enterococcus faecium l-35, was used at a dose of 0.5 kg / t in combination with the main ration. Blood samples for research were taken on 11, 21 and 42 days. In the course of the studies, a positive effect on morpho-biochemical, immunological parameters and parameters of antioxidant defense system of egg cross chicken blood when using "Profort" probiotic was revealed. A decrease of the content of monocytes, eosinophils, lymphocytes and pseudo-eosinophils was noted throughout the entire period of the study in blood of young birds of the experimental group, compared to the control group. The concentration of alpha-globulins in the blood of birds of the experimental group was higher throughout the entire period of the study relative to the parameters of the control group. The*

*maximum difference in immunological parameters of the blood of birds of the experimental and control groups was achieved on the 42<sup>nd</sup> day of the study. So, lysozyme activity of blood serum of young laying hens of the experimental group was higher by 18.8%, and the content of CIC and general Ig - by 30.7% and 21.9%, respectively. A decrease of medium molecular peptide level in blood shows a positive effect on the antioxidant status of the organism.*

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## **INFLUENCE OF PROFORT FEED ADDITIVE ON MEAT PRODUCTIVITY OF TURKEY OF "HYBRID CONVERTER" CROSS**

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**Keywords:** turkeys, productivity, probiotics, slaughter yield, meat.

*An acute problem in industrial turkey breeding is maintaining a high immune status of birds in order to increase the safety of the stock, productivity and, accordingly, the quality of meat. At the same time, the most important factor is proper bird feeding arrangement. In recent years, there has been a tendency in industrial turkey feeding to use various products that improve the birds' digestion physiology which can replace feed antibiotics. The search for biologically active substances that can stimulate development of the natural microflora of turkeys in order to suppress pathogenic bacteria by increasing the number of bifido and lactoflora are of great interest in science and practice. Various probiotic products have similar properties. The aim of our research was to study the effect of Profort probiotic feed additive on meat productivity of turkeys of Hybrid Converter cross. A production experiment was carried out on turkeys of Hybrid Converter cross.*

*Control slaughter of turkeys was carried out at the age of 98 days. Ten birds were selected from each group. The birds were fed for 60 days, the feed additive was given at a dose of 1 kg per 1 ton of the combined feed. Poultry processing and anatomical and morphological analysis of the carcasses were carried out in the laboratory of the research center of the Federal State Budgetary Scientific Institution "All-Russian Research Veterinary Institute of Pathology, Pharmacology and Therapy". The results were statistically processed using Statistica v6 program . Studies showed that application of Profort feed additive had a positive effect on meat production of turkeys. The superiority of the experimental group was clearly expressed in all the studied parameters. The results obtained allow us to recommend Profort probiotic feed additive for use in turkey breeding in order to increase productivity.*

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## **MEAT PRODUCTIVITY OF BROILER CHICKENS WHEN INCLUDING SUB-PRO PROBIOTIC IN THEIR DIET**

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Key words: broiler chickens, growth, carcass morphology, tissues, muscle fibers, meat microbiology, probiotic

*The possibility of including SUB-PRO probiotic instead of Maxus G feed antibiotic in the diet of broiler chickens of Ross 308 cross was studied to obtain products free of drugs for antimicrobial resistance usage. The dynamics of live weight and carcass weight of cockerels at 1-, 21-, 28-, 34-, 38- and 42-days old was determined. The males of the control group (group 1) reached live weight of  $2619 \pm 44.9$ , experimental -  $2739 \pm 46.2$  or more by 4.38%, at  $P \leq 0.05$  by 42 days of age, and those which received feed antibiotic (group 3) -  $2677 \pm 45.1$  (further, meat productivity of the latter was not studied, since they are not of practical importance). The mass of carcasses of the experimental group was equal to  $1704 \pm 23.1$  g, which is 4.60% more than the control, at  $P \leq 0.05$ ; the relative mass of muscle tissue increased with age by 10.78% in the experimental group in comparison with the 1-day -olds, in the control group - by 10.0%, whereas the mass of bones decreased by 16.75 and 16.59%, respectively (by the difference); the diameter of muscle fibers of superficial pectoral muscle of 42-day-old broilers of the experimental group increased with age by 6.94 times and amounted to  $57.9 \mu\text{m}$ ; in terms of microbiological parameters, carcass meat meets the requirements of the interstate standard GOST 31468—2012. At the age of 42 days, cockerels of the control group showed dystrophic changes in the superficial pectoral muscle in the form of an expansion of the endomysium diameter, with the accumulation of interfiber fluid (albuminous degeneration), while some cockerels of the experimental group have fibers with vacuoles and infiltration by immunocompetent cells (leukocytes, phagocytes). Adding SUB-PRO probiotic in the broilers' diet instead of the feed antibiotic does not reduce productivity, but excludes the negative consequences of feed antibiotics.*

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**MORPHO-BIOCHEMICAL STATUS OF YOUNG FATTENING  
PIGS WHEN USING "POLYSOL OMEGA-3" AND "OMEGA-3 ACTIVE"  
FEED ADDITIVES IN THEIR RATIONS**

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Key words: pigs, unsaturated fatty acids, morpho-biochemical status of blood, lipid metabolism, average daily gain, early maturity.

*The article describes results of application of «Polysol Omega-3» and «Omega-3 Active» feed additives in rations of young pigs during fattening period and their influence on hematological and biochemical parameters of animals' blood. The research was carried out at the pig breeding complex SPK named after N.K. Krupskaya of Melekesskyi district of Ulyanovsk region. The basis of «Omega-3 Active» supplement is flaxseed oil, which contains 60% of polyunsaturated fatty acids and the prevailing proportion of Omega-3. The feed mixture «Polysol Omega-3» includes fatty acids in combination with a complex of biologically*

*active and mineral substances. In addition to studying the productivity and quality of pig production, the study of the effect of these additives on morpho-biochemical status of blood and, in particular, lipid metabolism is of scientific interest. The results of the analysis showed that in case of application of these feed additives in the rations of young pigs, the concentration of erythrocytes in their blood was higher in comparison with control analogs by 1.13 ... 3.56 %, hemoglobin by 7.97 ... 14.15 % ( $P < 0.01$ ), the total protein content by 6 , 75 ... 7.88 %. This is confirmed by improvement of redox processes and metabolism in their bodies. The ration enrichment with the analyzed additives contributed to better usage of fats in feed, which is confirmed by the studied parameters of lipid metabolism (cholesterol, HDL, LDL, triglycerides). The activation of biosynthetic processes had a positive effect on average daily gain of pigs, as a result of which the early maturity of animals increased by 9 ... 23 days.*

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