

FIELD STUDIES OF TILLAGE VIBRATING ROLLER

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Key words: vibration action, roller, surface treatment, soil, rolling, parameters.

A completely new design of a vibrating soil tillage roller was developed, as a result of which the quality of soil compaction was increased, while energy costs are reduced due to a decrease of metal consumption by at least 3 times in comparison with commercially available rollers. The vibrations created by the offered roller make it possible to destroy large soil fractions more effectively and ensure high-quality soil compaction. To determine suitable parameters of the soil-tilling roller, a set of studies was carried out in field conditions, by means of which suitable parameters of the proposed design of the vibrating roller were identified. Ballast weight and diameters of the pulleys on the shaft of the hollow cylinder were changed during the experiment, and the influence of these parameters on improvement criterion was also evaluated. Measurements of soil moisture, its density and structure were carried out in the course of the experiment. The experimental results were processed with modern software: Microsoft Excel, Statistica, etc. As a result of the experiment, it was revealed that the quality of soil compaction by the proposed vibrating roller is 24.7% better than that of KKZ-6 roller, which is widely used in agriculture. In this case, the improvement criterion k_{pl} on the non-rolled section was 0.5, which is 82% lower than that of the proposed roller. The structure of the soil on the area rolled by the proposed roller fully meets the agrotechnical requirements. The proposed tillage roller of vibrating action is universal and can be used on different types of soils, provided that the

ballast weight and the ratio of the pulley diameters on the axis of the hollow cylinder and on the smooth cylinder are regulated.

Bibliography:

- 1. Milyutkin, V. A. The highly efficient unit for in-soil fertilizer application xtender with cultivator Cenius - TX (Amazonen-Werke, JSC "Evrotekhnika") technology No-Till, Mini-Till and the Crest-Ridge / V. A. Milyutkin, V. E. Buksman // Agroecological aspects of sustainable development of the agro-industrial complex: materials of the XIV International Scientific Conference. - 2017 .- P. 488-493.*
- 2. Rudenko, N. E. New technologies and means of mechanization in crop production / N. E. Rudenko, E. V. Kulaev, V. N. Rudenko. - Stavropol: Publishing house of Stavropol SAU, 2018 .- 380 p. - ISBN 978-5-9596-1429-4.*
- 3. Agricultural machinery and technology / I. A. Spitsyn, A. N. Orlov, V. V. Lyashenko [and others]; edited by I. A. Spitsyn. - Moscow: Kolos, 2006 .- 647 p. - ISBN 5-9532-0350-0*
- 4. Milyutkin, V. A. Energy-resource-moisture saving technologies in agriculture and recommended machine complexes / V. A. Milyutkin, S. A. Tolpekin, V. V. Orlov // Strategic guidelines for innovative development of the agro-industrial complex in modern economic conditions: materials of the International Scientific and Practical Conference. - Volgograd: Volgograd SAU, 2016 .- P. 232-236.*
- 5. Patent № 2619522 Russian Federation, IPC A01B 29/04. Tillage roller: № 2015148441: appl. 10.11.2015: publ. 16.05.2017/ Kurdyumov V.I., Sharonov I.A., Proshkin V.E., Proshkin E.N., Kurushin V.V., Linkov I.M .; applicant and patentee FSBEI HE Ulyanovsk State Agricultural Academy. - Bul. № 14.*
- 6. Milyutkin, V. A. "Strip-Till" - an energy-resource-moisture-saving technology of soil preparation for row crops / V. A. Milyutkin, V. V. Orlov // Agricultural science and education at the present stage of development: experience, problems and solutions: materials of the VII International scientific-practical conference. - Ulyanovsk: Ulyanovsk State Agricultural Academy named after P.A. Stolypin, 2016.- P. 259-264.*

7. *Analysis of requirements for development of mechanization means of cultivation of row crops / V. I. Kurdyumov, E. S. Zykin, S. A. Lazutkina, S. P. Albutov, O. A. Dmitriev // Fundamental foundations and applied solutions of urgent problems cultivation of grain legumes: materials of the International Scientific and Practical Conference. - Ulyanovsk: UISAU, 2020. - P. 234-237.*
8. *Strekalov, S. Designing soil tillage devices for the spiral land cultivation system / S. Strekalov, L. Strekalova // E3S Web of Conferences. - ICMTMTE, 2019. - Vol. 126. - P. 1-7.*
9. *Belousov, S. V. On the problem of interaction of the tillage working body with the soil / S. V. Belousov, E. E. Samurganov // E3S Web of Conferences. - ICMTMTE, 2020. - Vol. 193. - P. 1-7.*
10. *Erzamaev, M. P. Increase of the efficiency of using tillage devices / M. P. Erzamaev, D. S. Sazonov, E. O. Salomatov // Innovative achievements of science and technology of the agro-industrial complex: collection of scientific papers of the International scientific-practical conference. - Kinel: Samara State Agricultural Academy, 2017. - P. 689-692.*
11. *Improvement of tillage machines for resource-saving technologies / A. D. Kormshchikov, S. S. Khramtsov, A. Yu. Shmagin, N. G. Zyablitsev // Tractors and agricultural machines. - 2008. - № 2. - P. 29-32.*
12. *Patent № 2752987 Russian Federation, IPC A01B 29/04. Tillage roller: № 2020137915: appl. 17.11.2020: publ. 11.08.2021 / V. I. Kurdyumov, V. E. Proshkin, E. N. Proshkin, V. V. Dikov; patentee is the Federal State Budgetary Educational Institution of Higher Education Ulyanovsk State Agrarian University. - Bul. № 23.*
13. *Akramkhanov, A. Technology of planting crops along the ridges / A. Akramkhanov // TECHNOLOGIES & BEST PRACTICES FACTSHEET. - URL: <http://www.cacilm.org/articles/detail/493> (access date 09.05.2021).*
14. *Block-modular unit for cultivation of row crops / A. V. Balashov, A. N. Omarov, Zh. Zh. Zainushev, A. I. Zavrazhnov, S. V. Soloviev // Vestnik of Michurinsky State Agrarian University. - 2015. - № 2. - P. 163-170.*

15. Babitskiy, L. *Results of research of working bodies with increased reliability of tillage and sowing machines / L. Babitskiy, V. Moskalevich, A. Belov // E3S Web of Conferences. - ICMTMTE, 2020. - Vol. 193 .- P. 1-5.*
16. Sydyk, D. A. *Recommendations on resource-saving technology for cultivation of grain crops in the conditions of rainfed agriculture in southern Kazakhstan / D. A. Sydyk, A. D. Karabalaeva, M. A. Sydykov. - Shymkent: Ministry of Agriculture of the Republic of Kazakhstan, 2014 .- 19 p. - ISBN 9965-32-4922-2.*
17. *State Standard GOST R 54783-2011. Tests of agricultural machinery: approved and put into effect by the Order of the Federal Agency of Technical Regulation and Metrology dated December 13, 2011 № 995-st: introduced on 2011-12-13: publishing house of standards, 2011. - Moscow. - 23 p.*
18. *State Standard GOST R 54784-2011. Agricultural machinery testing. Methods for assessing technical parameters: approved and put into effect by the Order of the Federal Agency of Technical Regulation and Metrology dated December 13, 2011 № 996-st: introduced on 2012-03-01: publishing house of standards, 2012. - Moscow. - 23 p.*

**TO THE ISSUE OF SPECIFICATION OF THE IMPACT FORCE OF
UNBALANCED TILLAGE ROLLER ON THE SOIL**

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Key words: soil compaction, tillage roller, disbalance, angular velocity, angular acceleration, impact force

Intensification of the process of soil compaction and structuring during sowing is possible on the basis of development of a new unbalanced tillage roller

(UTR) equipped with disbalances rotating around the axis of a hollow cylinder. The rotation of disbalances leads to a change of the roller kinematic parameters and the nature of its impact on the soil. Having accepted the developed device as a material system with several degrees of freedom, we applied the Lagrange equation of the second kind to determine the kinematic parameters of the system, on the basis of which we obtained a system of second-order differential equations of the motion of the UTR in relation to generalized coordinates. The derived dependences made it possible to establish the kinematics peculiarities of the UTR at various masses of the hollow cylinder and disbalances. It was found that the impact of the UTR forms combined deformations of compression, shear and extension in the tilled soil environment, providing better fulfillment of agricultural requirements for rolling. It was revealed that the impact force of the UTR with rotating disbalances on the tilled soil environment has a periodic character of change, reaching a maximum of 1488 N with a mass of disbalances of 3 kg, their distance from the axis of the hollow cylinder by 0.25 m, the speed of the forward movement of the UTR of 3 m / s and disbalance rotation frequency 2 times higher than the hollow cylinder rotation frequency. The presence of this force intensifies the destruction process of soil clods and creates a structured and appropriately compacted soil layer in the area of seed placement. By changing the mass of UTR disbalances, their rotation frequency, relative position and position in relation to the hollow cylinder, it is possible to achieve exact compliance with agricultural requirements for rolling of various types of soils.

Bibliography:

- 1. Rudenko, N. E. New technologies and means of mechanization in crop production: monograph / N. E. Rudenko, E. V. Kulaev, V. N. Rudenko. - Stavropol: publishing house of Stavropol SAU, 2018 .- 380 p. - ISBN 978-5-9596-1429-4.*
- 2. Efficiency evaluation of technological processes / N. E. Rudenko, E. V. Kulaev, V. N. Rudenko, I. A. Nosov // Tractors and agricultural machines. - 2019. - № 3. - P. 91-94.*

3. Rudenko, N. E. *How to influence the soil effectively during surface tillage* / N. E. Rudenko // *Tractors and agricultural machines*. - 2017. - № 6. - P. 3-8.
4. *Effective technological methods in agriculture, ensuring suitable moisture accumulation in the soil and moisture consumption* / V. A. Milyutkin, V. V. Orlov, G. V. Knurova, V. S. Stenovskiy // *Vestnik of Orenburg State Agrarian University*. - 2015. - № 56 (6). - P. 69-72.
5. *Theoretical substantiation of ridger-seeder roll draft* / A. K. Subaeva, A. A. Zamaidinov, V. I. Kurdyumov, Y. S. Zykin // *Journal of Fundamental and Applied Sciences*. - 2017. - 9 (1S). - P. 1945-1955.
6. *Quality control indicators of soil ridges at sowing cultivated crops* / A. K. Subaeva, A. A. Zamaidinov, V. I. Kurdyumov, Y. S. Zykin // *International journal of Pharmacy & Technology*. - 2016. - Vol. 8, № 3. - P. 14965-14972.
7. *Kozyrev, B.M. Tillage machines with conoidal rotation working bodies* / B.M. Kozyrev. - Kazan: publishing house of Kazan University, 2001. - 328 p. - ISBN 5-7464-0747-X.
8. *Artemov, I.I. Application of Lagrange equations of the second kind for solving dynamics problems: methodical instructions* / I.I. Artemov, V.N. Pleshakov, A.A. Eliseeva. - Krasnodar: KubSAU, 2013. - 30 p.
9. *Mathematical description of mulching with a rod-type roller* / N.K. Mazitov, R.L. Sakhapov, S.M. Arkhipov, N. Kh. Galyautdinov // *Machinery in agriculture*. - 2005. - № 4. - P. 24-26.
10. *Loktionov, A. V. Equation calculation of the motion of small oscillations of an elliptical pendulum with a given initial angular velocity of its motion* / A. V. Loktionov, S. A. Senkov // *Theoretical and Applied Mechanics: International Scientific and Technical magazine*. - 2011. - № 26. - P. 138-143.
11. *The role of different types of oscillations in soil tillage* / G. G. Bulgariev, G. V. Pikmullin, R. G. Yunusov, V. P. Danilov // *Current issues of improvement of technologies and technical support of agricultural production: materials of the International Scientific Conference of the Institute of Mechanization and technical service*. - Kazan, 2012. - P. 46-49.

12. Bulgariyev, G.G. *To substantiation and definition of the oscillatory process of a spiral-plate working body* / G.G. Bulgariyev, G.V. Pikmullin, R.G. Yunusov // *Vestnik of Kazan State Agrarian University*. - 2014. - № 2 (32). - P. 63-67.
13. Sakhapov, R.L. *Theoretical foundations of oscillatory working bodies of cultivators* / R.L. Sakhapov. - Kazan: KFEI, 2001. - 193 p.
14. *Modeling the technological process of tillage* / S. G. Mudarisov, I. I. Gabitov, Y. P. Lobachevsky, N. K. Mazitov, R. S. Rakhimov, R. R. Khamaletdinov, I. R. Rakhimov, I. M. Farkhutdinov, A. M. Mukhametdinov, R. T. Gareev // *Soil & Tillage Research*. - 2019. - V. 190. - P. 70-77.

**VEGETATION CONDITIONS AND DURATION OF INTERPHASE
VEGETATION PERIODS OF SPRING SOFT WHEAT IN DRY
CONDITIONS**

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Key words: spring wheat, air temperature, duration of the vegetation season, productivity, correlation.

The research was carried out on southern carbonate black soil in the central zone of Orenburg region. The aim of the study was to study the relation between the vegetation season duration and the interphase periods of spring wheat and the air temperature regime and productivity. Rise of climate aridity as well as rise of temperature stress on the plant due to lack of precipitation leads to changes in crop phenology towards reduction of the growing season duration. The dependence of wheat yield on average daily and maximum air temperature for

interphase periods was studied, their adaptive parameters were specified: for average temperature for the period from germination to earing - 10.5 ° C and 19.7 ° C for the period from earing to full ripeness. The actual data on duration of the interphase vegetation periods of spring wheat in different years on favourableness are given. Reliable correlations between the yield and the duration of the interfacial periods of the growing season are established. The variety specificity in the studied variants of the experiment is shown. As a result of the study, it was found that the relative duration of the vegetation season for spring wheat in the Orenburg Cis-Urals zone is 91 days with a yield level of 27.4 dt/ ha. A sharp (by 15 days) reduction of the growing season duration leads to a yield decrease to 2.8 dt/ ha.

Bibliography:

- 1. Balashov V.V. Productivity of spring durum wheat depending on hydrothermal conditions on light chestnut soils of Volgograd region / V.V. Balashov, A.V. Balashov, K.V. Lyovkina, K.A. Kudina // Vestnik of Nizhnevolszhsky agro-university complex: science and higher professional education. - 2017. - № 4 (48). - P. 29-35.*
- 2. Nikitina V.I. Dependence of growing season duration of spring soft wheat varieties on cultivation point of / V.I. Nikitina // Vestnik of KrasSAU. - 2019. - № 5 (146). - P. 43-49.*
- 3. Ahmed, K. Phenotyping for drought resistance in bread wheat using physiological and biochemical traits / K. Ahmed, G. Shabbir, M. Ahmed, K.N. Shah, // Sci Total Environ. - 2020 Aug 10; 729: 139082. doi: 10.1016 / j.scitotenv.2020.139082. Epub 2020 Apr 29.*
- 4. Narayanan, S. Effects of high temperature stress and traits associated with tolerance in wheat. / S. Narayanan // Open Access J Sci. - 2018. - № 2 (3). - C.177-186.*
- 5. Shavrukov, Y. Flowering as a Drought Escape Mechanism in Plants: How Can It Aid Wheat Production? / Y. Shavrukov, A. Kurishbayev, S. Jatayev, V.*

- Shvidchenko., L. Zotova, F. Koekemoer, S. Groot, K. Soole, P. Langridge // *Frontiers in Plant Science*. - 2017. - № 17 (8).
6. Fabian, A. *Stigma Functionality and Fertility Are Reduced by Heat and Drought Co-stress in Wheat* / A. Fabian, E. Safran, G. Szabo-Eitel, B. Barnabas, K. Jäger // *Front Plant Sci*. - 2019. - № 10: 244.
7. Adeel, K. *Rising Atmospheric Temperature Impact on Wheat and Thermotolerance Strategies* / K. Adeel, A. Munir, A. Mukhtar, M.I. Hussain // *Plants*. - 2021. - № 10 (1). 43
8. Onyemaob, I. *Siddique and Guijun Yan Both Male and Female Malfunction Contributes to Yield Reduction under Water Stress during Meiosis in Bread Wheat* / I. Onyemaobi, L. Hui, H. M. Kadambot // *Plant Sci*. - 2017.
9. Djanaguiraman, M. *Sensitivity of sorghum pollen and pistil to high-temperature stress* / M. Djanaguiraman, R. Perumal, S.V.K. Jagadish, I.A. Ciampitti, R. Welti, P.V.V. Prasad // *First published*. - 2017.
10. Aslam, M.A. *Growing Degree Days and Photoperiod Predict Spring Wheat Phenology?* / M.A. Aslam, M. Ahmed, C.O. Stöckle, S.S. Higgins, ul F. Hassan., R. Hayat // *Can Front. Environ. Sci*. - 2017
11. Liu, Y. *Impacts of 1.5 and 2.0 ° C global warming on rice production across China* / Y. Liu, L. Tang, X. Qiu, B. Liu // *Agricultural and Forest Meteorology*. - 2020. - № 284 (7)
12. Neverov A.A. *Modern tendencies of climate change in Orenburg region* / A.A. Neverov // *Vestnik of beef cattle breeding*. - 2015. - № 1 (89). - P. 117-121.
13. *Methodology for state variety testing of agricultural crops*. - M.: Kolos, 1975. - Issue. 2 - 239 p.
14. Kornilova A.S. *Spearman's rank correlation method and its application* / A.S. Kornilova, R.A. Nikonova, D.A. Dryagina // *Modern innovations: theoretical and practical view. Materials of the VIII International Scientific and Practical Conference*. M.: Problems of Science. - 2018. - P. 52-53.

15. Prajapat A.L., Saxena R. Thermal requirements of wheat (*Triticum aestivum* L.) cultivars under different growing environments. *Int. J. Chem. Stud.* 2018; 6: 17-22.

16. Thalmann M., Santelia D. Starch as a determinant of plant fitness under abiotic stress. *New Phytol.* 2017 May; 214 (3): 943-951.

CULTIVATION OF MUNGBEAN SPROUTS (*VIGNARADIATA* L. (R) WILCZEK) FOR NUTRITIONAL AIMS

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Key words: mung bean, seeds, sprout, temperature control, moisture availability.

Modern ideas about healthy lifestyle were formed on the basis of thousands of years of practical experience of people inhabiting various natural zones of our planet. Natural sciences have created a theoretical basis for proper, balanced and rational nutrition, which should save health and ensure active longevity of population. At the stage of industrial production of food and semi-finished products for increasing population of the planet, food preparation technologies can not exist without synthetic additives, which lead to loss of some useful properties of food products. For a long time, to supplement the human diet, sprouted seeds of agricultural crops were used as food. Currently, nutritionists, food manufacturers, doctors and other professionals associated with this industry pay attention to mung bean crop, which has been cultivated in Southeast Asia for thousands of years. The mung bean variety created in Povolzhskiy Scientific

Institute of Selection and Seed breeding is offered for introduction in Samara region as a multi-use culture, as well as for obtaining sprouts that have a number of nutritional advantages. The temperature and water regimes were studied and their parameters were determined ensuring production of the maximum possible number of high-quality sprouts. It was revealed that the balance of temperature and water parameters with a temperature of $30\pm 1^{\circ}\text{C}$ and water consumption of split portions of 700% to the weight of the seeds taken, makes it possible to obtain 630-650 g of high quality sprouts from 100 g of mung bean seeds, regardless of the time of year and weather conditions.

Bibliography:

- 1. ILDIS World Database of Legumes. 2009. International Legume Lftfbase Database & Information Service. <http://www.ildis.org>. [accessed June 15, 2020].*
- 2. Vishnyakova, M.A. Collection of genetic resources of leguminous crops of All-union Institute of Crop Research as an integral component of the basis of food, environmental and bioresource security /M.A. Vishnyakova // Legumes and cereals. - 2017. - № 3(23). - P. 17-23.*
- 3. Shaskolskaya, N.D. Usage of sprouted seeds and their products as healthy products/ N.D. Shaskolskaya // <https://hari-katha.org/svetik/articles/solod.htm> (access date 26.03.2021)*
- 4. Fedorchenko, A. Mung bean Sprout is live food / A. Fedorchenko // <https://yandex.ru/turbo/tutknow.ru/s/meal/11723-prorostki-masha-zhivaja-eda.html>. (access date 26.03.2021).*
- 5. Vishnyakova, M.A. The role of All-union Institute of Crop Research in mobilization, conservation and usage of the gene pool of leguminous crops: the past and the present. / M.A. Vishnyakova // Legumes and cereal. - 2012. - № 1. - P. 27-37.*
- 6. Vishnyakova, M.A. All-union Institute of Crop Research collection as a basis for expanding of horizons / M.A. Vishnyakova // Legumes and cereals. - 2016. - № 2(18). - P. 37-41.*

7. Chelak, V.P. *Introduction of new leguminous plants – an urgent task of biological and agricultural science.* / V.P. Chelak // *Materials of the V International Symposium "New and Non-traditional plants and Prospects for their Use*», - M. - 2003. - Iss. 2. - P. 175 – 177.

8. Minedzhyan, G.Z. *Collection of ethnomedicine and non-traditional methods of treatment* /G.Z. Minedzhyan // Moscow. «Serda-Press LLC» - 2000. - 508 p.

9. Vishnyakova, M.A. *Source material for selection of vegetable leguminous crops in the collection of All-union Institute of Crop Research,* / M.A. Vishnyakova, S.V. Bulyntsev, M.O. Burlyaeva, T.V. Buravtseva, G.P. Egorova, E.V. Semyonova, I.V. Seferova, // *Vegetables of Russia.* - 2013. - №1. - P.16-26.

10. *Sprouted mung bean: properties, benefits and harms.*
<https://missbagira.ru/themes/health/proroshhennyj-mash-svoystva-polza-i-vred-recepty-iz-pro> (Access date: 26.03.2021).

11. Vishnyakova, M.A. *Mung bean and mungo bean: prospects of cultivation and selection in the Russian Federation.* / M.A. Vishnyakova M.O, Burlyaeva, M.G. Samsonova, // *Vavilovsky Journal of Genetics and Breeding.* - 2018; - 22(8); - P.957-966. DOI 10.18699/VJ18/34.

12. Ganesan, K. *A critical review on phytochemical profile and health promoting effects of mung bean (Vignaradiata).* /Ganesan K, Xu B. // *Food Science and Human Wellness.* – 2018; - 7(1).

13. I.M. Osadchenko, I.M. *Intensive technology of seed sprouting as components for food purposes* / I.M. Osadchenko, I.F. Gorlov, N.I. Mosolova, O.V. Harchenko, D.V. Nickolayev // *Food industry.* – 2016. - № 2. - P. 44-46.

14. Sushkevich, N.I. *The effect of growing conditions and the year of reproduction on sowing qualities of seeds, morphological and physiological characteristics in sprouts of Vignaradiata (l.) R. Wilczek* / N.I. Sushkevich, O.N Zabegaeva, M.O. Burlyaeva //, *Works on applied botany genetics and breeding.* - 2020. - Volume: 181 - № 2. - P. 73-86.

15. <http://www.ovoschevodstvo.com>. [Electronicresource]. URL

16. Burlyayeva, M.O. *Collections of Mungbean [Vignaradiata] (L.) R. Wilczek] and urdbean [V. mungo (L.) Hepper] in Vavilov Institute (VIR): traits diversity and trends in the breeding process over the last 100 years* /M.O. Burlyayeva, M.A. Vishnyakova, M.V. Gurkina, K.N. Kozlov, Ch.R.Li, Ch.T.Ti, R. Shaflyaytner, S.V. Nuzdvin, M.G. Samsonova, E.D. Von Wettberg // *Genetic Resources and Crop Evolution*. - Volume 66. - Issue 4, - P. 767-781 (publication - 2019).

17. Sokolkova, A.B. *Genome-wide association study in accessions of the mini-core collection of mungbean (Vignaradiata) from the World Vegetable Gene Bank (Taiwan)* /A.B. Sokolkova, M.O. Burlyayeva, T.I. Valyanikova, M.A. Vishnyakova., R. Shaflyaytner, Ch.Lii, Ch. Ting, R. Madkhavan Nair, S.V. Nuzhvin, M.G. Samsonova, E.D. Von Wettberg // *BMC Plant Biology*. – 2020. - 20(Suppl 1): 363 (access date: 26.03.2021)

18. Sokolkova, A.B. *Analysis of agronomic traits of mungbean (Vigna radiata) accessions from the World Vegetable Gene Bank (Taiwan) Bioinformatics of genome regulation and structure/systems biology (bgrs/sb-2020)*. / A.B. Sokolkova, M.A. Vishnyakova, Ch. Ting, M.O. Burlyayeva, R. Shaflyaytner, S.V. Nuzhvin, M.G. Samsonova, E. Wettberg, , T.I. Valyanikova, Ch. Lii // *The Twelfth International Multiconference. Abstracts, Institute of Cytology and Genetics, Siberian Branch of the Russian Academy of Sciences; Novosibirsk State University*. – Novosibirsk: ICG SB RAS, 2020.675 – 683 p. (Addressed date: 26.03.2021)

19. *State Standard GOST 12038 – 84. Seeds of agricultural crops. Methods for determining germination*. - M.: STANDARTINFORM. – 2011. - 64 p.

