

FEATURES OF TEMPERATURE REGIME IN A CONTACT TYPE UNIT WHEN DRYING SMALL SEED CROPS

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Key words: experimental studies, contact heat exchange, operating parameters, temperature gradient, seeds, moisture removal, transporting working body.

When creating modern effective complex technical systems that realize the processes of thermal impact on bulk agricultural materials with the required quality and at a high energy level, it is important to know the conditions of heat and moisture transfer. The target function of our research was scientific substantiation of the main thermophysical parameters of the studied process of thermal effect on the drying product as a whole, as well as identification of the effect of the created temperature regime of the drying unit on the temperature gradient when heating the treated seeds, and, ultimately, on the efficiency of the entire process. In case of contact drying of small-seeded crops, both external heat and moisture exchange processes are carried out - from the surface of the treated seeds to the external environment, and internal - the migration of heat and moisture inside the seeds. The main quantitative factor that most fully describes the mechanism of moisture transfer is the Bio criterion (Bi_m). This criterion establishes a relation between such parameters of the contact drying process as the intensity of moisture exchange on the surface of the processed grain and its moisture conductivity. The description of the process is reduced to solving an internal problem for the moisture contained in the processed grain, when considering the latter as a colloidal body, $Bi_m = 0.16$. In this case, the removal of moisture with its transformation into steam directly depends on the energy consumption for the heat treatment process. The driving force of this process is the temperature gradient

arising from thermal action. Studies have established that the kinetic coefficient, which most fully describes this phenomenon, is the thermal and moisture conductivity coefficient or the thermal gradient coefficient δ . This parameter characterizes the moisture content change in the processed grain at a temperature gradient equal to one degree Celsius. In order to confirm the above theoretical dependencies, experimental studies were carried out to identify the features of contact thermal effects on various small-seed crops. Based on the results of the studies, it was revealed that the following operating parameters have the greatest influence on temperature regime during grain drying in the developed contact type grain dryer: the temperature of the heating surface and the rotation frequency of the transporting working body. In this study, the rotation frequency of the transporting working body was changed from 30 min^{-1} to 110 min^{-1} , and the temperature of the heating surface - in the range from $40 \text{ }^\circ\text{C}$ to $100 \text{ }^\circ\text{C}$. It was revealed that the temperature gradient of grain heating in the developed installation for grain drying at appropriate drying modes is $9 \dots 12 \text{ }^\circ\text{C}$ and does not significantly depend on the type of processed seeds. When improving the operating parameters of the drying process of seeds of one crop, it is possible to operate the developed grain dryer without loss of quality during heat treatment of small seeds of other crops.

Bibliography:

- 1. Pakhomov, V.I. Improvement of heat treatment of feed grain with microwave energy. / V.I. Pakhomov, V.D. Kaun // Mechanization and Electrification of Agriculture, - 2000. - №. 9. - P. 8-11.*
- 2. Vargas, W.L. Heat conduction in granular materials / W.L. Vargas, J.J. McCarthy // AIChE Journal. - 2011. - 47, P. 1052-1059.*
- 3. Yadollahinia, A.R. Design and fabrication of experimental dryer for studying agricultural products / A.R. Yadollahinia, M. Omid, S. Rafie // Int. J. Agri. Biol. - 2010. - 10, P. 61-65.*
- 4. Converse, H.H. Transient heat transfer within stored in a cylindrical bin / H.H. Converse // Amer. Soc. Agr. Engrs., 2016. - №. 855.- P. 254-256.*

5. *Technology of post-harvest processing, storage and pre-sales preparation of crop production / V.I. Manzhosov, I.A. Popov, I.V. Maximov [and others]; edited by V.I. Manzhosov. - St. Petersburg: Lan, 2020. - 624 p. - ISBN 978-5-8114-5282-8.*
6. *Kurdyumov, V.I. Theoretical aspects of heat distribution in a contact-type installation during grain drying / V.I. Kurdyumov, A.A. Pavlushin, S.A. Sutyagin // Innovations in agriculture. - 2015. - №. 2 (12). - P.159-161.*
7. *Kwanchai, C. Performance and energy consumption of an impinging stream dryer for high-moisture particulate materials / C. Kwanchai, D. Sakamon, S. Somchart // Drying Technology. - 2010. - 28: 1, P. 20-29.*
8. *Savchenko, S.V. Development of scientific foundations and practical methods to improve the efficiency of grain drying technology: 05.18.01 technology of processing, storage and processing of grasses, legumes, cereals, fruits and vegetables and viticulture: dissertation of Doctor of Technical Sciences / Savchevko Svetlana Veniaminovna - Moscow, 2009. - 387 p.*
9. *Efficiency