20. Sushkevich, A.V. *Project "Features of Early Ontogenesis of Vigna radiata (L.) R. Wilczek and development of method for assessing its parameters»* / A.V. Sushkevich // <https://eee-science.ru/item-work/2019-1814/> (Access date: 26.03.2021)

21. Sushkevich, A.V. *Assessment of growth, germination energy and morphological parameters of Vignaradiata at the early stages of ontogenesis*. /A.V.

*Sushkevich, M.O.Burlyaeva //Eurasian Union of Scientists. – 2019. – № 1-1 (58). -
– P. 17–22. – URL:<https://www.elibrary.ru/item.asp?id=37604316> (Access date
26.03.2021)*

**ASSESSMENT OF AGROMETEOROLOGICAL CONDITIONS FOR
WINTERING OF WINTER GRAIN CROPS IN ABNORMALLY WARM
WEATHER CONDITIONS OF 2019-2020 AGRICULTURAL YEAR**

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Key words: climate, winter crops, air temperature, precipitation, wintering, snow cover, productivity.

The article analyzes the period of abnormally hot weather in the autumn and winter periods of 2019-2020 agricultural year, which was unprecedented and allowed the plants to overwinter successfully and even to go through a certain stage in their development and form a fairly high yield. It is a great anomaly with a typical return period of about 40 years. According to observations at Timiryazevsky agrometeorological post for 1990-2019, the average annual temperature increased by 1.04 ° C, atmospheric precipitation increased by 111.0 mm. The greatest increase of air temperature and atmospheric precipitation occurred in winter months. Analysis of wintering conditions for 2015-2020 agricultural years showed that positive temperature anomalies for the studied cold period of 2019-2020 reached up to 31.0 ° C. The amount of precipitation exceeded the average years long norms in November 2015 by 100 mm. Therefore, if earlier, the harvest of winter crops decreased due to freezing, as a result of snowlessness and severe frosts, then in recent years, soaking and asphyxiation played a certain role due to powerful snow cover. Such methods, as comparison, analysis and

generalization of data, were used to process the analysis of the original data. To study the long-term changes of the periodic transformation function of the average annual temperature dynamics and the annual sum of atmospheric precipitation, the Fourier series was used and the parameters of the best sinusoidal approximation, the trend and the method of correlation, discriminant analysis were determined. The practical significance of the work was determined by the results of the research on the conditions for overwintering of winter crops and adaptation of agriculture to the changing conditions of the regional climate.

Bibliography:

- 1. Pavlova, V.N. Assessment of territory vulnerability degree and climatic risk of large crop failures of grain crops in the grain-sowing regions of Russia / V.N. Pavlova, S.E. Varcheva // Meteorology and Hydrology. - 2017. - № 8. - P. 39-50.*
- 2. Report on climate peculiarities on the territory of the Russian Federation for 2019. - Moscow: Research Institution of Roshydromet, Roshydromet, 2020. - P. 11–72.*
- 3. Changes of thermal regime extremeness in the XXI century: ensemble estimates for the territory of Russia / E. I. Khlebnikova, Yu. L. Rudakova, I. A. Sall, S. V. Efimov, I. M. Shkolnik // Meteorology and hydrology. - 2019. - № 3. - P. 11-24.*
- 4. Dobrovolskiy, S.G. Droughts of the world and their evolution in the course of: agricultural, meteorological and hydrological aspects / S.G. Dobrovolskiy // Water resources. - 2015. - V. 42, № 2. - P. 119–132.*
- 5. Zhuravleva, E. V. Drought as one of the risk factors in agricultural economy of the Russian Federation / E. V. Zhuravleva, S. V. Fursov // Achievements of science and technology of the agro-industrial complex. - 2016. - V. 30, № 9. - P. 88-90.*
- 6. Mokhov, I.I. Weather and climatic anomalies in Russian regions and their relationship with global climate change / I.I. Mokhov, V.A. Semenov // Meteorology and Hydrology. - 2016. - № 2. - P.16-28.*
- 7. Sharipova, R.B. Influence of forecrops and sowing dates on overwintering and yield of winter wheat in changing conditions of regional climate / R.B. Sharipova,*

R.A. Khakimov, N.V. Khakimova // *Vestnik of Kazan State Agrarian University*. - 2020. - № 2 (58). - P. 66-71.

8. *Agriculture of Ulyanovsk region. Department of Economic Programs, Analysis and Pricing of the Department of Agriculture*. - Ulyanovsk: Pechatnyi dom, 2019. - - 32 p.

9. Sirotenko, O.D. *Fundamentals of agricultural meteorology. Volume II. Methods of calculations and forecast in agrometeorology. Book 1. Mathematical models in agrometeorology / O.D. Sirotenko*. - Obninsk: Federal State Budgetary Institution "All-Russian Research Institute of Hydrometeorological Information - World Data Center", 2012. - 136 p. - ISBN 978-5-8493-0196-9 (Volume II, Book 1).

10. Sharipova, R.B. *Trends in climate change and agroclimatic resources of Ulyanovsk region and their impact on yield of grain crops / R.B. Sharipova*. - Ulyanovsk: UlSTU, 2020. - P. 13-49. - ISBN 978-5-9795-2034-6.

11. Sabitov, M.M. *Economic efficiency of cultivation technologies in grain-fallow crop rotation / M.M. Sabitov // Achievement of science and technology of the agro-industrial complex*. - 2021. - V. 35, № 2. - P. 13-18.

EFFICIENCY OF PRIMARY TILLAGE AND FERTILIZER DOSES IN CULTIVATION OF WINTER WHEAT ON TYPICAL BLACK SOIL

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Key words: Winter wheat, yield, gluten and protein content, crop rotation, tillage, mineral fertilizers, economic efficiency.

Traditional mouldboard plowing, resource-saving nonmouldboard and combined systems of main tillage for winter wheat were studied in the grain-grass-

tilled crop rotation. The application levels of mineral fertilizers for soil cultivation were the following: without fertilizers, single ($N_{20}P_{40}K_{40}$) and double ($N_{40}P_{80}K_{80}$) dose. The soil of the experimental plot is typical black soil, medium loamy. As a result of the research, it was found that the main factor affecting the yield increase, gluten and protein content in winter wheat grain was mineral fertilizer. The highest yield of winter wheat (3.77 t / ha) was obtained during mouldboard tillage with a dose of mineral fertilizers of $N_{40}P_{80}K_{80}$. Grain yield decreased to 3.74 t / ha with non-mouldboard tillage, as for combined tillage, it was 3.57 t / ha. Gluten content was 19.3 ... 22.0%, protein - 11.2 ... 12.5% in variants without application of mineral fertilizers. In case of application of mineral fertilizers at a dose of $N_{20}P_{40}K_{40}$, gluten content increased to 22.8 ... 23.8%, at a dose of $N_{40}P_{80}K_{80}$ - up to 23.5 ... 24.9% and it was higher with mouldboard tillage; the protein content was 12.8 ... 13.0% and 13.0 ... 13.4%, respectively. Primary tillage systems did not have a statistically significant effect on gluten and protein content of winter wheat grain. The most effective was cultivation of winter wheat with application of fertilizers at a dose of $N_{20}P_{40}K_{40}$. In case of combined tillage, direct costs amounted to 15.85 thousand rubles / ha, the cost of grain was 4.80 rubles / ton; as for non-mouldboard, - 16.22 thousand rubles / ha, 4.98 thousand rubles / ton, respectively; whereas, mouldboard - 17.94 thousand rubles / ha, 5.37 thousand rubles / ton.

Bibliography:

- 1. Shakirov, R.S. Factors of efficiency increase of agriculture in the Republic of Tatarstan / R.S. Shakirov // Agriculture. - 2014. - №7. - P. 9-12.*
- 2. Gostev, A. V. An approach to automation of a rational choice of adaptive agricultural technologies / A. V. Gostev, A. I. Pykhtin, S. Tarasov // BIO Web of Conferences. International Scientific-Practical Conference "Agriculture and Food Security: Technology, Innovation, Markets, Human Resources" (FIES 2019). - 2020. - Vol. 17. - P. 0002. - URL: <https://doi.org/10.1051/bioconf/20201700002>.*

3. Sabitov, M.M. *The influence of forecrops on productivity of winter wheat in the forest-steppe conditions of the Middle Volga region* / M.M. Sabitov // *Agriculture*. - 2021. - №5. - P. 3-7. - URL: <https://doi.org/10.24412/0044-3913-2021-5-3-7>.
4. *Efficiency of various methods of main soil cultivation and direct sowing in cultivation of winter wheat on black soils* / D. V. Dubovik, V. I. Lazarev, A. Ya. Aydiev, B. S. Ilyin // *Achievements of science and technology of the agro-industrial complex*. - 2019. - V. 33, №12. - P. 26-29. - URL: <https://doi.org/10.24411/0235-2451-2019-11205>.
5. *Influence of tillage methods on optimization of nutrition, yield and filling grain of winter wheat on leached chernozem* / S. Korostylev, A. Esaulko, A. Ozheredova, N. Gromova, Y. Grechishkina // *Engineering for Rural Development*. - 2019. - P. 379-385. - URL: <https://doi.org/10.22616/ERDev2019.18.N198>.
6. Wozniak, A. *Effect of tillage systems on the yield and quality of winter wheat grain and soil properties* / A. Wozniak, L. Rachon // *Agriculture*. - 2020. - V. 10, №9. - S. 1-12. - URL: <https://doi.org/10.3390/agriculture10090405>.
7. *Bioenergetic assessment of efficiency of energy-saving soil cultivation in the dry-steppe zone* / D. A. Boldyr, V. M. Protopopov, V. Yu. Selivanova, E. P. Sukhareva // *Scientific-agronomic journal*. - 2018. - №1 (102). -P. 7-9.
8. *Influence of main soil tillage for winter wheat on formation of its productivity elements* / R.V. Kravchenko, S.I. Luchinskiy, A.A. Archipenko, A.E. Semenov // *Scientific works of Kuban State Agrarian University*. - 2021. - №90. - P. 64-70. - URL: <https://doi.org/10.21515/1999-1703-90-64-70>.
9. *Winter wheat productivity depending on fallow preparation methods and intensification means* / A. V. Shabalkin, O.M. Ivanova, V. A. Vorontsov, Yu. P. Skorochkin // *Achievements of science and technology of the agro-industrial complex*. - 2019. - V. 33, №2. - P. 52-55. - URL: <https://doi.org/10.24411/0235-2451-2019-10213>.
10. *Influence of primary tillage methods, fertilizers and plant protection products on winter wheat productivity* / S. I. Tyutyunov, P. I. Solntsev, Yu. V. Khoroshilova, M. V. Emets, Zh. Yu. Gorokhova // *Achievements of science and technology of the*

agro-industrial complex. - 2020. - V. 34, №5. - P. 18-23. - URL: <https://doi.org/10.24411/0235-2451-2020-10503>.

11. Aydiev, A. Ya. *Improvement of technologies of winter wheat cultivation in the conditions of Kursk region* / A. Ya. Aydiev, V.I. Lazarev, M.N. Kotelnikova // *Agriculture*. - 2017. - №1. - P. 37-39.

12. *Winter wheat straw decomposition under different nitrogen fertilizers* / G. Mühlbachova, P. Ruzek, H. Kusá, R. Vavera, M. Kas // *Agriculture*. - 2021. - V. 11, №2. - P. 83. - URL: <https://doi.org/10.3390/agriculture11020083>.

13. *The role of mineral fertilizer in increasing the productivity and quality of winter wheat grain* / A. S. Gimbatov, M. G. Muslimov, A. B. Ismailov, G. A. Alimirzaeva, E. K. Omarova // *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. - 2016. - V. 7, №5. - P. 1304-1310.

14. *Agroecological justification of winter wheat fertilization systems in the south-west of the Central Black-soil Region* / S. Tyutyunov, P. Solntsev, A. Stupakov, M. Kulikova, A. D. H. Khalaf // *E3S Web of Conferences*. 13. Ser. 13th International Scientific and Practical Conference on State and Prospects for the Development of Agribusiness, INTERAGROMASH 2020. - 2020. - P. 07005.

15. *Influence of crop rotation structure, the method of primary tillage and fertilizers on winter wheat productivity in the Central Black Soil region* / A. N. Voronin, V. V. Nikitin, V. D. Solovichenko, V. I. Melnikov // *Agrochemistry*. - 2016. - №5. - P. 21-27.

16. *Kuzina, E. V. Efficiency of application of mineral fertilizers and biological products on winter wheat, depending on the systems of primary tillage* / E. V. Kuzina // *Perm Agrarian Vestnik*. - 2015. - №2 (10). - P. 8-13.

17. *Dospekhov, B.A. Method of field experiment (with the basics of statistical processing of research results)* / B.A. Dospekhov. - Moscow: Agropromizdat, 1985. - 351 p.

AGROTECHNICAL FEATURES OF SPRING WHEAT PRODUCTIVITY FORMATION AFTER RAPE PLANT IN THE FOREST STEPPE OF WESTERN SIBERIA

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Key words: spring wheat, agricultural technology, crop rotation, tillage, intensive farming, yield, grain quality

There is a great number of repeated and permanent spring wheat crops with insufficient areas occupied by forecrops of the first group in the grain-sowing zones of the Omsk region, which leads to a decrease of soil fertility, productivity and grain quality. The aim of the research is to reveal the influence of rapeseed forecrop on fertility, phytosanitary state of agrophytocenosis, productivity and technological properties of spring wheat grain in the forest-steppe of Western Siberia. Complex studies were carried out in a stationary crop rotation of Omsk Agrarian Scientific Center (rapeseed-wheat-soybean-wheat) in 2011-2017. The effectiveness of different intensity impact of soil cultivation systems in crop rotation and effectiveness of intensification means were studied in a two-factor experiment on meadow-black soil. The influence patterns of agricultural technologies on soil fertility elements, phytosanitary state of agrophytocenosis, productivity and technological parameters of grain were established. It was found that in case of intensity decrease of soil cultivation systems in a crop rotation, especially with limited application of intensification means, there is a spring wheat yield decrease after rapeseed forecrop by 0.17 t / ha. Grain yield increases to 2.88 t / ha in case of complex usage of chemicals, with a decrease of variability over years (variation coefficient) from 55 to 37% or by 1.5 times. The application of fungicides reduces the development and prevalence of infections on the upper layer of leaves and increases yield by 0.56 t / ha or by 27.5%. An increase of the mass of

1000 grains, the nature of grain, the content of protein and gluten was observed on the variant of intensive cultivation technology.

Bibliography:

- 1. Scientific basis for production of high-quality wheat grain: scientific publication. - Moscow: FSBSI Rosinformagrotech, 2018. - 396 p. - ISBN 978-5-7367-1395-0.*
- 2. Khramtsov, I.F. The system of adaptive agriculture in Omsk region: monograph / I.F. Khramtsov, V.S. Boyko, L.V. Yushkevich [others]. - Omsk: publishing house of E.A. Maksheeva, 2020. - 522 p. - ISBN 978-5-6045647-1-4.*
- 3. Yushkevich, L.V. Productivity and grain quality of spring wheat depending on cultivation technology in the forest-steppe of Western Siberia / L.V. Yushkevich, A.G. Shchitov, I.V. Pakhotina // Agriculture. - 2019. - № 1. - P. 32-34.*
- 4. Zybalov, V. S. Spring rape plant - a culture of great opportunities in the Southern Urals / V. S. Zybalov // AIC of Russia. - 2019. - V. 26, № 5. - P. 755-762.*
- 5. Recommendations on cultivation of oilseeds in Omsk region. - Isilkul: SOS - branch of Federal State Budgetary Scientific Institution "Siberian Experimental Station of the All-Russian Research Institute of Oilseeds, 2019. - 108 p.*
- 6. Spring rapeseed is a promising crop for development of the agro-industrial complex of the Krasnoyarsk Territory / E. N. Oleinikova, M. A. Yanova, N. I. Pyzhikova, A. A. Ryabtsev, V. L. Bopp // Vestnik of KrasSAU. - 2019. - № 1 (142). - P. 74-80.*
- 7. Improvement of the main elements of spring rapeseed cultivation technology in the southern forest-steppe of Omsk region: recommendations. - Isilkul: Federal State Budgetary Scientific Institution "Siberian Experimental Station of the All-Russian Research Institute of Oilseeds, 2017. - 32 p.*
- 8. Nurlygayanov, R.B. Substantiation for usage of spring rapeseed as a green manure crop in Kemerovo region / R.B. Nurlygayanov, R.F. Akhmetgareev // Economics, labor, management in agriculture. - 2011. - № 1 (6). - P. 52-54.*

9. Abuova, A.B. *Influence of spring rapeseed on yield and some parameters of grain quality of spring wheat* / A.B. Abuova // *Vestnik of Ulyanovsk Agricultural Academy*. - 2012. - № 3 (19). - P. 4-8.
10. Surkova, Yu. V. *Spring rapeseed in the forest-steppe zone of the Trans-Urals* / Yu. V. Surkova // *Vestnik of Kurgan State Agricultural Academy*. - 2020. - № 3 (35). - P. 68-71 DOI: 10.5281 / zenodo.4152805
11. *Biological activity of meadow-black soils of the Omsk Priirtysh region* / O.F. Khamova, L.V. Yushkevich, N.A. Voronkova [and others]. - Omsk: Omskblankizdat, 2019. - 94 p. - ISBN 978-5-8042-0632-2.
12. Sineshchekov, V.E. *Phytosanitary situation in grain agrocenoses with minimization of soil cultivation: monograph* / V.E. Sineshchekov, N.V. Vasilieva. - Novosibirsk: FSBSI Siberian Research Institute of Agriculture and Chemicalization of Agriculture, 2015. - 138 p. - ISBN 978-5-906587-20-6.
13. *Phytosanitary consequences of soil cultivation techniques in the forest-steppe of Western Siberia* / E. Yu. Toropova, M. N. Selyuk, L. V. Yushkevich, A. F. Zakharov // *Vestnik of Buryat State Agricultural Academy named after V.R. Filippov*. - 2012. - № 3 (28). - P. 86-91.
14. *The impact of five long-term contrasting tillage systems on maize productivity parameters* / K. Romaneckas, D. Avizienyte, A. Adamaviciene, S. Buragiene, Z. Kriauciuniene, E. Sarauskis // *Agricultural and food science*. - 2020. - Vol. 29, No 1. - P. 6-17.
15. Cook, R. L. *Tillage and fertilizer effects on crop yield and soil properties over 45 years in Southern Illinois* / R. L. Cook, A. Trlica // *Agronomy Journal*. - 2016. - Vol. 108, No 1. - P. 415-426. - 10.2134 / agronj2015.0397. Doi: 10.2134 / agronj2015.0397
16. Chibis, V.V. *Efficiency of cultivation of oilseeds (rapeseed, soybeans) in field crop rotations of the forest-steppe zone of Western Siberia* / V.V. Chibis // *Polythematic network electronic scientific journal of KubSAU*. - 2014. - № 100. - P. 854-867. - URL: <http://ej.kubagro.ru/2014/06/pdf/42.pdf>

17. Kolmakov, Yu. V. *Evaluation of wheat material in selection and increase of the potential of its quality in grain production and baking: monograph / Yu. V. Kolmakov. - Omsk: FSEI HPE OmSAU, 2007. - 268 p.*

MINERAL FERTILIZERS IN SPRING WHEAT CULTIVATION TECHNOLOGY IN THE CONDITIONS OF THE MIDDLE VOLGA REGION

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Key words: spring wheat, mineral fertilizers, gluten, gluten deformation index, yield.

The paper presents results of study of the effectiveness of mineral fertilizers in the technology of spring wheat cultivation. Experimental studies were carried out on the experimental field of Ulyanovsk State Agrarian University in 2017-2020 in a five-field grain green manure crop rotation: green manure fallow - winter wheat - spring wheat - soybeans - barley. We studied change of grain yield and quality of spring wheat of Ulyanovskaya 100 variety in the experiment. Mathematical processing of the data showed that a significant increase of spring wheat grain yield was provided on the variants with fertilizer application at a dose of 40 and 60 kg / ha of active agent, which was 0.57 t / ha and 0.73 t / ha, respectively. At the same time, there was an increase of gluten amount up to 27.8% and improvement of its quality in the variant with application of fertilizers at a dose of 60 kg / ha of active agent (73 FDM units), which assigns it to the I quality group. The performed correlation-regression analysis made it possible to reveal the relationship between the grain yield of spring wheat and the conditions of its

formation. A direct relationship was revealed between the yield and the background of crop nutrition ($r = 0.64$). It is important to note that the main factor which influences gluten accumulation in grain is mineral nutrition of plants ($R^2 = 0.55$), the determination coefficient of the dependence of gluten accumulation on the hydrothermal index was $R^2 = 0.26$. The research results showed a close relationship between the mass fraction of gluten and protein in the grain of spring wheat of Ulyanovskaya 100 variety ($R^2 = 0.70$). The accumulation of protein varied from 264 (control) to 509 kg / ha ($N_{60}P_{60}K_{60}$) within the research years.

Bibliography:

1. Altukhov, I.A. Development of food grain market in Russia / I.A. Altukhov // *Niva of the Volga region*. - 2012. - № 4 (25). - P. 2-10.
2. Serzhanov, I.M. Improvement of fertilization system and technological methods of spring wheat cultivation in the northern part of the forest-steppe of the Middle Volga region: spec. 06.01.04 ; 06.01.01: abstract of dissertation for the degree of Doctor of Agricultural Sciences / Serzhanov Igor Mikhailovich; Kazan State Agrarian University. - Kazan, 2013. - 40 p.
3. Rabinovich, G. Yu. Cultivation of spring wheat with application of various fertilization schemes / G. Yu. Ryabinovich, Yu. D. Smirnova, N. A. Lukicheva // *International scientific-practical conference of FSBSI All-Russian Research Institute of Reclaimed Lands*. - Tver: FSBSI All-Russian Research Institute of Reclaimed Lands, 2015. - P. 33-37.
4. Influence of mineral fertilizers on yield of spring wheat grain / V.D. Abashev, F.A. Popov, E.N. Noskova, S.N. Zhuk // *Perm Agrarian Vestnik*. - 2017. - № 1 (17). - P.7-11.
5. Agrometeorological conditions of productivity formation of spring wheat in accordance with interphase ontogenesis periods / S.I. Pryakhina, Yu. A. Sklyarova, M. Yu. Vasilieva, Yu. N. Fridman // *Izvestiya of Saratov University*. - 2008. - V. 8, issue 1. - P. 22-25.

6. *Klimenko, N.N. Influence of mineral fertilizers on quality parameters of spring wheat grain in Irkutsk region / N.N. Klimenko, I.N. Abramova, E.N. Kuznetsova // Vestnik of Buryat State Agricultural Academy named after V.R. Filippov. - 2019. - № 1 (54). - P. 36-43. - URL: http://www.bgsha.ru/files/images/Vestnik/1_2019/5.%20Klimenko%20N..pdf*
7. *Saidyasheva, G.V. The effectiveness of mineral, biomineral fertilizers and Bisolbifit bioproduct on spring wheat crops in the Middle Volga region / G.V. Saidyasheva, S.A. Zakharov // Vestnik of Ulyanovsk State Agricultural Academy. - 2017. - № 1 (37). - P. 56-65.*
8. *State Standard GOST R 54478-2011. Methods for specification of the quantity and quality of gluten in wheat: introduced on 2013-01-01. - Moscow: Standartinform, 2012. - 23p.*
9. *Reference book of ecological and climatic characteristics of Moscow / edited by A. A. Isaev. - Moscow: Publishing House of the Faculty of Geography of Moscow State University, 2005. - V. 2. - 412 p. - ISBN 5-89575-059-1*
10. *Korchagina, I.A. Soil water regime and water consumption of spring wheat by maturity groups in the southern forest-steppe of Western Siberia / I.A. Korchagina // Bulletin of Science and Practice. - 2017. - № 1. - P. 93-99.*
11. *Rational use of fertilizers: manual / I.R. Wildflush, A.R. Tsyganov, V.V. Lapa, T.F. Persikova. - Gorki: Belarusian State Agricultural Academy, 2002. - 324 p. - ISBN 985-467-022-8.*
12. *Alabushev, A. V. Variety as a factor of innovative development of grain production / A. V. Alabushev // Grain economy of Russia. - 2011. - № 3. - P. 7-15.*
13. *Lichko, N.M. Standardization and certification of crop production: textbook / N.M. Lichko. - Moscow: Yurayt-Izdat, 2004. - 596 p.*
14. *Kiseleva, M. Yu. Formation of protein complex of spring soft wheat grain in the forest-steppe zone of the Middle Volga region: spec. 06.01.05; 06.01.09: abstract of dissertation for the degree of candidate of agricultural sciences / Kiseleva Mariya Yurievna; Penza State Agricultural Academy. - Penza, 2004. - 16 p.*

15. Rozova, M.A. *Influence of weather conditions on the content of protein, gluten in spring durum wheat grain and its quality in the conditions of the Priobskaya forest-steppe of the Altai Territory* / M.A. Rozova, V.N. Mukhin // *Achievements of science and technology of the agro-industrial complex*. - 2015. - V. 29, № 8. - P. 58-61.
16. *Grain yield and quality of spring wheat depending on usage of humic and mineral fertilizers* / S. V. Bogomazov, A. A. Levin, O. A. Tkachuk, A. V. Lyandenburgskaya // *Niva of the Volga region*. - 2019. - № 3 (52). - P. 68-73.
17. Dolgoplov, A. A. *Spring wheat in the Angara region* / A. A. Dolgoplov. - Irkutsk: IrSAA, 2007. - 121 p.
18. Polnomochnov, A. V. *Spring wheat of Cisbaikalia and the results of regionalization of agricultural crops* / A. V. Polnomochnov, I. E. Illy, I. A. Krutikov. - Irkutsk, 2009. - 288 p.

DETECTION OF ENZYME GENES OF BACTERIA OF BACILLUS SUBTILIS SPECIES BY REAL-TIME PCR

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Key words: Bacillus subtilis, polymerase chain reaction, phytase, nitrogenase, alkaline fosphatase, genes, REAL-TIME PCR.

Soil is a vital and valuable natural resource that sustains life on earth. Appropriate soil functioning depends on the balance of its structure and composition, as well as physical, chemical and biological properties. Often, this balance is disturbed under the influence of various abiotic, biotic and anthropogenic factors. Therefore, soil restoration is of great importance in order

to prevent possible adverse effects on living systems and to preserve the environment for future generations. Various studies confirmed the effectiveness of introduction of rhizobacteria to improve soil fertility, increase growth and productivity of agricultural crops. *Bacillus subtilis* is one of the most common rhizobacteria used in agriculture. Many *B. subtilis* strains are capable of fixing atmospheric nitrogen, solubilizing phosphorus and potassium, thereby contributing to an increase in the amount of macroelements necessary for plant nutrition in soil. The aim of this work was to search for genes responsible for synthesis of phytase, nitrogenase, and alkaline phosphatase enzymes in strains of bacteria of *Bacillus subtilis* species by real-time PCR. To determine the presence of genes encoding the synthesis of the desired enzymes in *Bacillus subtilis*, an in-silico analysis of the annotated genomes of this bacterial species presented in the NCBI information database was carried out. Then the selection of primers for screening the target spots was made. According to the results of the study, 10 out of 19 isolated *Bacillus subtilis* strains contained all three required DNA regions responsible for synthesis of phytase, nitrogenase, and alkaline phosphatase enzymes.

Bibliography:

1. Shah V., Daverey A. *Phytoremediation: A multidisciplinary approach to clean up heavy metal contaminated soil* // *Environmental Technology & Innovation*. – 2020. – T. 18. – C. 100774.
2. Shi T. et al. *Visible and near-infrared reflectance spectroscopy—An alternative for monitoring soil contamination by heavy metals* // *Journal of hazardous materials*. – 2014. – T. 265. – C. 166-176.
3. Ali A. et al. *Application of wood biochar in polluted soils stabilized the toxic metals and enhanced wheat (*Triticum aestivum*) growth and soil enzymatic activity* // *Ecotoxicology and environmental safety*. – 2019. – T. 184. – C. 109635.
4. Ali A. et al. *Apricot shell-and apple tree-derived biochar affect the fractionation and bioavailability of Zn and Cd as well as the microbial activity in*

smelter contaminated soil //Environmental Pollution. – 2020. – T. 264. – C. 114773.

5. Zhao X. et al. *A comprehensive investigation of hazardous elements contamination in mining and smelting-impacted soils and sediments //Ecotoxicology and environmental safety. – 2020. – T. 192. – C. 110320.*

6. Bennett J. A., Klironomos J. *Mechanisms of plant–soil feedback: interactions among biotic and abiotic drivers //New Phytologist. – 2019. – T. 222. – №. 1. – C. 91-96.* Saeid A., Prochownik E., Dobrowolska-Iwanek J. *Phosphorus solubilization by Bacillus species //Molecules. – 2018. – T. 23. – №. 11. – P. 2897.*

7. Kumar A. et al. *Plant growth-promoting rhizobacteria (PGPR): perspective in agriculture under biotic and abiotic stress //Crop improvement through microbial biotechnology. – Elsevier, 2018. – C. 333-342.*

8. Yang X. et al. *Remediation of heavy metal contaminated soils by organic acid extraction and electrochemical adsorption //Environmental Pollution. – 2020. – T. 264. – C. 114745.*

9. Jeyasundar P. G. S. A. et al. *Green remediation of toxic metals contaminated mining soil using bacterial consortium and Brassica juncea //Environmental Pollution. – 2021. – T. 277. – C. 116789.*

10. Wang Q. et al. *Influence of tea saponin on enhancing accessibility of pyrene and cadmium phytoremediated with Lolium multiflorum in co-contaminated soils //Environmental Science and Pollution Research. – 2016. – T. 23. – №. 6. – C. 5705-5711.*

11. Sarawaneeyaruk S. et al. *Enhancing plant growth under municipal wastewater irrigation by plant growth promoting rhizospheric Bacillus spp //Journal of King Saud University-Science. – 2019. – T. 31. – №. 3. – C. 384-389.*

12. Manoj S. R. et al. *Understanding the molecular mechanisms for the enhanced phytoremediation of heavy metals through plant growth promoting rhizobacteria: A review //Journal of environmental management. – 2020. – T. 254. – C. 109779.*

13. Tang Y. et al. Significance of manganese resistant *Bacillus cereus* strain WSE01 as a bioinoculant for promotion of plant growth and manganese accumulation in *Myriophyllum verticillatum* // *Science of The Total Environment*. – 2020. – T. 707. – C. 135867.

14. Balseiro-Romero M. et al. Use of plant growth promoting bacterial strains to improve *Cytisus striatus* and *Lupinus luteus* development for potential application in phytoremediation // *Science of The Total Environment*. – 2017. – T. 581. – C. 676-688.

15. Bharti N. et al. *Exiguobacterium oxidotolerans*, a halotolerant plant growth promoting rhizobacteria, improves yield and content of secondary metabolites in *Bacopa monnieri* (L.) Pennell under primary and secondary salt stress // *World Journal of Microbiology and Biotechnology*. – 2013. – T. 29. – №. 2. – C. 379-387.

16. Esitken A. et al. Effects of plant growth promoting bacteria (PGPB) on yield, growth and nutrient contents of organically grown strawberry // *Scientia horticultrae*. – 2010. – T. 124. – №. 1. – C. 62-66.

17. Berg G. Plant–microbe interactions promoting plant growth and health: perspectives for controlled use of microorganisms in agriculture // *Applied microbiology and biotechnology*. – 2009. – T. 84. – №. 1. – C. 11-18.

18. Perez-Garcia O. et al. Heterotrophic cultures of microalgae: metabolism and potential products // *Water research*. – 2011. – T. 45. – №. 1. – C. 11-36.

19. Bottini R., Cassán F., Piccoli P. Gibberellin production by bacteria and its involvement in plant growth promotion and yield increase // *Applied microbiology and biotechnology*. – 2004. – T. 65. – №. 5. – C. 497-503.

20. Alina S. O., Constantinescu F., Petruța C. C. Biodiversity of *Bacillus subtilis* group and beneficial traits of *Bacillus* species useful in plant protection // *Romanian Biotechnological Letters*. – 2015. – T. 20. – №. 5. – C. 10737-10750.

CORCULE GROWTH DYNAMICS OF VARIOUS-QUALITY DILL SEEDS DEPENDING ON TEMPERATURE

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Key words: dill, heterospermy, corcule growth, temperature

Temperature is one of the most important abiotic factor, the critical values of which can have a negative impact at different stages of plant growth and development. The work shows the effect of this factor on corcule growth of different quality dill seeds obtained from different tillering parts. Experimental data indicate that the initial sizes of a corcule of the first tillering part are 34.6% higher than the second. A significant variation in morphometric parameters of dill seeds was noted including those characterizing the correlation of the corcule, endosperm and seed, both within individual parts and the plant as a whole. New data on the influence of high and low temperature factors on corcule growth of dill seeds from different tillering parts were obtained. First and second part corcules showed significant sensitivity to prolonged continuous exposure to increased temperatures during the upswelling period. Second-part seed corcules appeared to be more sensitive to temperature stress and reacted to it more explicitly. The corcule growth and germination of seeds slowed down in case of increase of the upswelling temperature to 30-35 ° C for the first part and 25-30 ° C for the second one. The physiological response to continuous increased temperatures (30-40 ° C) is a progressive inhibition of the corcule growth. The maximum temperature which allows corcule growth differs significantly for different tillering parts. When approaching the critical temperature (40 ° C), the differences are leveled.

Significant ($p < 0.001$) differences in dynamics of corcule growth in comparison with the control (20°C) were observed only at temperatures below 10°C for seeds of the first part and 15°C for seeds of the second part.

Bibliography:

1. Hawkins, T. S. Morphophysiological dormancy in seeds of three eastern North American *sanicula* species (Apiaceae subf. Saniculoideae): evolutionary implications for dormancy break / T. S. Hawkins, C. C. Baskin, J. M. Baskin // *Plant Species Biology*. - 2010. - 25. - P. 103-113. - doi.org/10.1111/j.1442-1984.2010.00273.x.
2. Vandeloos, F. Relative embryo length as an adaptation to habitat and life cycle in Apiaceae / F. Vandeloos, S. B. Janssens, R. J. Probert // *New Phytologist*. - 2012. - 195. - P. 479–487. - doi.org/10.1111/j.1469-8137.2012.04172.x.
3. Bukharov, A.F. The emergence of induced dormancy of seeds of vegetable umbrella crops under the influence of allelopathically active substances / A.F. Bukharov, D.N. Baleev // *Agricultural biology*. - 2016. - V. 51, №5. - P. 714-721.
4. Effects of salinity on the growth, physiology and relevant gene expression of an annual halophyte grown from heteromorphic seeds / J. Cao, X. Y. Lv, L. Chen, J. J. Xing, H. Y. Lan // *AoB Plants*. - 2015. - 7. - P.112. - doi.org/10.1093/aobpla/plv112.
5. Morphometry of the corcule as an element of the system for testing the quality of dill seeds / A.F. Bukharov, D.N. Baleev, M.I. Ivanova, A.R. Bukharova [and others] // *Scientific works of Kuban State Agrarian University*. - 2018. - №3 (72). - P. 63-66. - doi: 10.21.515 / 1999-1703-72-63-66
6. Wen, B. Effects of high temperature and water stress on seed germination of the invasive species Mexican sunflower / B. Wen // *PLoS One*. - 2015. -- 10. - P. e0141567. - doi.org/10.1371/journal.pone.0141567.
7. Effect of temperature on seed germination in spinach (*Spinacia oleracea*) / J. Chitwood, A. Shi, M. Evans, C. Rom [et al.] // *Hort Science*. - 2016. - 51. - P. 1475-1478. - doi.org/10.21273/hortsci11414-16.

8. Nascimento, W. M. Carrot seed germination and respiration at high temperature in response to seed maturity and priming / W. M. Nascimento, D. J. Huber, D. J. Cantliffe // *Seed Science and Technology*. - 2013. - 41. - P. 164-169. - doi.org/10.15258/sst.2013.41.1.19.
9. Nascimento, W. M. Carrot seed germination and ethylene production at high temperature in response to seed osmopriming / W. M. Nascimento, D. J. Huber, D. J. Cantliffe // *Horticultura Brasileira*. - 2013. - 31. - R. 554–558. - doi.org/10.1590/s0102-05362013000400008.
10. Tariq, M. An overview on the small heat shock proteins / M. Tariq, S. Waseem, H. A. Bilal // *African Journal of Biotechnology*. - 2010. -- 9. - P. 927-949. - doi.org/10.5897/ajb09.006.
11. Zehtab-Salmasi, S. Effects of salinity and temperature on germination of dill (*Anethum graveolens* L.) / S. Zehtab-Salmasi // *Plant Sci. Res.* - 2008. - 1. - P. 27-29.
12. Vandelook, F. Seed dormancy and germination of the European *Chaerophyllum temulum* (Apiaceae), a member of a trans-Atlantic genus / F. Vandelook, N. Bolle, J. A. Van Assche // *Ann. Bot.* - 2007. - 100. - P. 233-239. - doi: 10.1093/aob/mcm090.
13. Vandelook, F. Morphological and physiological dormancy in seeds of *Aegopodium podagraria* (Apiaceae) broken successively during cold stratification / F. Vandelook, N. Bolle, J. A. Van Assche // *Seed Science Research*. - 2009. - 19. - P. 115-123. - doi.org/10.1017/s0960258509301075.
14. Cardinal temperatures for germination in three millet species / B. Kamkar, A. Koochaki, M. N. Mahalati, M. P. R. Moghaddam // *Asian J. plant Sci.* - 2006. -- 5. - P. 316-319. - doi.org/10.3923/ajps.2006.316.319.
15. Berti, M. T. Seed germination response of cuphea to temperature / M. T. Berti, B. L. Johnson // *Ind. Crops Prod.* - 2008. - 27. - P. 17-21. - doi.org/10.1016/j.indcrop.2007.05.004.

16. *Germination properties of some wild medicinal plants from Iran / M. Bannayan, F. Nadjafi, M. Rastgoo, L. Tabrizi // Seed Sci. Technol. - 2006. - 28. - P. 80-86.*
17. *Vandelook, F. Temperature, requirements for seed germination and seedling development determine timing of seedling emergence of three monocotyledonous temperate forest geophytes spring / F. Vandelook, J. A. Van Assche // Annals of Botany. - 2008. - 102. - P. 865–875. - doi.org/10.1093/aob/mcn165.*
18. *Ritz, C. Analysis of germination data from agricultural experiments / C. Ritz, C. B. Pipper, J. C. Streibig // European Journal of Agronomy. - 2013. - 45. - P. 1–6. - doi.org/10.1016/j.eja.2012.10.003.*
19. *Dose-response analysis using R / C. Ritz, F. Baty, J. C. Streibig, D. Gerhard // PLoS ONE. - 2015. -- 10. - P. e0146021. - doi.org/10.1371/journal.pone.0146021.*
20. *Bukharov, A. F. Kinetics of seed germination. Research methods and parameters / A. F. Bukharov, D. N. Baleev, A. R. Bukharova // Vestnik of Timiryazev Agricultural Academy. - 2017. - №2. - P. 5-19.*
21. *Necajeva, J. Seed dormancy and germination of an endangered coastal plant *Eryngium maritimum* (Apiaceae) / J. Necajeva, G. Ievinsh // Estonian Journal of Ecology. - 2013. - 62. - P. 150-161. - doi.org/10.3176/eco.2013.2.06.*
22. *Synthesis: The role of adaptive trans-generational plasticity in biological invasions of plants / A. R. Dyer, C. S. Brown, E. K. Espeland, J. K. McKay, H. Meimberg, K. J. Rice // Evolutionary Applications. - 2010. - 3. - P. 179-192. - doi.org/10.1111/j.1752-4571.2010.00118.x.*
23. *Gharoobi, B. Effects of Seed size on seedlings characteristics of five barley cultivars / B. Gharoobi // Iranian Journal of Plant Physiology. - 2011. - 1. - P. 265-270.*

**IDENTIFICATION OF SHORT-STEMMING DONORS OF WINTER
WHEAT SAMPLES WITH APPLICATION OF DNA MARKERS AND
DIALLE ANALYSIS**

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Key words: soft winter wheat, diallelic hybrids, variability, heritability, combining ability, stem length, short-stemming gene, Rht8.

Knowledge of genetic nature of plant height parameter is important in order to detect short-stemming donors that shorten the length of the stem without deteriorating grain productivity. Identification of short-stemming genes and study of their selection significance in the genotype are used in selection of pairs of wheat varieties for crosses as short-stemming donors in new variety development. The aim of this work is to determine the variability and inheritance of stem length of soft winter wheat and to find a system of genetic control in specification of this parameter, using classical methods of assessment and DNA markers. The research was carried out at Federal State Budgetary Scientific Institution "Omsk Agrarian Scientific Center" in 2017 - 2020. The experiment had three-fold repetition. The object of the research is 3 varieties and 3 lines (LG2, LG3, LG4, Severnaya Zarya, Novosibirskaya 32, Omsk ozimaya), as well as 30 hybrids of the first generation (obtained according to full diallelic scheme) of domestic and foreign selection. Plant nutrition area was 10 x 20 (cm²). The forecrop was black fallow. Samples were screened with application of SSR marker of Rht8 gene. The experiment showed that demonstration of the trait in soft winter wheat descendants depends both on variety specificities and nuclear-plasma relationships. The donors of the "short-stemming" trait were identified: LG2 and Severnaya Zarya. Based on the statistical and molecular genetic analyzes (analysis of F1 hybrids, TCA (total combining ability) effects, as well as identifying the alleles of genes responsible for short-stemming), associations "DNA marker - TCA effect) were determined for the stem length parameter: LG2 (TCA = -1.23) ; Rht 8s (192 bp); Severnaya Zarya - (TCA = -1.21) = Rht 8s (192 bp). Lines of winter soft wheat carrying Rht 8s allele

(192 bp) in their genotype, have a reduced stem height and can be recommended as sources of short stemming for usage in selection programs aimed at reducing plant height.

Bibliography:

1. Identification of *Rht2* and *Rht8* short-stemming genes in samples of hexaploid triticale using DNA markers / K. U. Kurkiev, L. G. Tyryshkin, M. A. Kolesova, U. K. Kurkiev // *Vestnik of Vavilov Society of Geneticists and Breeders*. - 2008. - V. 12, № 3. - P. 372-377.
2. Lepekhov, S. B. Traits with negative effects and their significance for soft wheat selection (*Triticum aestivum* L.) / S. B. Lepekhov // *Vavilovsky journal of genetics and selection*. - 2016. - № 20 (3). - P. 337-343.
3. Mukhordova, M.E. Genetic analysis of stem length in diallelic crosses of soft winter wheat / M.E. Mukhordova // *Vestnik of NSAU (Novosibirsk State Agrarian University)*. - 2018. - № 1 (46). - P. 88-94.
4. Study of inheritance types of plant height of F₂ hybrids of soft winter wheat / O.A. Nekrasova, P.I. Kostylev, O.V. Skripka, E.I. Nekrasov // *Grain economy of Russia*. - 2016. - № 5. - P. 3-6.
5. Identity of *Rht 11* and *Rht B1e* short-stemming genes / M.G. Divashuk, A.V. Vasiliev, L.A. Bespalova, G.I. Karlov // *Genetics*. - 2012. - V. 48, № 7. - P. 897–900.
6. Study of allelic composition of *Rht1*, *Rht2* and *Rht8* short-stemming genes in the collection of varieties and lines of winter wheat (*Triticum aestivum* L.) and their influence on agronomic traits / E. A. Fomina, S. V. Malyshev, S. N. Kulinkovich, O. Yu. Urbanovich // *Вестні Нацыянальнай акадэміі Навук Беларусі. Серыя біялагічных навук.* - 2018. - V. 63, № 1. - P. 46-52.
7. Korovushkina, M. S. Winter wheat selection for productivity and short stemming using L-982/08 semi-dwarf line (*Agapik x Pamyati Fedina*) / M. S. Korovushkina, B. I. Sandukhadze, M. I. Rybakova // *Achievements of science and technology of the agro-industrial complex*. - 2012. - № 7. - P. 42-46.

8. Chesnokov, Yu. V. *Molecular markers in population genetics and breeding of cultivated plants* / Yu. V. Chesnokov, N.V. Kocherina, V.M. Kosolapov. - Moscow, 2019. - 200 p. - ISBN 978-5-91850-036-1.
9. Dospekhov, B.A. *Method of field experiment* / B.A. Dospekhov. - Moscow, 1973. - 416 p.
10. Griffing, B. *Concept of general and specific combining ability in relation to diallel crossing system* / B. Griffing // *Austral. J. Biol. Sci.* - 1956. - Vol. 9. - P. 463-493.
11. Aksel, R. *Analysis of diallel cross: a work example* / R. Aksel, L. Johnson // *Advancing Frontiers of Plant Sciences.* - 1963. - Vol. 2. - P. 37-53.
12. *Diallelic analysis of selection of cultivated plants. Certificate of registration of the computer program № 2011613440; № 2011610357: appl. 11.01. 2011: registered in the Register of computer programs on 25.04.2011* / Aleinikov A.F., Stepochkin P.I., Grebenikova I.G.
13. Hayman, B. *The analysis of variance diallel tables* / B. Hayman // *Biometrics.* - 1954. - № 10. - P. 235-244.
14. *Genetic analysis of the dwarfing gene (Rht8) in wheat. Part I. Molecular mapping of Rht8 on the short arm of chromosome 2D of bread wheat (Triticum aestivum L.)* / V. Korzun, M. S. Roder, M. W. Ganai, A. J. Worland [et al.] // *Theor. Appl. Genet.* - 1998. - № 96. - P. 1104 -1109.
15. *Effects of Dwarfing Genes on the Genetic Background of Wheat Varieties in Southern Ukraine* / G. A. Chebotar, I. I. Motsnyy, S. V. Chebotar, Yu. M. Sivolap // *Cytology and Genetics.* - 2012. - Vol. 46, № 6. - P. 366–372.
16. *Effects of Rht17 in combination with Vrn-B1 and Ppd-D1 alleles on agronomic traits in wheat in black earth and non-black earth regions* / P. Yu. Kroupin, G. I. Karlov, A. G. Chernook [et al.] // *BMC Plant Biology.* - 2020. - № 20 (Suppl 1). - P. 304-321.
17. Borojevic, K. *The Transfer and History of "Reduced Height Genes" (Rht) in Wheat from Japan to Europe* / K. Borojevic, K. Borojevic // *Journal of Heredity.* - 2005. - № 96 (4). - P. 455–459.

INITIAL MATERIAL FOR WINTER WHEAT SELECTION FOR YIELD, IMMUNITY AND GRAIN QUALITY IN THE MIDDLE VOLGA REGION

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Key words: soft winter wheat, sample, yield, winter hardiness, grain quality, brown rust.

The studies were carried out in 2016 - 2018 on the experimental field of Samara Research Institute of Agriculture in order to identify samples of soft winter wheat with a complex of characteristics: winter hardiness, productivity, resistance to leaf rust and grain quality for usage as initial selection material. The research material consisted of 150 samples of soft winter wheat from 13 countries. The forecrop was bare fallow. The record area of the plots was 10 m². The repetition was threefold. The sources of winter hardiness were identified: Byrd, CO 07W245, W 95-091 (CIMMIT) with an estimate of overwintering of 8 points, versus 7. 4 points of Biryuza standard variety (Russia); sources of resistance to leaf rust (type of reaction to damage 0, degree of damage 0%, standard 4 and (60%): Byrd, CO 07W245, W 95-091 / AKRON, OKO 07214 (CIMMIT); yield source - Byrd (8, 36 t / ha); source of 1000 grain mass - W 95-091 / AKRON (47.7 g); source of the number of grains in an ear - W 95-091 / AKRON (46.4 pcs); sources of grain mass per ear - W 95-091 / AKRON (2.28 g), OKO 07214 (2.30 g); source of falling number: Byrd (463 s), CO 07W245 (413 s), OKO 07214 (406 s); sources of protein mass fraction in grain: CO 07W245 (15.0%), W 95-091 / AKRON (15.5%), OKO 07214 (16.0%); source of rheological and baking properties of dough - OKO

07214 (dough dilution of 50 Farinograph units, valorimetric assessment of 76 valorimeter units, bread volume of 865 ml, bread rating - 4.4 points).

Bibliography:

1. Zhuchenko, A. A. *Resource potential of grain production in Russia (theory and practice): monograph* / A. A. Zhuchenko. - Moscow: Publishing House Agrorus, 2004. - 1109 p. - ISBN 5-9900364-2-6.

2. Zakharov, N.N. *Productivity of winter soft wheat in connection with climatic resources of Ulyanovsk region* / N.N. Zakharov, N.G. Zakharov, M.N. Garanin // *Vestnik of Ulyanovsk State Agricultural Academy*. - 2017. - № 2. - P. 25 - 30. - DOI 10.18286/1816-4501-2017-2-25-30.

3. Merezhko, A.F. *The problem of donors in plant breeding* / A.F. Merezhko. - St. Petersburg: VIR, 1994. - 126 p.

4. *Productivity and main productivity elements of winter wheat varieties, intensive type of All-Russian Research Institute of Grain Crops* / O.V. Skripka, A.P. Samofalov, S.V. Podgornyi, S.N. Gromova // *Achievements of science and technology of the agro-industrial complex*. - 2016. - V. 30, № 9. - P. 30 - 32.

5. Kovtun, V. I. *Productivity and elements of its structure in new varieties of winter soft wheat* / V. I. Kovtun // *Agriculture*. - 2014. - № 5. - P. 43 - 44.

6. Sokolenko, N.I. *Initial material for winter soft wheat selection for productivity and the most important adaptive traits* / N.I. Sokolenko, N.M. Komarov // *Achievements of science and technology of the agro-industrial complex*. - 2016. - V. 30, № 9. - P. 26 - 29.

7. Stepanov, K.M. *Forecast of diseases of agricultural plants* / K.M. Stepanov, A.E. Ulanova. - Leningrad: Kolos, 1972. - P. 62.

8. *Study of wheat collection: guidelines* / edited by V.F. Dorofeeva. - Leningrad: Publishing house of VIR, 1985. - 28 p.

9. *International CMEA classifier of Triticum L genus*. - Leningrad: Publishing house of VIR, 1984. - 83 p.

10. Mains, E. E. *Physiologic specialization in the leaf rust of wheat, Puccinia tritici Erikss / E. E. Mains, H. C. Jackson // Phytopath. - 1926. - Vol. 16, № 2. - P. 89 - 120.*

11. *A diagrammatic scale for estimating rust intensity on leaves and of cereals / R. F. Peterson, A. B. Campbell, A. E. Hannah // Can J. Res. - 1948. - Vol. 26 (Section C). - P. 496 - 500.*

12. *State Standard GOST. 108420 - 89. Grain of cereals and legumes, oilseeds. Method for determining the mass of 1000 grains or seeds. - Moscow: Standartinform, 1991 - 10 p.*

13. *State Standard GOST ISO 3093 - 2016. Grain and products of its processing. Specification of the falling number by the Hagberg - Perten method. - Moscow: Standartinform, 2016. - 11 p.*

14. *State Standard GOST 10846 - 91. Grain and products of its processing. Protein specification method. - Moscow: Publishing house of standards, 1991. - 10 p.*

15. *State Standard GOST R 54478 2011. Grain. Method for specification of the quantity and quality of gluten in wheat. - Moscow: Standartinform, 2012. - 23 p.*

16. *State Standard GOST ISO 5530 - 1 - 2013. Wheat flour. Physical characteristics of the test. Specification of water absorption and rheological properties using a farinograph. - Moscow: Standartinform, 2014. - 16 p.*

**MONITORING OF VARIETY IMPURITY CONTENT IN NURSERY-
GARDEN OF PRIMARY AND ELITE SEED BREEDING OF FIBRE
FLAX**

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Key words: fiber flax, variety, seed production, category of seeds, variety purity of seeds, variety impurity, marker trait

The most common reason for varietal impurities of long-stalked type in the crops of fiber flax is non-compliance with the basic requirements of internal control when working with several flax varieties on the farm or when carrying out a variety change. During field testing, the identification of biological impurity of the intermediate type is not completely carried out due to the unevenness of the crops. Due to morphological similarity of fiber flax varieties, it is impossible to determine the percentage of mechanical variety impurities of the long-stalked type. The aim of the research is to study the reproduction dynamics of variety impurity of K-7009 long-stalked form of flax, which has a yellow color of seeds, in the seeds of fiber flax contaminated with it after 6-year sowing. The aim is also to clarify the parameter of variety purity of fiber flax seeds of the following categories: genuine seeds (GS) and elite seeds (ES) in State Standard GOST R 52325-2005. The research was carried out in 2015-2020 in the field conditions of the Experimental field of the Federal State Budgetary Scientific Institution "Federal Scientific Center of Bast Cultures" in Tver region. The objects of the study were plants and seeds of Antey fiber flax variety (control). The usage of variety admixture of the long-stalked flax form with a marker trait made it possible to accurately determine its content in the crop in case of seed multiplication in nurseries of primary seed growing, superelite (GS) and elite (ES). It was found that variety contamination of fiber flax seeds with variety admixture in the amount of 0.2-1.0% did not affect the yield of seeds and straw. As a result of five-year reproduction of seeds in the crops of GS category, an increase in the amount of variety impurity was noted by 0.1-1.3%, in the ES category - by 0.3-2.1% compared to initial contamination. Based on the obtained experimental data, it was recommended to reduce variety purity index for the category of genuine fiber flax seeds in State Standard GOST R 52325-2005 to 99.5%, elite - to 90%.

Bibliography:

1. Yanyshina, A. A. *Changes of variety purity of fiber flax seeds when they are contaminated with seeds of intermediate form of flax during their reproduction in nurseries of primary seed production* / A. A. Yanyshina, V. P. Ponazhev // *Agrarian Vestnik of the Upper Volga Region*. - 2020. - № 3. - P. 43-47. - DOI: 10.35523 / 2307-5872-2020-32-3-43-47.
2. *Types and methods of natural pollination of LINUM USITATISSIMUM common flax* / S.V. Zelentsov, E.V. Moshnenko, L.G. Ryabenko [et al.] // *Oil crops*. - 2018. - Issue. 1 (173). - P. 105-113.
3. *Assessment of contribution of anemophilic pollen transfer to genetic contamination of oilseed flax varieties* / S.V. Zelentsov, V.I. Oleinik, L.G. Ryabenko [et al.] // *Oil crops*. - 2019. - Issue. 2 (178). - P. 3-8.
4. *Schewe, L. C. Ontogeny of floral organs in flax (Linum usitatissimum; Lineaceae)* / L. C. Schewe, V. K. Sawhney, A. R. Davis // *American Journ. Of Botany*. - 2011. - Vol. 98 (7). - P. 1077-1085.
5. *Ponazhev, V.P. Influence of methods of creating original fiber flax seeds on their yield and quality* / V.P. Ponazhev // *Achievements of science and technology of the agro-industrial complex*. - 2020. Vol. 34, № 4. - P. 46-49. - DOI: 10.2441 / 0235-2451-2020-10409.
6. *Screening of flax collection samples for resistance to stress factors* / T. A. Rozhmina, O. Yu. Sorokina, T. S. Kiseleva, M. I. Smirnova, A. D. Smirnova // *Scientific support for production of textile crops: state of problems and prospects: collection of scientific papers*. - Tver, 2018. - P. 28-31.
7. *Vinogradova, E.G. To the development of flax cell engineering techniques for resistance to edaphic factors* / E.G. Vinogradova // *Scientific support for production of textile crops: state of problems and prospects: collection of scientific papers*. - Tver, 2018. - S. 54-58.
8. *Yanyshina, A.A. Reproduction dynamics of varietal admixtures in fiber flax seeds in the process of their reproduction in nurseries of primary seed breeding* /

A.A. Yanyshina, V.P. Ponazhev // *Vestnik of Agrarian Science*. - 2019. - № 2 (77). - P. 54-59. - DOI: 10.15217 / issn2587-666X.2019.2.54

9. *Primary seed production of fiber flax: instructional guidelines* / V. P. Ponazhev, A. A. Yanyshina, L. N. Pavlova, T. A. Rozhmina, E. I. Pavlov, G. A. Strogonova, O. V Medvedeva, A. A. Lin. - Tver: Tver State University, 2010 .- 60 p.

10. *Dolgov, B.S. Instructional guidelines for conducting field experiments with fiber flax* / B.S. Dolgov, V.B. Kovalev. - Torzhok, 1978 .- 73 p.

11. *Kuzmenko, N.N. Influence of fertilizer systems on fiber flax yield and product quality in flax crop rotation* / N.N. Kuzmenko // *Agrochemistry*. - 2017. - № 8. - P. 43-47. - DOI: 10.7868 / S0002188117080051.

TECHNOLOGY OF PRODUCTION AND CONTROL OF XANTHOMONAS CAMPESTRIS PHAGE BIOPRODUCT

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Key words: bacteriophages, Xanthomonas campestris pv. campestris, biological product, technological parameters, phytopathogen.

Traditional methods of combating bacterial diseases of plants, including vascular bacteriosis of Cruciferous plants, do not currently allow to achieve effective result, which, among other things, is associated with the ability of phytopathogens to adapt to changing environmental conditions. Application of bacteriophages as antibacterial agents is a farsighted and effective direction in the field of plant protection. The aim of the study was to develop a technology for production and control of Xanthomonas campestris phage biological product, taking into account previously defined technological parameters. The objects of the study were X. campestris pv. campestris Cl34-UlSAU bacteriophage isolated from cabbage samples with signs of vascular bacteriosis from the fields of Ulyanovsk region, Staromainsky district. As a production strain, we used X. campestris pv. campestris Xc2 bacterial strain. The authors carried out studies on

*selection of suitable conditions, taking into account previously defined parameters: a method for bacteriophage removal from a production culture of bacteria, suitable passage time for production of a phage preparation, appropriate balance of phage and bacterial culture for cultivation, suitable temperature for bacteriophage cultivation. The paper introduces a scheme for production and control of *Xanthomonas campestris* pv. *campestris* phage biological product, which consists of 4 stages: sample preparation of a production culture of bacteria for compliance with the properties of the declared strain, sample preparation of a production strain of K134-UISAU bacteriophage for compliance with its activity after storage, production of a phage product with reference to production scaling, pouring, purity control, bacteriophage titer, its specificity and spectrum of lytic action, storage of a biological product.*

Bibliography:

- 1. A Review of Phage Therapy against Bacterial Pathogens of Aquatic and Terrestrial Organisms / J. Doss, K. Culbertson, D. Hahn [et al.] // Viruses. - 2017. - Vol. 9 (3). - P. 50.*
- 2. Balogh, B. Phage Therapy for Plant Disease Control / B. Balogh, J. Jones, F. Iriarte // Current pharmaceutical biotechnology. - 2009. - 11. - P. 48-57.*
- 3. Phages in nature / M. R. Clokie, A. D. Millard, A. V. Letarov, S. Heaphy // Bacteriophage. - 2011. - № 1 (1). - R. 31–45.*
- 4. Occurrence and Diversity of *Xanthomonas campestris* pv. *campestris* in Vegetable Brassica Fields in Nepal / B. Jensen, J. Vicente, H. Manandhar, S. Roberts // Plant Disease. - 2010. - № 94. - P. 298-305.*
- 5. Francisco-Francisco N. Fundamental aspects of Common Bacterial Blight (*Xanthomonas axonopodis* pv. *Phaseoli* Smith): Characteristic, Pathogenicity and Control / N. Francisco-Francisco, G. Morales, Y. Ochoa-Fuentes [et al.] // Revista Mexicana de Fitopatología. - 2013. - № 31. - P. 147-160.*
- 6. ISTA. 7-019 Detection of *Xanthomonas campestris* pv. *campestris* on Brassica spp. International Rules for Seed Testing, Annexe to Chapter 7: Seed Health Testing Methods / S. J. Prepared by Roberts, H. Koenraad. - Bassersdorf,*

Switzerland: *International Seed Testing Association (ISTA)*, 2007. - URL: <https://www.seedtest.org/upload/cms/user/SH-07-019a-2014.pdf>

7. Jones, J. *Considerations for using bacteriophages for plant disease control* / J. Jones, G. Vallad, F. Iriarte // *Bacteriophage*. - 2012. - № 2. - P. 208-214.

8. Vandamme, E. *Phage therapy and phage control: To be revisited urgently* / E. Vandamme // *Journal of Chemical Technology and Biotechnology*. - 2014. - № 89. - P. 1-12.

9. Lu, T. K. *The next generation of bacteriophage therapy* / T. K. Lu, M. S. Koeris // *Curr. Opin. Microbiol.* - 2011. - № 14. - P. 524-531.

10. *Biological control of Black Rot (Xanthomonas campestris pv. Campestris) of Cabbage in Tanzania with Bacillus strains* / S. M. S. Massomo, C. N. Mortensen, R. B. Mabagala [et al.] // *J. Phytopathol.* - 2004. - Vol. 152. - P. 98-105.

11. Civerolo, E. L. *Relationships of Xanthomonas pruni Bacteriophages to Bacterial Spot Disease in Prunus* / E. L. Civerolo // *Phytopathology*. - 1973. - Vol. 63 (10). - P. 1279.

12. Silva, Y. J. *Influence of environmental variables in the efficiency of phage therapy in aquaculture* / Y. J. Silva, L. Costa, C. Pereira // *Microb. Biotechnol.* - 2014. - Vol. 7. - P. 401-413.

13. Fatmi, M. *Detection of Plant-Pathogenic Bacteria in Seed and Other Planting Material* / M. Fatmi, R. R. Walcott, N. W. Schaad. - Second Edition. - 2016. - P. 360.

14. Mayorov, P.S. *The main technological parameters of production of a biological product to combat the causative agent of vascular bacteriosis of cruciferous plants* / P.S. Mayorov, N. A. Feoktistova, D. A. Vasiliev // *Vestnik of Ulyanovsk State Agricultural Academy*. -2020. - № 1 (49). - P. 60-64.

15. Mayorov, P.S. *Development of a scheme for isolation of Xanthomonas campestris pv. Campestris bacteriophages* / P. S. Mayorov, N. A. Feoktistova, D. A. Vasiliev // *Modern science: current problems of theory and practice. Natural and technical sciences*. - 2019. - № 6. - P. 20-25.

16. Algorithm for phage typing of *Bacillus cereus* bacteria / A. I. Kaldyrkaev, D. A. Vasilyev, N. A. Feoktistova, M. A. Lydina, T. G. Yudina, E. G. Klimentova // *Agribusiness and ecology*. - 2015. - № 2 (2). - P. 166-169.

17. Feoktistova, N. A. Modification of method of *Bacillus anthracis* setting phage indication in samples of soil / N. A. Feoktistova, D. A. Vasilyev, C. N. Zolotukhin // *Asian journal of microbiology, biotechnology and environmental sciences*. - 2018. - № 3 (20). - P. 734-737.

INFLUENCE OF ENVIRONMENTAL FACTORS ON DISEASE RESISTANCE AND YIELD OF PEAS

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Key words: peas, fusarium, ascochitis, rust, productivity, mineral fertilizers, preparations.

To increase the efficiency and safety of phytosanitary measures, it is necessary to combine all available methods and means aimed at long-term suppression of the number of pests below economic threshold of harmfulness. In this regard, the article provides data on the influence of external environmental factors (weather conditions, preparations for pre-sowing seed treatment) on disease susceptibility and yield of peas. The hydrothermal conditions corresponded to climatic conditions of the Trans-Urals during the period of the experiments and were favorable for cultivation of agricultural crops. It was established that the most common and harmful diseases of peas are fusarium (in the forms of root rot and wilting) and ascochitis. Pre-sowing seed treatment with fungicides was effective not only against root rot and wilting of peas, the development of the disease decreased by 1.2-1.6 times, but also against a group of leaf-stem diseases,

susceptibility to ascochitosis decreased by 1.4-1.7 times. The influence strength of pre-sowing seed treatment on susceptibility of peas to *Fusarium* was 9.5-74.6 %, and weather conditions - 4.0-76.9 %. The development of leaf-stem infections was largely influenced by weather conditions of the growing season, the share of this factor was 13.7-88.7 %. Treatment of pea seeds with all the studied preparations provided a significant increase of yield by 9.7 ... 23.4 %. The influence of "Weather conditions of the year" factor in yield formation of peas was 72.8 ... 76.1 %, while the share of "Preparations" factor influence did not exceed 15.9 ... 18.3 %.

Bibliography:

1. *Climate change and plant diseases in Ontario / G. J. Boland, M. S. Melzer, A. Hopkin, V. Higgins, A. Nassuth // Can. J. Plant Pathol. - 2004. - Vol. 26, № 3. - P. 335-350.*
2. *Climate change effects on plant disease: genomes to ecosystems / K. A. Garrett, S. P. Dendy, E. E. Frank, M. N. Rouse, S. E. Travers // Annu. Rev. Phytopathol. - 2006. - Vol. 44. - P. 489-509.*
3. *Climate change and diseases of food crops / J. Luck, M. Spackman, A. Freeman, P. Trebicki, W. Griffiths, K. Finlay, S. Chakraborty // Plant Pathol. - 2011. - Vol. 60, № 1. - P. 113-121.*
4. *Levitin, M.M. Climate change and forecast of plant disease development / M.M. Levitin // Mycology and phytopathology. - 2012. - V. 46, № 1. - P. 14-19.*
5. *Juroszek, P. Potential strategies and future requirements for plant disease management under a changing climate / P. Juroszek, A. V. Tiedemann // Plant Pathol. - 2011. - Vol. 60, № 1.-P. 100-112.*
6. *Magan, N. Possible climate-change effects on mycotoxin contamination of food crops preand postharvest / N. Magan, A. Medina, D. Aldred // Plant Pathol. - 2011. - Vol. 60, № 1. - P. 150-163.*
7. *Formation of agroecosystems and establishment of communities of biotroph harmful species / V. A. Pavlyushin, N. A. Vilкова, G. I. Sukhoruchenko, L. I. Nefedova // Vestnik of plant protection. - 2016. - № 2 (88). - P. 5-15.*

8. Pavlyushin, V.A. *Microbiological plant protection in technologies for phytosanitary improvement of agroecosystems: theory and practice: a review* / V.A. Pavlyushin, I.I. Novikova, I.V. Boykova // *Agricultural biology*. - 2020. - V. 55, № 3. - P. 421-438. - DOI 10.15389/agrobiol.2020.3.421rus.
9. Sanin, S. S. *Phytosanitary challenges of modern intensive crop production* / S. S. Sanin // *Fruit and berry growing in Russia*. - 2015. - V. 43. - P. 178-183.
10. Dolzhenko, V. I. *Plant protection: present and future* / V. I. Dolzhenko // *Soil Fertility*. - 2018. - № 1 (100). - P. 24-26.
11. Chulkina, V. A. *Types of phytosanitary monitoring as the basis for improvement of integrated plant protection* / V. A. Chulkina, E. Yu. Toropova, G. Ya. Stetsov // *Plant protection and quarantine*. - 2010. - № 12. - P. 12-15.
12. Toropova, E. Yu. *Influence of soil cultivation methods on phytosanitary state of crops* / E. Yu. Toropova, V.A. Chulkina, G. Ya. Stetsov // *Plant protection and quarantine*. - 2010. - № 1. - P. 26-27.
13. Toropova, E. Yu. *Increase of innovative attractiveness of crop production and agricultural technologies based on the system-ecological approach in plant protection* / E. Yu. Toropova, V. A. Chulkina, A. F. Zakharov // *Vestnik of NSAU (Novosibirsk State Agrarian university)*. - 2011. - № 3 (19). - P. 36-41.
14. Postovalov, A.A. *The reaction of microorganisms in spring barley rhizosphere to mineral fertilizers and biological products* / A.A. Postovalov // *Vestnik of Kurgan State Agricultural Academy*. - 2018. - № 4 (28). - P. 39-45.
15. Sukhanova, S. F. *Influence of mineral fertilizers on phytosanitary state of spring barley crops* / S. F. Sukhanova, A. A. Postovalov // *Izvestiya of Gorskiy State Agrarian University*. - 2020. - V. 57, № 2. - P. 43-49.
16. Shpanev, A.M. *Efficiency of application of mineral fertilizers and an integrated system of plant protection in field crop rotation in the North-West of the Russian Federation* / A.M. Shpanev, M. A. Fesenko, V. V. Smuk // *Agrochemistry*. - 2021. - № 1. - P. 12-22. - DOI 10.31857/S0002188121010099.

17. Zazimko, M.I. *Agrotechnical method of plant protection - fundamental, but not explicit* / M.I. Zazimko, V.I. Dolzhenko // *Plant protection and quarantine*. - 2011. - № 5. - P. 11-16.
18. *Principles for state variety testing of agricultural crops*. - Moscow: Kolos, 1989. - 195 p.
19. *Recommendations on protection of leguminous crops against root rot*. - Moscow: Kolos, 1982. - 31 p.
20. *Diagnostics of main fungal diseases of grain crops* / T. N. Ishkova, L. I. Berestetskaya, E. L. Gasich [and others]. - St. Petersburg, 2002. - 76 p.
21. Dolzhenko, V. I. *Modern requirements for formation of a range of fungicides and protectants* / V. I. Dolzhenko, G. Sh. Kotikova, D. A. Orekhov // *Agro XXI*. - 1999. - № 11. - P. 3-4.
22. Shorokhov, M.N. *Improvement of the range of insectofungicides* / M.N. Shorokhov, N. G. Petrova, V. I. Dolzhenko // *Russian agricultural science*. - 2020. - № 3. - P. 28-31. - DOI 10.31857 / S2500262720030072.
23. *Development of research on formation of a modern range of fungicides* / L. D. Grishechkina, V. I. Dolzhenko, O. V. Kungurtseva [and others] // *Agrochemistry*. - 2020. - № 9. - P. 32-47. - DOI 10.31857 / S0002188120090070.
24. Dolzhenko, V.I. *Development of chemical method of plant protection in Russia* / V.I. Dolzhenko, G.I. Sukhoruchenko, A.B. Laptiev // *Plant protection and quarantine*. - 2021. - № 4. - P. 3-13. - DOI 10.47528 / 1026-8634_2021_4_3.

USAGE OF BIOLOGICALLY ACTIVE FEED ADDITIVES TO INCREASE NUTRITIONAL VALUE OF AFRICAN SHARPTOOTH CATFISH SPAWN

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Key words: aquaculture, African sharptooth catfish, spawn, nutritional value, vitamins, probiotics, adaptogenes.

The work is devoted to the study of nutritional value of African sharptooth catfish spawn and assessment of the effect of biologically active substances in the form of probiotics, adaptogenes, vitamins and amino acids on the sprawn. The aim of the work was to increase the nutritional value of African sharptooth catfish spawn by means of usage of biologically active feed additives in the ration. "Sporothermin" probiotics was used to improve the microbiocenosis of the fish habitat, as a protection against pathogenic microbiota, to improve fish intestinal microbiocenosis, and also as a source of biologically active substances. Our results showed that application of the probiotics increased the level of protein, fat, minerals and vitamins in African catfish spawn. "Irkutin" adaptogene was used due to its antioxidant properties, the ability to increase non-specific resistance and body endurance. The vitamin-amino acid complex was used as a source of vitamins and amino acids, providing metabolism regulation of proteins, fats and carbohydrates directly, or as part of complex enzyme systems. The research results showed that complex usage of the adaptogene and the vitamin-amino acid complex increased the quality of sprawn, its nutritional value and the content of water- and fat-soluble vitamins to a level that meets the requirements of health products. It was established that the sprawn of African sharptooth catfish, obtained in case of application of "Sporothermin" probiotics, "Irkutin" adaptogene, "Chiktonik" vitamin-amino acid complex in the ration, corresponds to National Standard 55577-2013 for functional food products in terms of content of fat and water-soluble vitamins.

Bibliography:

*1. The chemical composition of different edible locations (central and edge muscles) of flat fish (*lepidorhombuswhiffiagonis*) / R. G. Barbosa, R. Fett, M. Trigo, S. P. Aubourg, R. Prego // International Journal of Food Science & Technology. - 2018. - V. 53, № 2. - P. 27 1-281.*

2. Akhmerova, E.A. Nutritional value of fish caviar / E.A. Akhmerova, L.R. Kopylenko, T.E. Rubtsova // *Vestnik of Biotechnology and Physicochemical Biology named after Yu.A. Ovchinnikov*. - 2012. - V. 8, № 4. - P. 12–20.
3. Radakova, T.N. Caviar and caviar products in the world market / T.N. Radakova // *Fishing industry*. - 2009. - № 1. - P. 6-7.
4. The chemical composition, fatty acid, amino acid profiles and mineral content of six fish species commercialized on the wouri river coast in Cameroon / N. Tenyang, HM Womeni, B. Tiencheu, FT Mbiapo, M. Linder, P. Villeneuve // *Rivista Italiana delle Sostanze Grasse*. - 2014. - V. 91, № 2. - P. 129-138.
5. Stancheva, M. Fatty acid composition of fish species from the Bulgarian Black Sea / M. Stancheva, A. Merdzhanova, L. Makedonski // *Acta Medica Bulgarica*. - 2011. - V. 38, № 1. - P. 26-33.
6. Kim, G. N. Comparative study of nutritional value of fish caviar in the Pacific basin / G. N. Kim, N. V. Dementieva, V. D. Bogdanov // *Fish industry*. - 2016. - № 3. - P. 102–107.
7. Characteristics of chemical composition and fish population of small rivers South Khanty-Mansiysk Autonomous Region / A. V. Korzhavin, E. I. Popova, E. S. Zemtsova, A. Ju. Tokarjova, A. A. Chemagin, I. A. Cherkashina // *In the World of Scientific Discoveries, Series B*. - 2013. - V. 1, № 1. - P. 74-83.
8. Green, C. L. Regulation of metabolic health by essential dietary amino acids / C. L. Green, D. W. Lamming // *Mechanisms of Aging and Development*. - 2019. - V. 177. - P. 186-200.
9. Dvoryaninova, O. P. Current state and development prospects of caviar production / O. P. Dvoryaninova, M. V. Bobreshova // *Materials of the LII scientific conference for 2013. In 3 parts*. - Voronezh: Voronezh State University of Engineering Technologies. - 2014. - Part 1. - P. 67-68.
10. Characteristics of fatty acid composition of gammarus lacustris inhabiting lakes with and without fish / O. N. Makhutova, G. S. Kalachova, M. I. Gladyshev, T. A. Sharapova, S. P. Shulepina // *Doklady Biochemistry and Biophysics*. - 2016. - T. 466, № 1. - P. 20-22.

11. *Fish protein hydrolysates: proximate composition, aminoacidcomposition, antioxidant activities and applications: a review / M. Chalamaiah, Kumar B. Dinesh, R. Hemalatha, T. Jyothirmayi // Food Chemistry. - 2012. - T. 135, № 4. - R. 3020-3038.*

ASSESSMENT OF ACUTE ORAL TOXICITY AND CUMULATIVE PROPERTIES OF INSACAR TOTAL S AND INSACAR TOTAL K ANTI-PARASITIC MEDICATIONS

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Key words: acute toxicity, Insacar Total S, Insacar Total K, imidacloprid, pyriproxyfen, moxidectin, mice, lethality, oral administration, cumulation coefficient.

A wide range of antiparasitic medications is produced for treatment of parasitic diseases of domestic carnivores, but only few of them are highly effective. Recently, highly effective antiparasitic medications of a new generation were designed, including complex compositions of active substances. Our work presents results of tests of such composite antiparasitic medications as Insakar Total S and Insakar Total K, developed at Federal State Budgetary Scientific Institution "Federal Scientific Center - All-Russian Scientific Research Institute of Experimental Veterinary Medicine of the RAS. The ultimate advantage of these drugs is that they include a composition of active substances - imidacloprid, pyriproxyfen and moxidectin. The medications exhibit high antiparasitic activity against both ecto- and endoparasites. They have a destructive effect on imaginal and preimaginal stages of parasites. The parameters of acute toxicity of medications when administered into the stomach were studied. It was found that

the half-lethal dose (LD₅₀) of the medication for dogs was 4425 mg / kg. The LD 50 of the medication for cats was 4575 mg / kg. It indicates that the tested medications - "Insacar Total S" and "Insacar Total K" belong to the 3rd hazard class (moderately hazardous substances), according to the hygienic classification (State Standard GOST 12.1.007-76). The assessment of the cumulative properties of Insacar Total S and Insacar Total K was carried out. The cumulation coefficient of the tested medications was 2, it means that their cumulative properties are poorly exhibited.

Bibliography:

- 1. Arisov, M. V. Pharmacotoxicological assessment of a complex antiparasitic medication for dogs and cats / M. V. Arisov, V. A. Stepanov, E. S. Smirnova // Russian veterinary journal. Small domestic and wild animals. - 2014. - № 4. - P. 36-39.*
- 2. Arisov, M. V. Toxicological assessment of the insectoacaricidal preparation Insakar for arachnoentomoses treatment of carnivores / M. V. Arisov, A. A. Stepanov // Russian parasitological journal. - 2012. - № 1. - P. 98-103.*
- 3. Arisov, M. V. Specification of acute toxicity of Insakar and Insakar Plus medications / M. V. Arisov, A. A. Stepanov // Theory and practice of combating parasitic diseases. - 2011. - № 12. - P. 28 - 30.*
- 4. General principles of conducting preclinical toxicology studies of antiparasitic drugs for veterinary use / M. V. Arisov, D. N. Urazaev, E. O. Kachanova, A. S. Pavlova // IOP Conference Series: Earth and Environmental Science. III International Scientific Conference: AGRITECH-III-2020: Agribusiness, Environmental Engineering and Biotechnologies. Krasnoyarsk Science and Technology City Hall of the Russian Union of Scientific and Engineering Associations. - 2020. - P. 42042.*
- 5. Determining the acute toxicity of new preparation vetom 20.76 on geese and ducks / G. A. Nozdrin, Y. V. Novik, R. G. Utkina, A. A. Lelyak // Sarhad Journal of Agriculture. - 2020. - V. 36, № 2. - P. 470-477.*

6. *The acute and sub-acute toxicity of c 60 / pvp complex in vivo / M. A. Dumpis, V. V. Iljin, E. V. Litasova, D. N. Nikolaev, V. V. Bulion, I. B. Krylova, I. V. Okunevich, O. M. Rodionova, A. F. Safonova, E. N. Selina, L. B. Piotrovsky // Advances in Nano Research. - 2016. - V. 4, № 3. - P. 167-179.*
7. *State Standard GOST 12.1.007-76. Harmful substances. Classification and general safety requirements: date of introduction 01.01.77. - Moscow, 1976.*
8. *Polova, Zh. Study of acute toxicity of a new veterinary drug for intramammary introduction / Zh. Polova, N. Seredinskaya // Eureka: Health Sciences. - 2018. - № 2. - P. 51-60.*
9. *Nizhenkovska, I. V. Acute toxicity study of a new complex drug with anti-inflammatory activity / I. V. Nizhenkovska, L. V. Zinchenko // Current Topics in Pharmacology. - 2017. -- T. 21. -- R. 71-74.*
10. *Toxicological characteristics of the medical product for veterinary use "Ketoprofen 10%" on laboratory animals (acute toxicity) / A. N. Shkatova, D. A. Devrishov, O. B. Litvinov, V. E. Brylina // Veterinary medicine, animal husbandry and biotechnology. - 2021. - № 1. - P. 29-40.*
11. *Emeliyanova, N.B. Acute oral toxicity of antiparasitic paste with ivermectin / N.B. Emeliyanova // Theory and practice of combating parasitic diseases. - 2015. - № 16. - P. 132-133.*

REGULATION OF FISH ANTIOXIDANT SYSTEM WITH BIOLOGICALLY ACTIVE FEED ADDITIVES

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Key words: aquaculture, African sharptooth catfish, malondialdehyde, antioxidant system, lipid peroxidation.

The article contains results of the research on the influence of "Sporothermin" probiotics and "Chiktonik" vitamin-amino acid complex on the processes of free-radical oxidation of lipids in the muscle tissue of fish. Three groups of sexually mature African catfish were formed. The first test group received "Sporothermin" probiotic at a dose of 2 g / kg of feed. The second group received "Chiktonik" vitamin-amino acid complex at a dose of 2 ml / kg of feed, the third group was the control and received only LimKorm "Som" brand feeds. All groups were tested for malondialdehyde content (MDA) in three months. In the control group, the content of MDA of males was 7948.71 mmol / 100 g of tissue, females - 8119.65 mmol / 100 g of tissue. Fish reared with the probiotics had the lowest levels of lipid peroxidation. Males had the MDA level of 3931.62 mmol / 100 g of tissue, and females - 4273.5 mmol / 100 g of tissue. As for the second group, which received "Chiktonik" vitamin-amino acid complex, the MDA content was lower than in the control, but higher than in the group which received the probiotics and was 4358.97 mmol / 100 g of tissue (males), and 4957.26 mmol / 100 g of tissue (females). It can be concluded that the usage of "Sporothermin" probiotics and "Chiktonik" vitamin-amino acid complex in the diet of African sharptooth catfish leads to a decrease of free radical processes, reduces the activity of lipid peroxidation, stimulates the antioxidant system, provides resistance to oxidative stress, revitalizing and increasing the vitality of the organism fish.

Bibliography:

- 1. Mokhovikov, O.V. Prospects for Russian aquaculture / O.V. Mokhovikov, A.A. Grunina // Delta of Science. - 2019. - № 1. - P. 10-12.*
- 2. Barulin, N. V. System approach to regulation technology of reproduction of aquaculture objects in fish-breeding industrial complexes / N. V. Barulin // Issues of fish industry in Belarus. - 2018. - № 34. - P. 235-239.*
- 3. Khodorevskaya, R. P. Current state and prospects of reproduction of aquatic biological resources for industrial aquaculture in Astrakhan region / R. P.*

Khodorevskaya, S. O. Nekrasova // Vestnik of Astrakhan State Technical University. Series: Fisheries. - 2019. - № 3. - P. 107-116.

4. Buyarov, V. S. Reserves for increasing the efficiency of commercial aquaculture / V. S. Buyarov, Yu. A. Yushkova, A. V. Buyarov // Agrarian Vestnik of the Upper Volga Region. - 2019. - № 1 (26). - P. 63-69.

5. Spirina, E.V. Adaptive changes in the blood picture of African catfish in case of trekrezan application in artificial environment breeding / E.V. Spirina, E.M. Romanova, Yu. V. Petrova // Vestnik of Ulyanovsk State Agricultural Academy. - 2021. - № 1 (53). - P. 124-129. - DOI 10.18286 / 1816-4501-2021-1-124-129.

6. Vinogradov, E.V. Changes in biochemical parameters of mucus and blood of fish resistant to stress / E.V. Vinogradov, V.M. Simonov // Vestnik of fishery science. - 2018. - V. 5, № 2 (18). - P. 24-32.

7. Oganisyan, A. O. Changes in succinate dehydrogenase activity in various parts of the brain during combined exposure to vibration and licorice root / A. O. Oganisyan, K. R. Oganisyan, S. M. Minasyan // Neuroscience and behavioral physiology. - 2005. - Vol. 35, No 5. - P. 545-548.

8. Babaeva, A. Kh. Lipid peroxidation and antioxidant protection in blood serum of pregnant women with preeclampsia and iron deficiency anemia / A. Kh. Babaeva // Vestnik of problems of biology and medicine. - 2017. - Vol. 1, №2 (136). - P. 80-82.

9. Influence of NHE-1 zoniporide inhibitors and BMA-1321 on the level of lipid peroxidation products and enzymes of the antioxidant system in heart mitochondria of animals with chronic heart failure / V. N. Perfilova, N. A. Gurova, T. A. Popova [and etc.] // Vestnik of Volgograd State Medical University. - 2019. - № 3 (71). - P. 62-65. - DOI 10.19163 / 1994-9480-2019-3 (71) -62-65.

10. Molecular dynamic modeling of interaction of cationic fluorescent probes (sensitive to lipid peroxidation) with mitochondrial membrane / A.M. Nesterenko, E.G. Kholina, K.G. Lyamzaev [et al.] // Reports of the Academy of Sciences. - 2019. - V. 486, № 4. - P. 509-513. - DOI 10.31857 / S0869-56524864509-513.

11. Voloshchuk, O.N. *Intensity of free radical oxidation of biomolecules of mitochondria of hepatocytes in case of nutritional imbalance / O.N. Voloshchuk, Yu. V. Stus, GP Kopylchuk // Biomedical chemistry. - 2020. - V. 66, № 5. - P. 386-391. - DOI 10.18097 / PBMC20206605386.*
12. Yudina, N.V. *Antioxidants in lipids of peat-forming plants and peat / N.V. Yudina, A.V. Savelieva // Chemistry of vegetable raw materials. - 2019. - № 3. - P. 253-259. - DOI 10.14258 / jcprm.2019034840.*
13. Orlova, T.N. *Influence of probiotics on intestinal microbiocenosis of broiler chicken / T.N. Orlova // Eurasian Union of Scientists. - 2020. - № 10-2 (79). - P. 68-70. - DOI 10.31618 / ESU.2413-9335.2020.2.79.1039.*
14. *Hematological parameters of young sterlet in case of combined usage of Bacillus subtilis culture and nanoparticles of Cu-Zn alloy / E.P. Miroshnikova, A.E. Arinzhanov, Yu. V. Kilyakova [et al.] // Animal husbandry and forage production. - 2018. - V. 101, № 3. - P. 100-109.*
15. *Effects of nanostructured zeolite and aflatoxin B1 in growth performance, immune parameters and pathological conditions of rainbow trout Oncorhynchus mykiss / S. Alinezhad, M. Faridi, B. Falahatkar, R. Nabizadeh, D. Davoodi // Fish and Shellfish Immunology. - 2017. - Vol. 70. - P. 648–655.*
16. *Artemenkov, D.V. Rearing of Clarias gariepinus on compound feeds with addition of subtilis probiotics under RAS conditions: spec. 06.04.01: abstract of dissertation for the degree of candidate of agricultural sciences / Artemenkov Dmitry Vladimirovich; Russian State Agrarian University - Moscow Agricultural Academy named after K.A. Timiryazev. - Moscow, 2013. - 23 p.*
17. *Toxicity assessment of arsenic on common carp (Cyprinus carpio) and development of natural sorbents to reduce the bioconcentration by RSM methodology / Z. Ghadersarbazi, F. Ghiasi, F. Ghorbani, S. A. Johari // Chemosphere. - 2019. - Vol. 224. - P. 247–255.*
18. *Maksimov, N.I. Influence of combined probiotic on growth rates and level of immunity in weaned pigs / N.I. Maksimov, A.P. Lashin // Far Eastern Agrarian Vestnik. - 2020. - № 1 (53). - P. 56-61. - DOI 10.24411 / 1999-6837-2020-11008.*

19. *Effect of stimulation of fish antioxidant system in case of Sporothermin probiotics usage / E. V. Spirina, E. M. Romanova, V. V. Romanov, L. A. Shadyeva // Vestnik of Ulyanovsk State Agricultural Academy. - 2020. - № 1 (49). - P. 85-90. - DOI 10.18286 / 1816-4501-2020-1-85-90.*

20. *Histological characteristics of the intestine of African sharptooth catfish (Clarias gariepinus) in case of Sporothermin probiotics usage / E. M. Romanova, E. V. Spirina, V. N. Lyubomirova, V. V. Romanov // Vestnik of Ulyanovsk State Agricultural Academy. - 2019. - № 4 (48). - P. 76-82. - DOI 10.18286 / 1816-4501-2019-4-76-82.*

21. *Bachinskaya, V.M. Veterinary and sanitary assessment of carcasses of broiler chicken in case of application of Chiktonik and Abiotonik / V.M. Bachinskaya, S.I. Chinchikov, E.V. Tyurina // Innovative Science. - 2019. - № 6. - P. 195-198.*

22. *Dvornitsyn, A.I. Effectiveness evaluation of "Chiktonik" application in feeding of calves / A.I. Dvornitsyn // BIO. - 2018. - № 2 (209). - P. 16-17.*

23. *Shchukova, K.B. Application of one-factor analysis to assess system performance using STATISTICA program / K.B. Shchukova // Modern equipment and technologies. - 2015. - № 12 (52). - P. 254-259.*

24. *Experimental assessment of the influence of dust from cities of the Karaganda region on the indicators of lipid peroxidation in bronchoalveolar lavage / K. A. Nurlybaeva, A. M. Aitkulov, G. M. Tykezhanova [et al.] // Vestnik of the Karaganda university. Biology. Medicine. Geography Series. - 2021. - Vol. 102, No 2. - P. 57-62. - DOI 10.31489 / 2021BMG2 / 57-62.*

**COMPARATIVE EVALUATION OF EFFICIENCY OF INSACAR TOTAL
K AND ACAROMECTIN ACARICIDAL MEDICATIONS IN CASE OF
OTODECTOSIS OF CATS**

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Key words: otodectosis, Otodectes cynotis, acariform ticks, cat, acaricides, arachnoentomoses, extension efficiency, Insakar Total K, acaromectin.

*Otodectosis of cats is one of the most spread diseases of animals of this species from the group of arachnoentomoses. The lack or non-compliance with therapeutic and preventive measures in case of otodectosis contributes to massive spread of the disease. A comparative assessment of the effectiveness of two acaricidal medications, such as Insakar Total K, developed at Federal State Budgetary Scientific Institution "Federal Scientific Center - All-Russian Scientific Research Institute of Experimental Veterinary Medicine of the RAS (Moscow), and Acaromectin for cats' otodectosis was carried out. Insakar Total K is a complex acaricidal medication containing imidocloprid, pyriproxyfen and moxidectin, providing high therapeutic efficacy against ecto- and endoparasites both in imaginal and preimaginal stages of development. It is recommended for treatment of arkhanoentomoses, nematodes of the gastrointestinal tract of cats. Acaromectin is a medication from the group of macrocyclic lactones. The active ingredient of the drug is ivermectin, which has a destructive effect on acariform ticks. The drug is active against sarcoptic mites at different stages of ontogenesis (*Sarcoptes canis*, *Sarcoptes vulpis*, *Notoedres cinotis*, *Psoroptes cuniculi*), demodectic mites (*Demodex canis*), as well as insects (*Ctenocephalides canis*, *Telotdecephalides*) parasitizing on dogs and cats. The object of the study was the cats of "Lapa Pomoshchi" shelter for homeless animals at Ulyanovsk State Agrarian University, spontaneously infested with *Otodectes cynotis* ticks. In the course of the experiment, it was found that both tested medications show outstanding efficacy for treatment of otodectosis of cats. Insakar Total K has a more pronounced therapeutic effect, extension efficiency was 100 %. The extension efficiency of Acaromectin was slightly lower and amounted to 80 %.*

Bibliography:

1. Karelkin, D.V. *Skin diseases and their dominant role in formation of general infectious pathology of domestic animals* / D.V. Karelkin // *Scientific life*. - 2016. - № 8. - P. 40-46.
2. Zorina, N.P. *Epizootic situation on acarosis of dogs in the city of Stavropol* / N.P. Zorina, Yu. V. Diyachenko, B.M. Bagamaev // *Izvestiya of the International Academy of Agrarian Education*. - 2016. - № 30. - P. 119-121.
3. Stolbova, O. A. *Skin diseases of dogs and cats in Tyumen region* / O. A. Stolbova, L. N. Skosyrskikh, Yu. A. Tkacheva // *Current problems of science and education*. - 2015. - № 4. - P. 516.
4. Irwin, P. *Parasitic diseases of cats and dogs in the tropics* / P. Irwin, R. Traub // *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*. - 2006. - V. 1. - P. 010.
5. Stolbova, O. A. *Seasonal dynamics of ectoparasites in small domestic animals in the conditions of the city of Tyumen* / O. A. Stolbova, L. N. Skosyrskikh, D. S. Kruglov // *Current problems of science and education*. - 2017. - № 2. - P. 237.
6. Fadeeva, A. N. *Parasitic diseases of domestic carnivores in the conditions of Nizhny Novgorod city* / A. N. Fadeeva, N. G. Gorchakova // *Veterinary Medicine*. - 2016. - № 6. - P. 33-35.
7. Fadeeva, A. N. *Parasitosis of domestic carnivores in urban areas* / A. N. Fadeeva // *International veterinary Vestnik*. - 2016. - № 2. - P. 30-33.
8. Otranto, D. [Diagnostic challenges and the unwritten stories of dog and cat parasites](#) / D. Otranto // [Veterinary Parasitology](#). - 2015. - T. 212, № 1-2. - P. 54-61.
9. Mencke, N. [Future challenges for parasitology: vector control and 'one health' in europe: the veterinary medicinal view on cvbds such as tick borreliosis, rickettsiosis and canine leishmaniosis](#) / N. Mencke // [Veterinary Parasitology](#). - 2013. - T. 195, № 3-4. - P. 256-271.
10. Moskvina, T. V. [Parasites of stray and client-owned domestic cats in urban areas in russia during 2000-2015 years](#) / T. V. Moskvina, A. V. Tsybulsky, A. V. Izrailskaia Kharitonova // [Tropical Biomedicine](#). - 2018. - T. 35, № 1. - P. 267-279.
11. Balashov, Yu. S. *Harmfulness of parasitic insects and acarines to mammals and birds* / Yu. S. Balashov // *Entomological Review*. - 2007. - T. 87, № 9. - P. 1300-1316.

12. Arisova, G. B. [Study of pharmacokinetics of the slow-release drug in the form of moxidectin-based solution for dogs and cats](#) / G. B. Arisova, M. V. Arisov, I. A. Stepanova // [World's Veterinary Journal](#). - 2021. - T. 11, № 2. - P. 300-306.

13. Arisov, M. V. [Pharmacokinetics of combination antiparasitic drug preparation for dogs and cats in the form of spot-on solution](#) / M. V. Arisov, E. N. Indyukhova, G. B. Arisova // [Journal of Advanced Veterinary and Animal Research](#). - 2019. - T. 6, № 1. - P. 25-32.

14. Glazunov, Yu. V. *Comparative effectiveness of action of acaricides on ixodid ticks* / Yu. V. Glazunov, L.A. Glazunova // *Vestnik of veterinary medicine*. - 2015. - № 1 (72). - P. 36–39.

15. Arisov, M. V. *Study of the therapeutic effect of "Inspector spray" medication on dogs and cats with acarosis* / M. V. Arisov, A. I. Demin, E. A. Koshkarev // *Veterinary medicine, animal husbandry and biotechnology*. - 2016. - № 5. - P. 77-80.

16. Karmaeva, S. G. *Assessment of acaricidal efficacy of drugs in cat notoedrosis* / S. G. Karmaeva, E. M. Romanova, L. A. Shadyeva // *Agrarian Science*. - 2020. - No. 5. - P. 25-27.

17. *The efficiency of the multicomponent drug in the form of tablets for sarcoptosis and demodicosis in dogs and cats* / Arisov M.V., Stepanova I.A., Poselov D.S., Arisova G.B. // *Veterinarian*. - 2019. - № 6. - P. 4-9.

18. *The use of new generation acaricides in the treatment of otodectosis invasion of arctic foxes* / B. A. Korolev, M. A. Levchenko, A. N. Davletshin, Yu. V. Koshevko // *Rabbit breeding and animal husbandry*. - 2013. - No. 4. - pp. 19-20.

19. *Comparative efficacy of acaricidal drugs in otodectosis of cats* / F. G. Gizatullina, Zh. S. Rybyanova, S. V. Sirenko, A.V. Vyrypaeva // *Agroindustrial Complex of Russia*. - 2020. - Vol. 27, No. 4. - pp. 665-673.

20 [Improving the diagnosing dermatitis parasitic etiology methods of carnivorous animals](#) / B. M. Bagamaev, N. P. Zorina, P. V. Krikun, J. V. Dyachenko, V. V. Mikhaylenko // [Research Journal of Pharmaceutical, Biological and Chemical Sciences](#). - 2019. - T. 10, № 1. - P. 1684-1688.

**INFLUENCE OF COMPONENTS OF BIOLOGICALLY ACTIVE
ADDITIVE FOR FUNCTIONAL FEEDING COMPLEXES ON FISH
BLOOD PARAMETERS**

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The aim of the work was to study red and white blood composition of African sharptooth catfish, reared with application of innovative biotechnology elements, which involve usage of a complex of biologically active components, including Irkutin adaptogen, Sporothermin probiotics and Chiktonik vitamin and amino acid complex. Irkutin adaptogen was used to increase fish organism resistance to unfavorable environmental factors. Sporothermin probiotics was applied as an immunomodulatory agent to increase immunity, reduce the negative effects of stress factors, prevent infections, and regulate microbiocenosis. Chiktonik vitamin - amino acid complex was considered as a source of vitamins and amino acids, which the fish organism desperately needs when reared in recirculating aquaculture system. The object of the study was sexually mature males and females of African sharptooth catfish. The tasks of the work included assessment of the fish blood system reaction to components of our functional feed additive. The results of the research showed that application of Irkutin adaptogen in rearing of African catfish had an activating effect on the level of erythrocytes, leukocytes and hemoglobin content in the fish blood. Usage of Sporothermin probiotics also had a conspicuous effect on the content of blood corpuscles and hemoglobin content. However, Chiktonik vitamin-amino acid complex had the strongest activating effect on blood parameters, all parameters were significantly higher than in case of application of other biologically active components. The

activating effect of each biologically active component did not go beyond the physiological norm.

Bibliography:

- 1. Analysis of the current state of commercial aquaculture / A. B. Aliev, B. I. Shikhshabekova, A. D. Guseinov, I. V. Musaeva, E. M. Alieva, A. R. Shikhshabekov // Problems of development of the agro-industrial complex of the region. - 2017. - Vol. 3, № 3 (31). - P. 102-106.*
- 2. Vlasov, V. A. Breeding of Clarius catfish (CLARIAS GARIEPINUS BURCHELL) on mixed feeds with different levels of protein / V. A. Vlasov, I. S. Kulkova // Chief livestock technician. - 2020. - № 4. - P. 58-67.*
- 3. Vlasov, V. A. Usage of "Subtilis" probiotics as an additive in compound feed for Clarius catfish breeding (CLARIAS GARIEPINUS) / V. A. Vlasov, D. V. Artemenkov, V. V. Panasenko // Fish industry. - 2012. - № 5. - P. 89-93.*
- 4. Vinogradov, G.D. Physiological and biochemical state of commercial ichthyofauna under conditions of dissemination of xenobiotics in the river basin of the Belaya River: spec. 03.03.01: dissertation abstract for the degree of candidate of biological sciences / Gennady Dmitrievich Vinogradov; Moscow Agricultural Academy named after K.A. Timiryazev. - Moscow, 2011. - 22 p.*
- 5. Kovzalov, N.I. Influence of growth-stimulating products on hematological parameters, chemical composition and biological value of meat of Kalmyk bull calves / N.I. Kovzalov, A.A. Kaidulina, E.V. Karpenko // Agrarian Vestnik of the Urals. - 2013. - № 9 (115). - P. 37-40.*
- 6. Probiotics in aquaculture / E. A. Kotova, N. A. Pyshmantseva, D. V. Osepchuk, A. A. Pyshmantseva, L. N. Tkhakushinova // Collection of scientific works of the All-Russian Research Institute of Sheep and Goat Breeding. - 2012. - V. 3, № 1-1. - P. 100-103.*
- 7. Mazur, O. E. Blood cell composition of Salvelinus malma (Salmonidae) of the Raduga River (Kamchatka) / O. E. Mazur, T. E. Butorina, O. Yu. Busarova // Izvestiya of Pacific Fisheries Research Center. - 2021. - V. 201, № 2. - P. 371-384.*

8. *Evaluation of young common catfish in selection of producers by ALT level / A.B. Petrushin, G.I. Pronina, V.A. Petrushin, A.O. Revyakin // Vestnik of Orenburg State Agrarian University. - 2013. - № 1 (39). - P. 243-244.*
9. *Pronina, G.I. Comparative characteristics of catfish of different species by hematological and biochemical parameters / G.I. Pronina, D.V. Artemenkov, A.B. Petrushin // Scientific works of All-Russian Research Institute of Fisheries and Oceanography. - 2017. - V. 165. - P. 111-117.*
10. *Pronina, G.I. Morphometric and physiological-biochemical evaluation of young common catfish reared in pond conditions / G.I. Pronina, A.B. Petrushin // Animal science. - 2011. - № 7. - P. 25-26.*
11. *Pronina, G.I. Physiology - immunological assessment of reared aquatic organisms: carp, catfish, crayfish: spec. 03.03.01: dissertation abstract for the degree of Doctor of Biological Sciences / Pronina Galina Iozepovna; RSAU Moscow Agricultural Academy named after K.A. Timiryazev. - Moscow, 2012. - 36 p.*
12. *Innovative technologies for production of functional products in industrial aquaculture / E. M. Romanova, V. V. Romanov, V. N. Lyubomirova, M. E. Mukhitova, L. A. Shadyeva, T. M. Shlenkina, I. S. Galushko // Fish farming and fish farming. - 2018. - № 5 (148). - P. 54-59.*
13. *Seasonal studies of caviar production and the growth rate of the African catfish (*Clarias gariepinus*, Burchell, 1822) / E. M. Romanova, V. N. Lyubomirova, V. V. Romanov, M. E. Mukhitova, T. M. Shlenkina // Egyptian Journal of Aquatic Research. - 2018. - T. 44, № 4. - P. 315-319.*
14. *Biology of reproduction of catfish (*Clarias gariepinus*, Burchell, 1822) in hightech industrial aquaculture / EM Romanova, VN Lyubomirova, VN Lyubomirova, VV Romanov, ME Mukhitova, TM Shlenkina, LA Shadyeva, IS Galushko // Journal of Fundamental and Applied Sciences. - 2018. - V. 10, № 5S. - P. 1116-1129.*
15. *Shalak, M. V. Hematological parameters and live weight of tench in case of rearing in cages with "Iodinol" application / M. V. Shalak, Yu. M. Goncharik, A. I.*

- Kozlov // *Current problems of intensive development of animal husbandry*. - 2019. - № 22-2. - P. 85-93.
16. Ivanova, N. T. *Atlas of fish blood cells* / N. T. Ivanova. - Moscow: textile and food industry, 1982. - 184 p.
17. *Gonadosomatic index and some hematological parameters in african catfish clarias gariepinus (Burchell, 1822) as affected by feed type and temperature level* / W. A. Al-Deghayem, H. F. AlBalawi, S. A. Kandeal, E. A. M. Suliman // *Brazilian archives of biology and technology*. - 2017. - V. 60. - P. E17160157.
18. Mekkawy, I. A. *Effects of 4-nonylphenol on blood cells of the African catfish clarias gariepinus (Burchell, 1822)* / I. A. Mekkawy, U. M. Mahmoud, A. E. D. H. Sayed // *Tissue and cell*. - 2011. - V. 43, № 4. - P. 223-229.
19. *Early development of the African catfish clarias gariepinus (Burchell, 1822), focusing on the ontogeny of selected organs* Osman A.G.M. / S. Wuertz, F. Kirschbaum, I. A. Mekkawy, J. Verreth // *Journal of applied ichthyology*. - 2008. - V. 24, № 2. - P. 187-195.
20. *Altered hematological and immunological parameters in silver catfish (rhamdia quelen) following short term exposure to sublethal concentration of glyphosate* / LC Kreutz, LJ Gil Barcellos, S. De Faria Valle, T. De Oliveira Silva, D. Anziliero, E. Davi Dos Santos, M. Pivato, R. Zanatta // *Fish & shellfish immunology*. - 2011. - V. 30, № 1. - P. 51-57.

**IMMUNOMODULATING PROPERTIES OF A NUMBER OF
BIOLOGICALLY ACTIVE FEED ADDITIVES**

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Key words: aquaculture, African sharptooth catfish, structure of leukocyte formula, adaptogene, probiotics, vitamin - amino acid complex.

*The article presents results of the studies on assessment of the effect of a number of biologically active feed additives on leukocyte formula structure of African sharptooth catfish. The biologically active feed additives under study were: "Irkutin" adaptogen, "Sporothermin" probiotics and "Chiktonik" vitamin - amino acid complex. Until recently, adaptogenes have not been used in fish feeding, but they are widely used in medicine to increase nonspecific resistance and resistance to stress. We evaluated the effect of the adaptogenes on leukocyte formula structure of African sharptooth catfish. The effect of "Chiktonik" vitamin-amino acid complex and "Sportermin" probiotics based on *B. subtilis* and *B. licheniformis* bacteria on the leukocyte formula of African catfish was also evaluated. The probiotics was used to regulate the microbiocenosis of fish gastrointestinal tract. The vitamin-amino acid complex was used to improve fish metabolism. In the course of the work, it was found that "Irkutin" adaptogene had the most pronounced effect on leukocyte formula structure among all the studied biologically active feed ingredients. Analysis of the leukocyte formula in case of usage of biologically active feed ingredients revealed activation of the phagocytic link. In case of application of each of the biologically active feed ingredients, a specific redistribution of the content of lymphocytes, neutrophils, monocytes and other cells in the leukocyte formula of African catfish took place. The research results showed that biologically active feed ingredients: "Irkutin" adaptogene, "Sportermin" probiotics, "Chiktonik" vitamin-amino acid complex showed an immunomodulatory effect.*

Bibliography:

- 1. Analysis of the current state of commercial aquaculture / A. B. Aliev, B. I. Shikhshabekova, A. D. Guseinov, I. V. Musaeva, E. M. Alieva, A. R. Shikhshabekov // Problems of development of the agro-industrial complex of the region. - 2017. - Vol. 3, № 3 (31). - P. 102-106.*

2. Vlasov, V. A. *Breeding of Clarius catfish (CLARIAS GARIEPINUS BURCHELL) on mixed feeds with different levels of protein / V. A. Vlasov, I. S. Kulkova // Chief livestock technician. - 2020. - № 4. - P. 58-67.*
3. Vlasov, V. A. *Usage of "Subtilis" probiotics as an additive in compound feed for Clarius catfish breeding (CLARIAS GARIEPINUS) / V. A. Vlasov, D. V. Artemenkov, V. V. Panasenko // Fish industry. - 2012. - № 5. - P. 89-93.*
4. Kovzalov, N.I. *Influence of growth-stimulating products on hematological parameters, chemical composition and biological value of meat of Kalmyk bull calves / N.I. Kovzalov, A.A. Kaidulina, E.V. Karpenko // Agrarian Vestnik of the Urals. - 2013. - № 9 (115). - P. 37-40.*
5. *Probiotics in aquaculture / E. A. Kotova, N. A. Pyshmantseva, D. V. Osepchuk, A. A. Pyshmantseva, L. N. Tkhakushinova // Collection of scientific works of the All-Russian Research Institute of Sheep and Goat Breeding. - 2012. - V. 3, № 1-1. - P. 100-103.*
6. Kuzina, T.V. *Analysis of hematological parameters of pike perch in the Volga-Caspian canal / T.V. Kuzina // Natural sciences. - 2009. - № 4 (29). - P. 96-100.*
7. Mazur, O. E. *Blood cell composition of Salvelinus malma (Salmonidae) of the Raduga River (Kamchatka) / O. E. Mazur, T. E. Butorina, O. Yu. Busarova // Izvestiya of Pacific Fisheries Research Center. - 2021. - V. 201, № 2. - P. 371-384.*
8. Pronina, G.I. *Comparative characteristics of catfish of different species by hematological and biochemical parameters / G.I. Pronina, D.V. Artemenkov, A.B. Petrushin // Scientific works of All-Russian Research Institute of Fisheries and Oceanography. - 2017. - V. 165. - P. 111-117.*
9. Pronina, G.I. *Morphometric and physiological-biochemical evaluation of young common catfish reared in pond conditions / G.I. Pronina, A.B. Petrushin // Animal science. - 2011. - № 7. - P. 25-26.*
10. Pronina, G.I. *Physiology - immunological assessment of reared aquatic organisms: carp, catfish, crayfish: spec. 03.03.01: dissertation abstract for the degree of Doctor of Biological Sciences / Pronina Galina Iozepovna; RSAU*

Moscow Agricultural Academy named after K.A. Timiryazev. - Moscow, 2012. - 36 p.

11. *Seasonal studies of sprawn production and growth rate of African catfish (Clarias gariepinus, Burchell, 1822) / E. M. Romanova, V. N. Lyubomirova, V. V. Romanov, M. E. Mukhitova, T. M. Shlenkina // Egyptian Journal of Aquatic Research. - 2018. - V. 44, № 4. - P. 315-319.*

12. *Biology of reproduction of catfish (Clarias gariepinus, Burchell, 1822) in hightech industrial aquaculture / EM Romanova, VN Lyubomirova, VN Lyubomirova, VV Romanov, ME Mukhitova, TM Shlenkina, LA Shadyeva, IS Galushko // Journal of Fundamental and Applied Sciences. - 2018. - V. 10, № 5S. - P. 1116-1129.*

13. *Ivanova, N. T. Atlas of fish blood cells / N. T. Ivanova. - Moscow: Textile and food industry, 1982. - 184p.*

14. *Early development of the African catfish clarias gariepinus (Burchell, 1822), focusing on the ontogeny of selected organs / A. G. M. Osman, S. Wuertz, F. Kirschbaum, I. A. Mekkawy, J. Verreth // Journal of applied ichthyology. - 2008. - V. 24, № 2. - P. 187-195.*

SPECIFICATION OF SIZE OF NUCLEIC ACIDS OF PS.S-7 ULGAU AND PS.S-27 ULGAU BACTERIOPHAGES

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Key words: Pseudomonas syringae, nucleic acids, size, bacteriophages, DNA, method, extraction

The article presents results of studies on specification of the size of nucleic acids of Ps.s-7 ULGAU and Ps.s-27 ULGAU bacteriophages. The relevance of the

research on classification of bacteriophages by type and size of nucleic acid is substantiated in the introduction of the article. It was established, by the method of extraction on magnetic particles and phenol-chloroform extraction, that the maximum calculated size for the DNA of Ps.s-7 UlGAU bacteriophage (isolated from a soil sample, characteristics: lytic activity, determined by the Grazio method, - $2.0 \pm 0.1 \times 10^9$ pfu / ml, by Appelman's method - 10^{-8} , drip test - n° ; spectrum of lytic action - 85.7%) was 38137 bp, for Ps.s-27 UlGAU bacteriophage (isolated from a soil sample, characteristics: $1.0 \pm 0.1 \times 10^9$ pfu / ml according to Grazio, according to Appelman - 10^{-8} , drop test - n° ; spectrum of lytic action was 85.7%) DNA size was 23744 bp. The studies used a DNA molecular weight marker Quick-Load Extend DNA 500-48500 bp, a Nanodrop 2000 / 2000c spectrophotometer (ThermoFisher), and a PAGE electrophoresis technique. The obtained data will make it possible to specify the phylogenetic relationship of Ps.s-7 UlGAU and Ps.s-27 UlGAU bacteriophages with bacteriophages annotated in the NCBI database, using Protein BLAST, active against phytopathogenic *Pseudomonas syringae* bacteria, causing tumor neoplasms, rotting, growth cessation and death of a part of plants cultivated by humans without decay, chlorosis, necrosis, etc.

Bibliography:

- 1. Miroshnikov, K.A. Genomics and proteomics of lytic Pseudomonas aeruginosa bacteriophages: spec. 03.01.04; 03.01.06: Author's abstract of dissertation for the degree of Doctor of Chemical Sciences / Miroshnikov Konstantin Anatolievich; Moscow State University named after M.V. Lomonosov. - Moscow, 2013. - 169 p.*
- 2. Clokie, Martha R. J. Bacteriophages. Methods and Protocols. Volume 3 / Martha R. J. Clokie, A. M. Kropinski, R. Lavigne. - Humana Press, 2018. - 311 p.*
- 3. Molecular biological and genetic principles of selection of therapeutic bacteriophages of bacteria of Pseudomonas and Staphylococcus genera / K. A. Miroshnikov, E. E. Kulikov, O.S. Darbeeva, K. A. Lysko, G. M. Ignatiev // Applied Biochemistry and microbiology. - 2014. - V. 50, №3. - P. 338.*

4. Ackermann, H. W. *Bacteriophage taxonomy* / H. W. Ackermann // *Microbiology Australia*. - 2011. - Vol. - P. 5.
5. *Development of the scheme of isolation and bacteriological identification of Pseudomonas syringae bacteria and its approbation* / N. A. Feoktistova, A. K. Bekkalieva, D. A. Vasiliev, E. V. Suldina // *Vestnik of Ulyanovsk State Agricultural Academy*. - 2021. - №2 (54). - P. 148-156.
6. *Bacteriophages of Pseudomonas syringae: features of isolation and study of main biological properties* / D. A. Vasiliev, N. A. Feoktistova, E. V. Suldina, A. V. Mastilenko, A. K. Bekkalieva // *IOP Conference Series: Earth and Environmental Science*. - 2021. - 723. - P. 022084. -- doi: 10.1088 / 1755-1315 / 723/2/022084.
7. *Effective methods for isolation of nucleic acids for analysis in molecular biology: a review* / O.S. Antonova, N.A. Korneva, Yu. V. Belov [et al.] // *Scientific instrument making*. - 2010. - V. 20, №1. - P. 3-9.
8. *Tan, S. C. DNA, RNA, and protein extraction: The past and the present* / S. C. Tan, B. C. Yiap // *J. Biomed. Biotechnol.* - 2009. - Vol. 2009.- P. 574398. -- DOI: 10.1155 / 2009/574398
9. *Moore, D. D. Isolation and purification of large DNA restriction fragments from agarose gels* / D. D. Moore, J. Chory, R. K. Ribaud // *Current Protocols in Immunology*. - 1993. - Vol. 8, is. 1. - P. 1051-10512.
10. *Specification of appropriate technique for DNA extraction of Pseudomonas syringae bacteriophages* / N. A. Feoktistova, E. V. Suldina, A. V. Mastilenko, D. A. Vasiliev // *Agrarian science and education at the present stage of development: experience, problems and solutions: materials of the XI International Scientific and Practical Conference*. - Ulyanovsk, 2021. - P. 157-164.
11. *Development of giant bacteriophage phiKZ is independent of the host transcription apparatus* / PJ Ceysens, L. Minakhin, A. van den Bossche, M. Yakunina, E. Klimuk, B. Blasdel, J. de Smet, JP Noben, U. Bläsi, K. Severinov, R. Lavigne // *Journal of Virology*. - 2014. - Vol. 88. - P. 10501-10510.

12. *Bacteriophages: biology and practical application* / E. Cutter, A. Sulakvelidze; scientific editor A. V. Letarov; translation from English by E.E. Kulikov [and others]. - Moscow: Nauchnyi mir, 2012. - 636 p. - ISBN 978-5-91522-284-6.
13. Zolotukhin, S. N. *Molecular genetic studies of the genome of new bacteriophages* / S. N. Zolotukhin, D. A. Vasiliev // *Vestnik of Ulyanovsk State Agricultural Academy*. - 2010. - №1 (11). - P. 65-68.
14. Ackermann, H. W. *Phage classification and characterization* / H. W. Ackermann // *Methods Mol Biol*. - 2009. - Vol. 501. - P. 127-140.

**EFFICIENCY OF INJECTIONS OF METHYLURACIL 2% IN COMPLEX
TREATMENT OF CATS SUFFERING FROM HYPERACIDAL
GASTRITIS COMPLICATED WITH PANCREATITIS**

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Keywords: gastritis, pancreatitis, cat, methyluracil, vomiting, blood, diet, therapy, diarrhea

The article presents results of experimental studies on complex therapeutic efficacy of "Methyluracil 2%" injections for treatment of cats' gastritis complicated with pancreatitis. Scientific research was carried out on the basis of the veterinary clinic "Doctor-VET" (Saratov, OOO VetTorgService) on 16 sick cats. Two groups were formed: experimental and control. These were mainly domestic (not going outside) animals aged 1 to 3 years, whose diet consisted mainly of dry feed. All animals were treated according to basic treatment scheme

for sick animals; 2% solution of Methyluracil was additionally introduced into the protocol of the experimental group. At the first attendance, all animals showed an identical clinical picture of the course of the disease: refusal from feed, hyposthenic condition, signs of diarrhea and vomiting, pain reaction was recorded on palpation of the abdominal cavity. In the course of the treatment, it was noted that the restoration of motor and food activity in the experimental group was noted on 4.13 ± 0.23 days, in the control group, on 5.13 ± 0.23 days. When studying the biochemical parameters of blood, an increase of alkaline phosphatase, amylase and lipase was noted. Thus, the application of "Methyluracil 2%" injections in the standard treatment scheme for cats with gastritis complicated with pancreatitis helps to shorten the remission of the main disease symptoms, accelerate the restoration of functional activity of the affected organs and body systems, which is proved by the results of clinical observations and the dynamics of hematological parameters.

Bibliography:

- 1. Levkina, K. Yu. Ultrasound examination of stomach disorders of cats and dogs / K. Yu. Levkina, A. V. Zagumennov // Innovative ideas of young researchers for the agro-industrial complex: collection of materials of the International scientific-practical conference of young scientists. - Penza, 2021. - P. 188-190.*
- 2. Kiseleva, E. Yu. Etiology and statistics of diseases of the gastrointestinal tract of dogs and cats / E. Yu. Kiseleva, A.A. Darbinyan // Scientific aspect. - 2019. - V. 12, № 2. - P. 1514-1517.*
- 3. Fedulova, D. Morphological manifestations of pathologies of non-infectious etiology of cats / D. Fedulova, O.V. Vavina // Vestnik of Nizhny Novgorod State Agricultural Academy. - 2017. - № 3 (15). - P. 20-26.*
- 4. Timokhina, M.A. Biochemical and clinical blood parameters of cats with gastritis of Scottish and British breeds / M.A. Timokhina, A.S. Chernakova // PRIORITY DIRECTIONS OF REGIONAL DEVELOPMENT: materials of the All-*

Russian (national) scientific-practical conference with an international participation. - 2020. - P. 809-812.

5. Sapozhnikov, A. V. *Clinical and endoscopic picture of pathologies of internal organs of dogs and cats / A. V. Sapozhnikov, E. M. Maryin, P. M. Lyashenko // Vestnik of Ulyanovsk State Agricultural Academy. - 2015. - № 4 (32). - P. 143-146.*

6. *Application of methyluracil in complex therapy of acute pancreatitis of domestic animals / M. V. Bendyurina, V. G. Parkhomenko, Yu. A. Khmeleva, N. I. Kocherova, T. S. Bratashova // Caspian international youth scientific forum of agricultural technologies and food security. - 2018. - P. 38-39.*

7. Shunaeva, A. V. *New approaches in treatment of pancreatitis of cats in Krasnodar clinic of the city of Krasnodar / A. V. Shunaeva, G. A. Burmenskaya // Veterinary medicine of the Kuban. - 2021. - № 2. - P. 49-51.*

8. Ushakova, T.M. *Pharmacocorrection of acute catarrhal gastritis of dogs against the background of diet therapy / T. M. Ushakova, T. N. Derezhina // Current problems and methodological approaches to diagnosis, treatment and prevention of animal diseases: materials of the International Scientific and Practical Conference. - 2020. - P. 101-105.*

9. *Study of the therapeutic efficacy of "Meksidol-vet" medication in veterinary geriatrics / A. A. Volkov, S. A. Staroverov, A. N. Ostapchuk, S. V. Kozlov, V. V. Arsenievich // Russian veterinary journal. - 2017. - № 10. - P. 33-37.*

10. Kiseleva, E. Yu. *Etiology and statistics of diseases of the gastrointestinal tract of dogs and cats / E. Yu. Kiseleva, A.A. Darbinyan // Scientific aspect. - 2019. - V. 12, № 2. - P. 1514-1517.*

11. *Morphobiochemical blood parameters of animals with some diseases of the digestive system / V. S. Stepanov, A. A. Volkov, S. V. Kozlov, S. A. Staroverov, A. P. Volkova, A. M. Subbotin // Scientific notes of the educational institution Vitebsk Order Badge of honor State Academy of Veterinary Medicine. - 2011. - V. 47, № 2-1. - P. 207-211.*

MITOSIS PHYSIOLOGY AND PATHOLOGY DURING STUDY OF KINETIC PARAMETERS OF GROWTH OF EPITELIAL ORIGIN

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Key words: pathomorphology, histology, proliferative activity, mitotic index, number of mitoses, pathological mitosis, apoptotic index, adenocarcinoma, mammary gland, cat.

This article presents results of a study of proliferative activity of moderately differentiated tubulopapillary adenocarcinoma in the mammary gland of cats. The studies were carried out on the basis of Interdepartment Scientific Center of Veterinary Medicine of Ulyanovsk State Agrarian University. Pathological material was obtained by excisional biopsy in accordance with the rules for taking biomaterial for histological studies. The biopsy material was freed from formalin by rinsing in tap water for 12 ... 24 hours. Slices of 20 ... 30 μm thick were obtained using a freezing microtome MZ-2. The preparations were stained with hematoxylin and eosin according to the standard technique. The parameter of mitotic activity of tumor tissue, the mitotic index, was calculated as the number of mitoses per 1000 cells of the tumor parenchyma, measured in the areas with the highest proliferative activity of the neoplasm on the periphery of the tumor node. Cell nuclei in a state of physiological rest, as well as at the stages of mitosis and apoptosis, clearly visible on photographs of the microscope visual fields, were marked in a graphic editor and counted using the ImageJ program. Based on the data of histological diagnostics of biopsy material slices, such kinetic parameters of tumor growth as mitotic activity were studied - the mitotic index, the number of mitoses in the field of view, the proportion and types of pathologies of cell division, and the cell loss factor, numerically measured in the form of the apoptotic index

were calculated. Based on the obtained data, a characteristic was given of the growth rate and invasiveness of this neoplasm of epithelial origin, as well as a prognosis of metastatic activity, the risk of recurrence and the likelihood of complete morphological regression of tumor tissue after radiation and chemotherapy.

Bibliography:

1. Terentiev, I. G. *Research of kinetic parameters of tumor growth in the aspect of predicting the course of recurrent and metastatic neoplasms / I. G. Terentiev, S. S. Kuznetsov, K. V. Bazanov // Fundamental research. - 2015. - № 1-6. - P. 1235-1239.*
2. *Deep learning algorithms out-perform veterinary pathologists in detecting the mitotically most active tumor region / M. Aubreville, C. A. Bertram, C. Marzahl [et al.] // Sci Rep. - 2020. - 10. - P. 16447. - URL: <https://doi.org/10.1038/s41598-020-73246-2>.*
3. *Multivariate prognostic evaluation of the mitotic activity index and fibrotic focus in node-negative invasive breast cancers / J. Baak [et al.] // European journal of cancer. 2005. 41 (14). - P. 2093-101.*
4. *Bazanov, K. V. Modeling growth kinetics of recurrent and metastatic colorectal cancer in order to assess the effectiveness of chemotherapeutic treatment / K. V. Bazanov, S. S. Kuznetsov, I. G. Terentiev // Modern technologies in medicine. - 2014. - V. 6. - P. 85-91.*
5. *Meuten, Donald J. Tumors in Domestic Animals, Fifth Edition / Donald J. Meuten // John Wiley & Sons, Inc. - 2016. - P. 1008.*
6. *Indolent course of adrenocortical cancer: clinical and morphological characteristics of 7 patients / V. Yu. Bokhyan, A. I. Pavlovskaya, A. A. Kolomeitseva, V. E. Bugaev, I. S. Stilidi // Endocrine surgery. - 2016. - V. 10, № 4. - P. 13–19.*
7. *Strukov, A. I. Pathological anatomy: textbook / A. I. Strukov, V. V. Serov; edited by V. S. Paukov. - 6th ed., Rev. and add. - Moscow: GEOTAR - Media, 2015. - 880 p. - ISBN 978-5-9704-6138-9.*

8. *Therapeutic pathomorphosis of malignant tumors: clinical and morphological criteria. Classifications. The prognostic value of therapeutic pathomorphosis in breast cancer and other tumors / A. A. Lisaeva, Ya. V. Vishnevskaya, E. M. Roshchin, D. V. Komov, I. V. Kolyadina // Tumors of the female reproductive system. - 2011. - № 4. - P. 19-23.*
9. *Outcomes after high-dose radiation in the management of neuroendocrine neoplasms / K. S. Chen, C. Lawhn-Heath, S. Behr, R. Juarez, J. Whitman, A. Paciorenk [et al.] // PLoS ONE. - 2021. - 16 (6). - R. e0252574. - URL: <https://doi.org/10.1371/journal.pone.0252574>*
10. *Meuten, D. J. Mitotic Count and the Field of View Area: Time to Standardize / D. J. Meuten, F. M. Moore, J. W. George // Veterinary Pathology. - 2016. - Vol. 53 (1). - P. 7-9.*
11. *Levitskaya, A.B. Modern methods for apoptosis specification / A.B. Levitskaya, D.B. Nikityuk // Vestnik of new medical technologies. - 2005. - V. XII, № 3-4. - P. 33.*
12. *Tyshko, N. V. Specification of apoptosis activity in the organs of rats on the model of CCl4 toxic impact / N. V. Tyshko, K. E. Selyaskin, V. A. Tuteliyan // Fundamental research. - 2014. - № 10-5. - P. 993-998.*
13. *Introduction to methodology of apoptosis research in oncological diseases / V.N. Tsygan, A.M. Ivanov, V.A. Bubnov [and others]. - St. Petersburg: VmedA, 2010. - 64 p. - ISBN 978-5-98825-009-2.*
14. *Wong, R. S. Apoptosis in cancer: from pathogenesis to treatment / R. S. Wong // J Exp Clin Cancer Res. - 2011. - 30 (1). - P. 87. - URL: <https://doi.org/10.1186/1756-9966-30-87>*
15. *Kalinichenko, S. G. Morphological characteristics of apoptosis and its significance in neurogenesis / S. G. Kalinichenko, N. Yu. Matveeva // Morphology. - 2007. - V. 131, № 2. - P. 16-28.*
16. *Mitko, V. Assessment of algorithms for mitosis detection in breast cancer histopathology images / V. Mitko, P. J. van Diest, S. M. Willems // Med Image Anal. - 2015. - 20 (1). - P. 237-248.*

REARING OF YOUNG GOATS WITH APPLICATION OF NON-CONVENTIONAL FEED ADDITIVES IN THEIR RATIONS

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Key words: goats, feeding, feed additives, live weight, efficiency.

The aim of the research is to determine the effectiveness of non-traditional feed additives in the rearing of young goats. To conduct the scientific and economic experiment, three groups of young goats were formed. Average daily rations of young goats met the feeding requirements in terms of exchange energy, dry matter, crude protein, except digestible protein, copper, and cobalt. The data analysis of live weight dynamics showed that there was no significant difference between the groups of animals at the beginning of the experiment. However, the animals of the experimental groups that consumed feed additives exceeded the live weight of goats from the control group starting from the age of 6 months. Upon reaching the age of 6 months, the animals from the control group were inferior in live weight to the goats of the experimental groups by 3.51% and 4.39%, at 8 months - by 3.72% and 6.69%, at 10 months - by 3.61% and 6.89% ($P > 0.95$), and at the age of 12 months - by 3.59% and 7.78%, respectively ($P > 0.99$). Data analysis of the average daily gains of the experimental animals showed the superiority of the goats of the experimental groups over the control group in terms of growth intensity. Animals of the experimental groups surpassed animals of the control group in terms of average daily gains of live weight at the age of 4-6 months by 20.93% and 25.58%, in the period of 6-8 months - by 4.89% and 19.52%, at 8-10 months - by 2.78% and 8.33%, and in the period of 10-12 months of age by 3.46% and 17.11%, respectively. Thus, application of non-traditional

feed additives in rations of goats contributes to improvement of growth and development parameters without negative affect on the body.

Bibliography:

1. Popova, A.S. *Current state of the goat breeding market* / A.S. Popova, A.T. Aydinova // *New science: new challenges: collection of scientific papers of the I International scientific and practical conference.* - 2018. - P. 37-58.

2. Rybalova, T.I. *Dairy goat breeding as a point of growth* / T.I. Rybalova // *Dairy industry.* - 2018. - № 7. - P. 56-59.

3. *Quality and safety of meat of broiler chickens in correction of pre-slaughter stress* / A. V. Miftahutdinov, E. R. Sayfulmulyukov, E. A. Nogovitsina, E. A. Miftahutdinova // *Achievements of science and technology of the agro-industrial complex.* - 2020. - V. 34, № 3. - P. 71-74.

4. *Feeding of farm animals: a text book* / N. I. Vladimirov, L. N. Cheremnyakova, V. G. Lunitsyn, A. P. Kosarev, A. S. Popelyaev. - Barnaul: Publishing house of ASAU, 2008. - 211 p.

5. *Feed additive "Glimalask-vet" for correction of stress adaptation of bull calves during fattening period* / M. I. Slozhenkina, A. N. Struk, B. K. Bolaev, O. N. Konieva, D. A. Randelin, A. L. Alekseev // *Vestnik of Russian agricultural science.* - 2017. - № 1. - P. 68-70.

6. *Physico-chemical study of quail meat under feed stress and stress correction with sapropel extract* / E.V. Tolpyshev, M.V. Zabolotnykh, A. Yu. Nadtochiy, M.P. Pogrebnyak // *Vestnik of Omsk State Agrarian University.* - 2016. - № 2 (22). - P. 190-193.

7. *Development of ways to improve the efficiency of the acclimatization process and meat productivity of young cattle in Yakutia: monograph* / M.F. Grigoriev, A.I. Grigoriev. - Yakutsk: Publishing House of NEFU named after M.K. Ammosov, 2019. - 120 p.

8. *Natural sorbent in feed for calves* / O. B. Filippova, A. N. Zazulya, A. I. Frolov, V. I. Vigdorovich // *Science in Central Russia.* - 2017. - № 1 (25). - P. 63-68.

9. *Efficiency of using spropel and spropverm "Etkul Energy" in rations of young cattle / O. A. Bykova, M. B. Rebezov, N. V. Sadovnikov, N. D. Ovcharenko, L. G. Mukhamediyarova // Agrarian Vestnik of the Urals. - 2017. - № 12 (166). - P. 4-8.*

10. *Kravchik, E. G. Nutrient digestibility of corn-sapropelic feed in case of its usage in the diets of dairy cows / E.G. Kravchik; edited by V. K. Pestis // Agriculture - problems and prospects: collection of scientific papers. - Grodno, 2018. - P. 114-122.*

11. *On the issue of using local non-traditional feed additives in the feeding system of farm animals and birds in Yakutia / M.F. Grigoriev, N.M. Chernogradskaya, A.I. Grigorieva // Development of the branches of the agro-industrial complex based on the formation of an effective management mechanism. Materials of the International Scientific and Practical Conference. - Kirov: FSBEI HE Vyatka State Agricultural Academy, 2019. - P. 65-68.*

12. *Usage of non-traditional feed additives in horse feeding / A.A. Sidorov, A.I. Grigorieva, M.F. Grigoriev // Agricultural science in the innovative development of agriculture in Yakutia: collection of scientific articles. Issue 2; Arctic State Agrotechnological University. - Yakutsk: Publishing House of NEFU, 2021. - P. 12-16.*

13. *Frolkis, L.S. Research of mineral exchange / L.S. Frolkis // Reference book of a paramedic and delivery nurse. - 2009. - № 7. - P. 35-45.*

14. *Frolkis, L.S. Research of mineral exchange / L.S. Frolkis // Reference book of a paramedic and delivery nurse. - 2009. - № 8. - P. 27-36.*

15. *Influence of protein and mineral feed additives on growth and development of young cattle in Yakutia / N.M. Chernogradskaya, S.I. Stepanova, A.I. Grigorieva, M.F. Grigoriev // Scientific support of sustainable functioning and development of the agro-industrial complex of Yakutia: collection of scientific papers. - Yakutsk: Alaas, 2019. - P. 167-170.*

MICROELEMENT COMPOSITION OF MUSCLE TISSUE OF BROILER CHICKEN IN CASE OF APPLICATION OF COMPLEX FEED ADDITIVE

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Key words: broiler chickens, muscle tissue, complex feed additive, trace elements, iron, copper, zinc, manganese.

The results of the influence of "Zaslon 2+" complex feed additive on the content of microelements in the muscles (breast, femur, lower leg) of broiler chickens of Ross 308 cross are presented. Two groups of birds were formed, each contained 100 birds. Birds of the control group were fed with the main ration. The main ration in the experimental group was used in combination with "Zaslon 2+" complex feed additive throughout the entire period of the study. Positive effect of the complex feed additive on concentration of microelements in the muscle tissue of broiler chickens was noted throughout the experiment. Thus, the level of iron in pectoral muscles of the birds of the experimental group increased by 9.1%, copper - by 6.7%, zinc - by 6.9% on the 38th day of the experiment, in comparison with the control group. The concentration of iron in femoral muscles of broiler chickens after application of the feed complex was higher by 18.1%, zinc - by 16.2 in relation to the parameters of the control group. The content of mineral elements in leg muscles of broiler chickens from the experimental group was higher than their concentration in the muscles of the birds from the control group. So the level of iron was higher - by 27.6%, copper - by 23.1%, zinc - by 11.8%. An increase of the content of microelements in the muscle tissue of birds indicates a positive effect of the components that make up the complex of additional nutrition.

Bibliography:

1. Nikonov, I.N. *Effective barrier to mycotoxins in poultry* / I.N. Nikonov // *World and Russian trends in development of poultry farming: realities and challenges of the future: materials of the 19th International conference*. - Sergiev Posad, 2018. - P. 280–283.
2. *Parameters of mineral metabolism in blood and liver of laying hens after application of a complex probiotic additive* / V. I. Kotarev, L. I. Denisenko, V. V. Shipilov, P. Okonevski // *Veterinary Pharmacological Vestnik*. - 2021. - №1 (14). - P. 35-42.
3. *Increase of the resistance and immune status of broilers by including biologically active substances of different spectrum of action in their rations* / A. V. Bushov, V. V. Kurmanaeva // *Vestnik of Ulyanovsk State Agricultural Academy*. - 2012. - №4 (20). - P. 87-92.
4. *The content of vitamins A and E in poultry liver when phytase is used in rations of different nutritional supply* / E. A. Rusakova, A. M. Korotkova, D. B. Kosyan, O. V. Kwan, E. V. Sheida // *Current problems of science and education*. - 2015. - №2. - P. 2.
5. *Control of feed safety on poultry farms in Siberia* / S. Lysko, O. Suntsova, O. Makarova // *Compound feed*. - 2012. - №2. - P. 99.
6. *Safety of feed, feed additives and food products: monograph* / Yu. A. Ponomarenko, V.I. Fisinin, I.A. Egorov. - Minsk: *Ecoperspectiva*, 2012. - 894p. - ISBN 978-985-469-339-2.
7. *Intensive feeding of agricultural birds: a textbook* / E.E. Epimakhova, N.V. Samokish, B.T. Abilov. - St. Petersburg: *Lan*, 2020. - 92 p. - ISBN 978-5-8114-3821-1.
8. *Component feed additives in the diets of laying hens* / L.S. Ignatovich // *Poultry farming*. - 2013. - №7. - P. 9-12.
9. *Ways of increasing the efficiency of production of eggs and egg products in Russia* / G.A. Bobyleva // *Poultry and poultry products*. - 2013. - №4. - P. 22-25.

10. Kotarev, V. I. *Metabolism of mineral substances and productive parameters of broiler chickens when using "Likvipro" feed additive* / V. I. Kotarev, L. V. Lyadova, N. N. Ivanova // *Veterinary pharmacological Vestnik*. - 2019. - №4 (9). - P. 27-36.
11. Lebedev, S. V. *Dynamics of chemical composition and morphofunctional state of reproductive organs of chickens in different ontogenesis periods* / S. V. Lebedev // *Young scientist*. - 2011. - V. 1. - P. 65.
12. Tishenkov, A. N. *Dynamics of the content of vitamins A, E and iron in the liver of broiler chickens* / A. L. Tishenkov, Yu. L. Mikulets // *Veterinary medicine*. - 2002. - №11. - P. 30-31.
13. Kotarev, V. I. *Evaluation of the growth of young hens of egg direction and their survivability in case of application of a probiotic supplement in rations* / V. I. Kotarev, L. I. Denisenko // *Veterinary pharmacological Vestnik*. - 2020. - №2 (11). - P. 103-105.
14. *Influence of dietary peas and organic acids and probiotic supplementation on performance and caecal microbial ecology of broiler chickens* / J. Czerwinski [et al.] // *Br. Poult. Sci.* - 2010. -- 51 (2). - P. 258-569.
15. Kochish, I.I. *The effectiveness of usage of Baksin-vet immunostimulating product in poultry farming* / I.I. Kochish, M. S. Naydenskiy, M. E. Totoeva // *Poultry and poultry products*. - 2008. - №5. - P. 29-31.
16. Nikonov, I.N. *Effective barrier to mycotoxins in poultry* / I.N. Nikonov // *World and Russian trends in the development of poultry farming: realities and challenges of the future: materials of the 19th International conference*. - Sergiev Posad, 2018. - P. 280–283.
17. Gribanova, E. A. *Influence of potassium humate on enzyme profile of hepatocytes of broiler chickens* / E. A. Gribanova, R. G. Karimova // *Vestnik of Samara State Agricultural Academy*. - 2015. - №1. - P. 41-43.
18. Lopes, E. C. *The impact of feed withdrawal on quality, safety. Yield of processed chickens* / E. C. Lopes // *Poultry International*. - Vol. 50, №3. - P.50-58.

19. "Zaslon 2+" sorbent-regulator with enhanced sorption properties against non-polar toxins. - URL: https://biotrof.ru/produkcija/zaslon_2.

20. Ivanova, N.N. Productivity of broiler chickens in case of addition of a complex of additional nutrition / N.N. Ivanova // Vestnik of KrasSAU. - 2020. - №6 (159). - P. 223-228.

THE INFLUENCE OF ORGANIC ACIDS AND THEIR SALTS ON GROWTH OF BROILER COCKERELS OF "ROSS-308" CROSS

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Key words: broiler chickens, organic acid, butyrates, live weight, average daily gain.

The article discusses the effect of Presan and Selko pH feed additives, which consist of organic acids added into concentrated feed and drinking water, on live weight of broiler chickens. Totally, six rations were studied: the control group was given antimicrobial medications from 1 to 4 and from 19 to 22 days; as for group 2, in addition to the above scheme, Bacitracin antibiotic was additionally introduced into the feed; Group 3 was given antibiotics in the first two phases of growth, and Presan additive was added to the feed in the given dosages; Group 4 was given antibiotics at the start and growth stage together with Selko pH, and at the finish stage - Selko pH without antibiotics; Group 5 was given antibiotics together with Selko pH at the start and growth stages, and at the finish stage - Selko pH without antibiotics and, additionally, Presan additive in the given dosages was introduced into the feed at all growth phases; Group 6 was given only additives in the established dosages in feed and water, without application of

antimicrobial medications at all growth stages. Analysis of the results on growth dynamics of chickens showed changes in growth of chickens at different age periods. At the age of 40 days, the best results were recorded in the 1st, 3rd and 4th groups: 2964.7 g, 2937.0 g and 2942.9 g, respectively. Broilers of the 6th group (2903.8 g) fell slightly behind, receiving feed and drinking water without introduction of antimicrobial medications.

Bibliography:

- 1. Zyuban, A. V. Development of a functional feed additive for young farm animals / A. V. Zyuban, M. V. Kaledina // Gorinsky readings. Innovative solutions for the agro-industrial complex: materials of the International Student Scientific Conference. In 4 volumes. - Maisky: Belgorod State Agrarian University named after V.Ya. Gorin, 2020 .- P. 370.*
- 2. Increase of stress resistance, productivity and ecological purity of production of cows, laying hens and broilers when using sorbing and antioxidant additives in rations / V. E. Ulitko, S. P. Lifanova, O. E. Erisanova [and others] ... - Ulyanovsk: Ulyanovsk State Agrarian University named after P.A. Stolypin, 2019 .- 434 p. - ISBN 9785604348345.*
- 3. Kotarev, V. I. Chemical composition of meat and liver of broiler chickens when using "Zaslon 2+" supplementary feed complex in the ration / V. I. Kotarev, N. N. Ivanova // Vestnik of Ulyanovsk State Agricultural Academy. - 2021. - № 1 (53). - P. 183-187. - DOI 10.18286 / 1816-4501-2021-1-183-187.*
- 4. Kotarev, V. I. Influence of the complex of additional nutrition "Zaslon 2+" on the content of trace elements in blood and liver of broiler chickens / V. I. Kotarev, N. N. Ivanova, V. V. Shipilov // Veterinary medicine of the Kuban. - 2021. - № 3. - P. 17-18. - DOI 10.33861 / 2071-8020-2021-3-17-18.*
- 5. PSVIII-4 Bone marrow architectonics of turkeys hybrid cross "Converter" / V. I. Kotarev, P. A. Parshin, E. V. Mikhailov [et al.] // Journal of Animal Science. - 2020. - Vol. 98, no S4. - P. 253-254. - DOI 10.1093 / jas / skaa278.457.*
- 6. Disorders of the metabolic status and morphofunctional state of liver and kidneys of chicken / P. Anipchenko, S. Shabunin, V. Kotarev [et al.] // FASEB*

Journal. - 2020. - Vol. 34, no S1. - P. 03896. - DOI 10.1096 / fasebj.2020.34.s1.03896.

7. *Martynova, E. G. Experiment of using feed additives in feeding of hens of egg breeds / E. G. Martynova, P. P. Kornienko // Youth Agrarian Forum - 2018: materials of the International Student Scientific Conference, Belgorod, March 20-24, 2018. - Belgorod: Belgorod State Agrarian University named after V.Ya. Gorin, 2018. - P. 183.*

8. *Calcium And Phosphorus Feed Supplement FAX-2 In The Feeding Of Laying Hens Of Industrial HERD / AN Dobudko, OE Tatyanchieva, IA Boyko, OA Popova, PP Kornienko, VS Burlakov, YN Litvinov // Research Journal of Pharmaceutical, Biological and Chemical Sciences. - 2018. - 9 (6). - R. 1551-1559.*

9. *Various sources of methionine in broiler chicken rations / I. Koshchayev, K. Mezinova, A. Ryadinskaya [et al.] // E3S Web of Conferences: 8, Rostovon-Don, 19-30 August 2020. - Rostovon-Don, 2020. - P. 06009. - DOI 10.1051 / e3sconf / 202021006009.*

10. *The multi factor influence of housing conditions on productivity of broiler chickens / O. N. Yastrebova, A. N. Dobudko, V. A. Syrovitsky, A. E. Yastrebova. - Belgorod: Publishing and Printing Center "POLITERRA", 2018. - 63 p. - ISBN 9785982422576.*

11. *Non-traditional feeds in the ration of agricultural poultry / O.E. Tatyanchieva, A.P. Khokhlova, N.A. Maslova, O.A. Popova. - Maisky v.: Belgorod State Agrarian University named after V.Ya. Gorin, 2018. - 200 p. - ISBN 9785905686979.*

12. *The multi factor influence of housing conditions on productivity of broiler chickens / O. N. Yastrebova, A. N. Dobudko, V. A. Syrovitsky, A. E. Yastrebova. - Belgorod: Publishing and Printing Center "POLITERRA", 2018. - 63 p. - ISBN 9785982422576.*

13. *Kotarev, V. I. Dynamics of morphological and biochemical parameters of blood of broiler chickens which receive enterosorbent in the process of growing /*

V. I. Kotarev, N. N. Ivanova // *Poultry and poultry products*. - 2020. - № 2. - P. 44-46. - DOI 10.30975 / 2073-4999-2020-22-2-44-46.

14. *Study of the correlation between the main zootechnical parameters and parameters of probiotic cultures used in feed* / I. A. Koshchaev, K. V. Mezinova, N. N. Sorokina [and others] // *Current problems of agricultural biology*. - 2020. - № 4 (18). - P. 123-130.

15. *Histomorphometric indicators of chicken-broilers spleen of the cobb-500 cross within the species-specific interferon* / VI Kotarev, EV Mikhailov, NA Khokhlova [et al.] // *BIO Web of Conferences: International Scientific-Practical Conference "Agriculture and Food Security: Technology, Innovation, Markets, Human Resources "(FIES 2019), Kazan, November 13-14, 2019*. - Kazan: EDP Sciences, 2020. - P. 00100. - DOI 10.1051 / bioconf / 20201700100.

16. *Identification of cases of pododermatitis in broiler chickens when feeding a probiotic feed additive* / I. Koshchaev, K. Mezinova, A. Ryadinskaya [et al.] // *E3S Web of Conferences: 8, Rostovon-Don, August 19–30 2020 year*. - Rostovon-Don, 2020. - P. 06023. - DOI 10.1051 / e3sconf / 202021006023.

17. *Modern technologies of rearing of broiler chickens: monograph* / A. N. Dobudko, V. A. Syrovitsky, O. N. Yastrebova, S. A. Chuev. – Maisky v.: Belgorod State Agrarian University named after V.Ya. Gorin, 2020 .- 204 p.

18. *Improvement of application of antibacterial agents in industrial animal husbandry and poultry farming. Bacteriophages and organic acids as a means of effective combating of bacterial infections* / A. V. Danilyuk, A. D. Mitrikova, E. A. Yakimova, A. V. Kapustin // *Russian Journal. Problems of veterinary sanitation, hygiene and ecology*. - 2018. - № 1 (25). - P. 124-128. - DOI 10.25725 / vet.san.hyg.ecol.201801021.

19. *Otchenashko, V. Each acidifier has its own characteristics* / V. Otchenashko // *Animal husbandry of Russia*. - 2016. - № S1. - P. 29-31.

20. *Usage of modern feed additives in rations of agricultural poultry* / O. E. Tatiyanicheva, O. A. Popova, A. P. Khokhlova, N. A. Maslova, T. N. Ustinova. - Belgorod: FSBEI HE Belgorod SAU, 2020 .- P. 202.

**INFLUENCE OF BISOLBI BIO ADDITIVE IN THE RATIONS OF PIGS
ON PARAMETERS OF THEIR PROTEIN EXCHANGE AND
SURVIVABILITY OF PRENURSERY PIGS**

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Key words: sows, pregnancy, production cycle, blood, erythropoiesis, redox processes, immunoglobulins, colostrum, weaning, survivability.

The paper presents results of experimental studies on inclusion of Bisolbi feed additive in the rations of pregnant and lactating sows and its effect on biochemical parameters of their blood, immune status, colostrum quality and survivability of piglets by the day of weaning. The results of the research allow us to draw the following conclusions: sows that received Bisolbi product, in addition to their ration, at a dose of 0.5 and 1.0% of the feed mass had increased activity of hematopoietic and immune systems, also, the intensity of metabolic processes increases, which is confirmed by a rise of the total protein concentration and its fractions, as well as the protein index in their blood, which indicates an increase of assimilation processes in their body on the 100th day of gestation and by the day of weaning of piglets. Along with a rise of whey protein - globulin in the blood of sows in the experimental groups in all periods of the study, there is an increase in concentration of immunoglobulins of A, M and G classes in the same groups in comparison with control animals. These changes indicate more intensive redox, metabolism and energy processes in their bodies, which ultimately affected the survivability of piglets by the weaning day. These changes were most conspicuous when animals were fed with ration, enriched with Bisolbi at a dose of 1.0% of the compound feed weight.

Bibliography:

1. *Feed and biologically active feed additives for animals: a text book* / N. V. Mukhina, A. V. Smirnova, Z. N. Cherkay, I. V. Talalaeva. - Moscow: Kolos, 2008. - 268 p. - ISBN 978-5-9532-0535-1.
2. Abramkova, N.V. *Comparative efficiency of application of spore-forming probiotics in the technology of piglet rearing* / N.V. Abramkova // *Vestnik of Krasnoyarsk State Agrarian University*. - 2015. - № 8 (107). - P. 173-176.
3. *Physico-biochemical bases of bacterial degradation of xenobiotics* / L. A. Golovleva [and others] // *Microorganisms and biosphere: abstracts: International scientific conference*. - Moscow: INMI RAN, 2007. - P. 25-31.
4. Mareicheva, E. A. *Usage of probiotics in pig breeding* / E. A. Mareicheva, A. N. Zarubin, N. V. Abramkova // *Summary session of young scientists, held within the framework of the "Week of Science"*. - Orel, 2014. - P. 45-49.
5. Andreychuk, O. A. *Comparative effectiveness of sporogenic probiotics in feeding of weaned pigs* / O. A. Andreychuk // *Scientific journal of young scientists*. - 2019. - № 2 (15). - P.19-22.
6. *Productivity and parameters of blood of sows fed with probiotic supplements* / L. N. Gamko, T. L. Talyzina, V. E. Podolnikov, I. I. Sidorov, A. G. Menyakina // *BIOWebofConferences*. - 2020. - Vol. 27. - P. 00025.
7. Sein, O.B. *Influence of "Mucinol" probiotic preparation on physiological and biochemical status of pigs* / O.B. Sein, D.P. Chernikov // *Vestnik of Kursk State Agricultural Academy*. - 2018. - № 4. - P. 115-118.
8. *Probiotics in feeding of pigs* / R.V. Nekrasov, M.G. Chabaev, O.I. Bobrovskaya, P.V. Mytnikov, M.I. Kartashov // *Pig breeding*. - 2012. - № 6. - P. 31-33.
9. *Bio supplements in the diets of sows that increase the realization of productivity potential in industrial complexes: monograph* / A. V. Kornienko, V. E. Ulitko, E. V. Savina, L. A. Pykhtina. - Ulyanovsk, 2018. - 242 p. - ISBN 978-5-6041263-6-3.
10. Plokhinsky, N. A. *Biometrics: a text book* / N. A. Plokhinskiy. - Moscow: Publishing House of Moscow State University, 1970. - 377 p.
11. Talyzina, T. L. *The influence of probiotic additives on biochemical blood parameters of sows and their offspring* / T. L. Talyzina, Yu. S. Kopteva // *Intensity*

and competitiveness of livestock industries: materials of the International scientific and practical conference. - Bryansk, 2016. - P. 288-295.

12. Chernenok, V.V. Influence of probiotics on blood parameters and growth rate of suckling piglets / V.V. Chernenok, Yu. N. Chernenok, Yu. I. Simonov // Animal husbandry. - 2016. - № 5. - P. 24-25.

13. Ulitko, V. E. Morphobiochemical status of the blood of sows and the survivability of their offspring in case of application of "Biooretron-forte" preprobiotic additive in the diets / V. E. Ulitko, A. V. Kornienko, E. V. Savina // Agricultural science and education at the present stage of development: experience, problems and solutions: materials of the VII International scientific-practical conference. - Ulyanovsk: USAA, 2016. - P. 62-68.

14. Hecht, K. Heilung von Natur und Tierwelt durch die Anwendung des Naturzeoliths / K. Hecht. - Spurbuchverlag: Baunach, 2017. - 162 p.

15. Chemical composition of colostrum and milk of sows in case of application of probiotic and sorbing pre-probiotic supplements in the diets / A.V. Kornienko, V.E. Ulitko, E.V. Savina, L.A. Pykhtina // Animal husbandry. - 2016. - № 3. - P. 25-27.

16. Gamko, L. N. Probiotic additives in the rings of young pigs under the conditions of technogenous environmental pollution / L. N. Gamko, T. L. Talyzina, V. V. Talyzin // Research Journal of Pharmaceutical, Biological and Chemical Sciences. - 2019. - V. 10, № 1. - P. 1853-1859.

USAGE OF THE BLUP ANIMAL MODEL FOR ESTIMATION OF THE BREEDING VALUE OF SIMMENTAL COWS

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Key words: Simmental breed, breeding value assessment, milk productivity, fat content, protein content, correlation coefficient.

The article presents results of milk productivity analysis and calculation of the breeding value of cows (EBV) of different levels of productivity, using the BLUP ANIMAL MODEL methodology. The studies were carried out on Simmental cows from 14 regions of Russia, the total number was 61816 heads. The levels of development of the main parameters of milk productivity were assessed and a forecast of the breeding value of cows according to a number of parameters was obtained. It was found that productivity of Simmental cows born after 2005 is significantly higher: by +617 kg of milk ($P \leq 0.001$) and + 0.06% of protein in milk ($P \leq 0.001$), with a decrease of -0.02% of fat ($P \leq 0.001$), a service period of -4 days ($P \leq 0.001$) and the number of milking days by -20 ($P \leq 0.001$) in comparison with cows born earlier. Animals born after 2005 have higher EBV by mass fraction of milk fat with an average productivity of 5000 to 7000 kg of milk, where they have positive values in the range of + 0.0021 ... + 0.0041%, in comparison with cows born before 2005 years, which have negative values -0.0107 ... -0.0020%. As for EBV by mass fraction of milk protein of cows born after 2005, they had negative values in the range of -0.0037 ... -0.0008%, nevertheless, their values were much higher than the values of cows born earlier 2005 (values of -0.0057 ... -0.0028%). Sufficiently high correlation coefficients were obtained, $r = 0.568$ between phenotypic parameters of milk yield and its estimates, and $r = 0.450$ between parameters of the mass fraction of fat and its estimates.

Bibliography:

- 1. Explicit modeling of ancestry improves polygenic risk scores and BLUP prediction / C. Y. Chen, J. Han, D. J. Hunter, P. Kraft, A. L. Price // Genetic epidemiology. - 2015. - Vol. 39, № 6. - P. 427-438. - Doi: 10.1002 / gepi.21906*
- 2. Li, H. Y. Mapping soil salinity in the yangtze delta: REML and universal kriging (E-BLUP) revisited / H. Y. Li, R. Webster, Z. Hi // Geoderma. - 2015. - Vol. 237. - P. 71-77. - Doi: 10.1016 / j.geoderma.2014.08.008*

3. *Efficient estimation and applications of cross-validated genetic predictions to polygenic risk scores and linear mixed models / J. Mefford, N. Zaitlen, D. Park, Z. Zheng, J. Yang, A. Ko. - 2020. - Vol. 27, № 4. - P. 599-612. - Doi: 10.1089 / cmb.2019.0325*
4. *Usage of BLUP-assessment of servicing bulls of Yaroslavl breed in selection of highly productive cows and increase of their productive longevity / E. A. Zvereva, N. S. Furaeva, N. A. Muravyova, L. P. Moskalenko // Vestnik of the agro-industrial complex of the Upper Volga region. - 2016. - № 3 (35). - P. 58-62.*
5. *Shkuratova, G. M. Productive qualities of first-calf heifers of the Simmental breed of different breeding in a sharply continental climate / G. M. Shkuratova, T. N. Khamiruev // Dairy and beef cattle breeding. - 2016. - № 8. - P. 15–21.*
6. *Danshin, V. A. Assessment of the breeding value of bulls and cows of dairy breeds / V. A. Danshin, S. Yu. Ruban, V. Yu. Afanasenko // Animal biology. - 2017. - V. 19, № 1. - P. 44-53. - Doi: 10.15407 / animbiol19.01.044*
7. *The breeding value of servicing bulls by a complex of milk productivity parameters of their daughters / S. N. Kharitonov, E. E. Melnikova, N. S. Altukhova, A. P. Pyzhov, I. A. Lashneva, O. Yu. Osadchaya , A. A. Sermyagin // Vestnik of Timiryazev Agricultural Academy. - 2019. - № 4. - P. 77-87.*
8. *Kudinov, A.A. Application of the BLUP ANIMAL MODEL method for assessing the breeding value of Ayrshire cows in Leningrad region / A.A. Kudinov, A.V. Petrova, K.V. Plemyashov // Genetics and animal breeding. - 2017. - № 2. - P. 79-85.*
9. *Comparative characteristics of cattle herds based on the assessment of the breeding value of cows using the BLUP ANIMAL MODEL method / A. A. Sermyagin, I. N. Yanchukov, E. E. Melnikova, S. N. Kharitonov, R. V. Nekrasov // Vestnik of Kursk State Agricultural Academy. - 2018. - № 9. - P. 160-167.*
10. *Nikitin, S. A. Evaluation of the breeding value of Simmental and Holstein cows by the BLUP AM method / S. A. Nikitin // Modern problems in animal husbandry: state, solutions, prospects: materials of the International Scientific and Practical*

Conference dedicated to the 85th anniversary of Academician V.G. Ryadchikov. - 2019. - P. 169-177.

11. Usage of the BLUP Animal model method in specification of the breeding value of Holstein cattle in Leningrad region / K. V. Plemyashov, V. V. Labinov, E. I. Saksa, M. G. Smaragdov, A. A. Kudinov, A. V. Petrova // Dairy and beef cattle breeding. - 2016. - № 1. - P. 2–5.

12. Elevated haplotypes frequencies reveal similarities for selection signatures in Western and Russian Simmental populations / G. Mészáros, M. Fornara, H. Reyer, K. Wimmers, J. Sölkner, G. Brem, A. Sermyagin, N. Zinovieva // Journal of Central European Agriculture. - 2019. - № 20 (1). - P. 1-11. - DOI: 10.5513 / jcea01 / 20.1.2412.

13. Khainatskiy, V. Yu. Method of breeding assessment of servicing bulls of meat breeds on the basis of BLUP / V. Yu. Khainatskiy // Animal breeding and feed production. - 2021. - V. 104. - P. 23-31. - Doi: 10.33284 / 2658-3135-104-1-20

14. Firsova, E. V. Assessment results of the cattle breeding value of lines with application of methods of peer comparison and BLUP in Murmansk region / E. V. Firsova, A. P. Kartashova // Agrarian Vestnik of the Urals. - 2021. - № 5. - P. 63-70. - Doi: 10.32417 / 1997-4868-2021-208-05-63-70

15. Ignatieva, L.P. Comparative characteristics of animals of the Simmental breed of different origin based on the assessment of the breeding value of cows using the BLUP ANIMAL MODEL method in connection with the level of herd productivity / L.P. Ignatieva // Vestnik of KrasSAU. - 2020. - № 11 (164). - P. 152-161. - Doi: 10.36718 / 1819-4036-2020-11-152-161

16. Genetic value of Simmental servicing bulls of foreign selection in case of re-evaluation on the basis of breeding resources of Russia / A. A. Sermyagin, L. P. Ignatyeva, S. A. Shemetyuk, S. N. Kharitonov, I. Selkner, N. A. Zinovieva // Dairy and beef cattle breeding. - 2019. - № 7. - P. 13-18.

17. Development and improvement of the equations of the mixed BLUP model for assessing the breeding value of servicing bulls of Holstein black-and-white breed of the Republic of Kazakhstan / K. Zh. Zhumanov, T. N. Karymsakov, M. A.

Kineev, A. D. Baimukanov // *Agrarian science*. - 2021. - № 2. - P. 33-36. - DOI: 10.32634 / 0869-8155-2021-345-2-33-36

18. *Evaluation of breeding value of dairy breeds sires* / V. Danshyn, S. Ruban, O. Fedota, L. Mitiohlo, O. Borsch // *Technology of production and processing of livestock products*. - 2016. - № 2 (129). - P. 110-116.

19. *Application of BLUP AM in Russian Ayrshire cattle breeding value evaluation* / A. A. Kudinov, A.V. Petrova, K.V. Plemyashov // *The international conference on the Status of plant & animal genome research*. - 2017. - San Diego, CA, 14-18 January. - P. 0425.

20. *Masuda, Y. Introduction to BLUPF90 suite programs Standard Edition* / Y. Masuda. - University of Georgia, September 2019. - 199 p.

**ANALYSIS OF RELATIONS BETWEEN CHARACTERISTICS OF
ARGYROPHILIC ZONES IN POPULATIONS OF INTACT
LYMPHOCYTES OF DOMESTIC AND WILD SHEEP (OVIS AMMON)
HYBRIDS**

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Key words: argyrophilic structures, argali (Ovis ammon) , hybrids, sheep, lymphocytes, microphotometry, nucleolar organizers, nucleus.

The purpose of this study is to determine the relations between AgNOR characteristics, obtained by means of computer analysis, in populations of intact lymphocytes of hybrid sheep of different genotypes and to select parameters for

functional assessment of nucleoli. The AgNOR state was studied in peripheral blood lymphocytes of hybrid sheep of three genotypes: purebred F1 Romanov sheep with argali (group 1), hybrids carrying 3/4 of Romanov sheep blood and 1/4 of argali blood (group 2), and hybrids with 7 / 8 blood of domestic sheep and 1/8 of argali blood (group 3). The number of argyrophilic zones (AgNOR), their total area (ΣS_{NOR}), their average color density (D_{NOR}), and average color density of the nucleus (D_N) and its AgNOR-free area (D_F) were taken into account. Parameters which characterize argyrophilic zones and the correlation coefficients between them were calculated in the samples of lymphocytes obtained from hybrids of different genotypes and from their generalized population. The study of the preparations was carried out on the equipment of the Altami company (Russia, S.-P.). Image processing and analysis were performed using the Image Scope 1.0 software (SMA, Russia, M.). The closest correlations exist between parameters of color density, which confirms an equal possibility of using them in assessing the state of argyrophilic zones. It was found that the correlation coefficients between different compared features have values from close to 0 to 1.0. The number of AgNORs in a cell, their total area and average density are characteristics that complement each other, since they are weakly correlated with each other. To assess the state of the nucleus -forming system, it is advisable to take into account mutually complementary features: the number of AgNORs, their total area, as well as the average optical densities of AgNOR (D_{NOR}). The average nucleus density, closely correlated with D_{NOR} values, can serve as an alternative to this parameter.

Bibliography:

- 1. Functional value of the human SURF6nucleolus protein, a key protein of the of the same name eukaryotic family / M. Yu. Kordyukova, M. A. Polzikov, K. V. Shishova, O. V. Zatsepina // Reports of the Academy of Sciences. - 2014. - V. 455, № 4. - P. 1-3. - DOI: 10.7868 / S0869565214100211*

2. *Pelletier, J. Ribosome biogenesis in cancer: New players and therapeutic avenues / J. Pelletier, G. Thomas, S. Volarevic // Nat. Rev. Cancer. - 2018. -18. - P. 51–63. - DOI: 10.1038 / nrc.2017.104*
3. *Coexisting Liquid Phases Underlie Nucleolar Subcompartments / M. Feric, N. Vaidya, T. S. Harmon, D. M. Mitrea, L. Zhu, T. M. Richardson, R. W. Kriwacki, R. V. Pappu, C. P. Brangwynne // Cell. - 2016.-165. - P.1686-1697. - DOI: 10.1016 / j.cell.2016.04.047.*
4. *Functional features of nucleolar organizer in growing oocytes of immature female birds / A. G. Davidiyan, E. I. Koshel, O. B. Lavrova, A. G. Demin, S. A. Galkina, A. F. Sayfitdinova, E R. Gaginskaya // Ontogenesis. - 2017. - V. 48, № 3. - P. 263–269. - URL: https://elibrary.ru/download/elibrary_29404363_54891183.pdf*
5. *Tiku, V. Nucleolar Function in Lifespan Regulation / V. Tiku, A. Antebi // Trends Cell Biol. - 2018. - 28. - P. 662–672. - DOI: 10.1016 / j.tcb.2018.03.007.*
6. *Howell, W. Controlled silver staining of nucleolus organizer regions with a protective colloidal developer: in a one step method / W. Howell, D. Black // Experientia. - 1980. - V. 36. - P. 1014–1015.*
7. *Parameters of nucleolar organizers of duck erythrocytes in postnatal ontogenesis / V. I. Trukhachev, A. N. Kvochko, A. V. Malyukin, A. Yu. Krivoruchko, I. I. Nekrasova, V. S. Skripkin, F. A Meshcheryakov // Cytology. - 2016. - V. 58, № 3. - P. 229-233. - URL: https://elibrary.ru/download/elibrary_25676646_83866250.pdf*
8. *Changes of parameters of nucleolar organizers in cells of the renal tubules after partial nephrectomy when using catgut threads for suturing an operating wound / A. I. Sidelnikov, A. N. Kvochko, A. Yu. Krivoruchko, E. V. Shalamova // Vestnik of the Altai State agrarian university. - 2016. - № 5 (139). - P. 143-148.*
9. *Botasheva, V. S. The nature of morphological changes in case of hypothyrosis / V. S. Botasheva, A. A. Kaloeva, L. D. Erkenova // Fundamental research. - 2015. - № 1-1. - P. 36-40. - URL: https://elibrary.ru/download/elibrary_23033674_16949899.pdf*

10. *Interrelation of argyrophilic proteins of nucleolar-forming regions in mib-1 positive cells with clinical and morphological parameters and survival in case of non-small cell lung cancer / D. S. Kobayakov, A. M. Avdalyan, A. F. Lazarev, E. L. Lushnikova, L. M. Nepomnyashchikh // Fundamental research. - 2015. - № 1. - P. 1600-1604.*
11. *Bugorkova, S.A. The nucleolar apparatus of lymphocytes as a parameter of functional activity of lymphoid organs for preclinical assessment of vaccines / S.A. Bugorkova, T.N. Shchukovskaya, A.F. Kurylina // Problems of especially dangerous infections. - 2015. - Issue. 2. - P. 75-78. - URL: https://elibrary.ru/download/elibrary_23699694_93296639.pdf*
12. *The influence of new agents from raw antler deer material on biosynthetic processes in the cells of skeletal muscles of rats under conditions of prolonged physical activity / A. Yu. Zharikov, V. G. Lunitsyn, V. V. Lampatov, Yu. G. Motin, O. S. Talalaeva, D.V. Eliseev, G.V. Pavlyashik // Biomedicine. - 2016. - № 1. - P. 90-94. - URL: https://elibrary.ru/download/elibrary_26382946_45202615.pdf*
13. *Kopytko, A.S. Evaluation of protein-synthetic function of chickens of COBB 500 and ABER ACRESS PLUS crosses for predicting their productivity / A.S. Kopytko, A.N. Kvochko // Vestnik of AIC of Stavropol. - 2014. - № 4 (16). - P. 107-110.*
14. *International Wheat Genome Sequencing Consortium, Wu J, Nasuda S. Structural features of two major nucleolar organizer regions (NORs), Nor-B1 and Nor-B2, and chromosome-specific rRNA gene expression in wheat / H. Handa, H. Kanamori, T. Tanaka, K. Murata, F. Kobayashi, SJ Robinson, CS Koh, CJ Pozniak, AG Sharpe, E. Paux // Plant J. - 2018. - 96 (6). - P. 1148-1159. - DOI: 10.1111 / tpj.14094*
15. *Evaluation of nucleoli in intact lymphocytes of sheep using computer analysis of images / P. M. Klenovitsky, N. T. Onkorova, B. S. Iolchiev, V. A. Bagirov, L. G. Moiseykina // Theoretical and applied problems of agro-industrial complex ... - 2018. - № 3. - P. 42-46. - DOI: 10.32935 / 2221-7312-2018-36-3*

16. Klenovitskiy, P.M. Analysis of parameters which characterize nucleolar organizers in intact lymphocytes of hybrid goats / P.M. Klenovitskiy, B.S. Iolchiev, V.A. Bagirov // Vestnik of the Mari State University. Agricultural Sciences Series. Economic sciences. - 2019. - V. 5, № 3. - P. 298-304. - DOI: 10.30914 / 2411-9687-2019-5-3-298-304

CROSSING EFFICIENCY OF BESTUZHEV COWS WITH RED DANISH BULLS

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Key words: breed, Bestuzhev breed, red Danish, crossing, first-calf heifers, feeding ration, milk productivity.

The article presents results of studies on milk productivity of crossbred first-calf heifers obtained by crossing Bestuzhev cows with red Danish bulls. Feeding of both groups (control and experimental) was carried out with proper and balanced ration. Total nutritional value of the ration was 14.07 energetic feed units (EFU). One EFU accounted for 85.15 g of digestible protein, dry matter per 100 kg of live weight - 3.6 kg, fiber from dry matter - 23%. Sugar - protein ratio of the diet was at the level of 0.8. As a result, crossbred first-calf heifers had higher parameters of milk yield (by 20.57%), fat content (by 0.23%) and protein (by 0.07%) in milk compared to pure-bred Bestuzhev peers; they had also higher milking capacity index (by 14.14%). In addition, crossbred first-calf heifers show better development, their live weight is 26 kg or 5.64% higher than the level of the breed minimum requirements. Consequently, the effect of heterosis is noted when crossing Bestuzhev cows with red Danish bulls, which has a positive effect on better development of crossbred heifers and on increase of their milk productivity.

As a result, crossbred first-calf heifers meet the modern requirements of milk production technology on an industrial basis better than their Bestuzhev peers. Therefore, this method of crossing with the red Danish breed is advisable and should be used in selection and breeding work with the Bestuzhev breed.

Bibliography:

- 1. Sivkin, N. V. Fattening and meat qualities of bulls in case of intensive technology of a dairy complex / N. V. Sivkin, N. I. Strekozov, V. I. Chinarov // Dairy and meat cattle breeding. - 2016. - № 5. - P.20 - 22.*
- 2. Amerkhanov, Kh. A. The state and development of dairy cattle breeding in the Russian Federation / Kh. A. Amerkhanov // Dairy and meat cattle breeding. - 2017. - № 1. - P. 2-5.*
- 3. Subprogram "Improvement of the genetic potential of dairy cattle" of the Federal Scientific and Technical Program for Development of Agriculture for 2017 - 2025. Department of Scientific and Technological Policy and Education of the Ministry of Agriculture of the Russian Federation. - № 13/1339. - 28.07.2020. - P.12-13.*
- 4. Sharkaeva, G. A. Potential of the breeding base of imported dairy cattle in the Russian Federation / G. A. Sharkaeva, V. I. Sharkaev // Animal husbandry. - 2016. - № 1. - P. 2 - 4.*
- 5. Krasota, V. F. Bestuzhev cattle / V. F. Krasota, V. T. Lobanov, V. A. Babushkina. - Moscow: Selkhozgiz, 1952. - 192p.*
- 6. Klyushkin, K. I. Bestuzhev breed of cattle / K. I. Klyushkin, V. N. Kochetkov, A. A. Tolmanov. - Ulyanovsk: Privolzhskoe publishing house, 1976. - 144 p.*
- 7. Tolmanov, A. A. Bestuzhev breed: evolution, progress, preservation of the gene pool / A. A. Tolmanov, P. S. Katmakov, V. P. Gavrilenko. - Ulyanovsk, 2000. - 239p.*
- 8 Theory and practice of breeding work with Bestuzhev breed of cattle: monograph / V. N. Kochetkov, D. P. Khaisanov, V. E. Ulitko, P. S. Katmakov [and others]. - Ulyanovsk: State Agricultural Academy, 2004. - 457p.*

9. *Highly productive Bestuzhev cows and their economic and biological characteristics: a textbook / N. I. Stenkin, G. M. Mulyanov, S. N. Zolotukhin, S. P. Lifanova. - Ulyanovsk: USAA, 2017. - 254p.*
10. *Dunin, I. M. Results of valuation of dairy cattle in the Russian Federation / I. M. Dunin, V. I. Sharkaev, G. A. Sharkaeva // Yearbook on breeding work in dairy cattle breeding in the Russian Federation (2014) : Digest of articles. - Moscow: All-Russian Scientific Research Institute of Breeding, 2015. - P. 3-14.*
11. *Karamaev, S. V. Cattle breeding: textbook / S. V. Karamaev, Kh. Z. Valitov, A. S. Karamaeva. - St. Petersburg: Lan, 2018. - 548 p. - ISBN 978-5-8114-2776-5.*
12. *Genetic markers in breeding of dairy cattle / P.S. Katmakov, V.P. Gavrilenko, A.V. Bushov, N.I. Stenkin. - Ulyanovsk: Regional Printing House Pechatnyi dvor, 2010. - 84 p. - ISBN 978-5-7572-0265-5.*
13. *Vsyakikh, A. S. Imported cattle in the USSR (breeding and use) / A. S. Vsyakikh, M. S. Kurinsky. - Moscow: Kolos, 1976. - P. 185 - 199.*
14. *Dmitriev, N. G. Cattle breeds according to countries of the world. Reference book / N. G. Dmitriev. - Leningrad: Kolos (Leningrad branch), 1978. - P. 177 - 179.*
15. *Soldatov, A. P. Breeds of farm animals in Russia. Catalog / A.P. Soldatov. - Moscow: Astrel; AST, 2013. - P. 15 - 16.*
16. *Dunin, I. M. Dictionary - reference book / I. M. Dunin, A. G. Dankvert. - Moscow: All-Russian Scientific Research Institute of Breeding, 2013. - P. 26.*
17. *Medvedev, N. G. Breed and age characteristics of biochemical and morphological composition of blood of experimental animals / N. G. Medvedev // Scientific works of Ulyanovsk Agricultural Institute. - Ulyanovsk, 1978. - V. 14. - P.61 - 65.*
18. *Catalog of bulls - producers of Bestuzhev breed / N. I. Stenkin, Z. A. Aynatulov, A. Ya. Khakimov, M. A. Sapparova. - Ulyanovsk, 2010. - 32p.*
19. *Catalog of bulls - producers of "Head center of reproduction of farm animals". - Bykovo, 2014, 2015. - 35p.*

20. *Norms and rations for feeding of farm animals: a reference book / A. P. Kalashnikov, N. I. Kleimenov, V. N. Bakanov [and others]. - Moscow: Agropromizdat, 1985 .- 352p.*

REGRESSIONAL ANALYSIS OF THE STATE AND INTERACTION OF THE MAIN PROCESSES OF CATTLE METABOLISM ENERGY USAGE

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Key words: intracellular metabolism, heat supply, milk synthesis, ruminant process, arguments, functions, interactions.

Taking into account the growth of population, reduction of energy costs in food production is one of the urgent tasks of the human community. Metabolic energy is used for synthesis of new substances, is excreted from the body as part of milk, and is also converted into heat energy to maintain a constant body temperature of animals. The multi factor nature and complexity of the phenomenon currently does not allow to design a "metabolic map" of the genesis of gross feed energy into food for humans. Analysis of the problem (by methods of biological statistics) allows us to establish the most general concept and make a preliminary conclusion about the action and interaction of individual processes of using metabolic energy in a whole organism, to establish the value of independent factors - arguments and the influence of biological functions on the vital activity of animals. Improvement of isotherm by hereditary and technological factors contributes to growth of energy efficiency, productive animal husbandry.

Bibliography:

1. *Norms and rations for feeding of farm animals / A. P. Kalashnikov, V. I. Fisinin, V. V. Shchegolev [and others]. - Moscow: Znaniye, 2005 .- 456 p. - ISBN 5-94587-093-5.*
2. *Slonim, A.D. Physiology of thermoregulation and thermal adaptation of agricultural animals / A.D. Slonim. - Moscow - Leningrad: Nauka, 1966 .- 146 p.*
3. *Mokhov, B. P. Cattle breeding for positive behavior stereotype / B. P. Mokhov // Report of the All-Union Academy of Agricultural Sciences. - 1983. - № 9. - P. 32 - 35.*
4. *Bukarov, N. G. About the project of creating microchips for characterizing genetic structures, which determine reproduction level of farm animals / N. G. Bukarov, P. V. Gorelov, L. K. Ernst // Problems of animal productivity. - Borovsk, 2011. - P. 27 - 29.*
5. *Plokhinsky, N. A. Regression. Indicative functions. In the book Biometrics / N.A. Plokhinsky. - Moscow: Moscow University, 1970 .- P. 210 - 273.*
6. *Schmidt - Nielsen, K. The sizes of animals: why are they so important? / K. Schmidt - Nielsen. - Moscow: Mir, 1987 .- 259 p.*
7. *Ugolev, A. M. Food behavior and regulation of homeostasis. In the book Complex forms of behavior / A. M. Ugolev, V. G. Kassil. - Moscow - Leningrad: Nauka, 1965 .- P. 41-59.*
8. *De Roberts, E.D. Cell Biology. / E. D. de Roberts, V. Novinskiy, F. Saez. - Moscow: Mir, 1967 .- 473 p.*
9. *Grachev, I.I. Cytophysiology of milk secretion / I.I. Grachev, S.M. Popov, V.G. Skopichev. - Leningrad: Nauka, 1978 .- 241 p.*
10. *Mokhov, B.P. Specification of the breeding value of productive animals and improvement of methods for their selection / B.P. Mokhov // Animal husbandry. - 2017. - № 9. - P. 41-59.*
11. *Strekozov, N. I. Evaluation of dairy breeds by reproductive and adaptive abilities / N. I. Strekozov, N. V. Sivkin // Animal husbandry. - 2017. - № 7. - P. 2-6.*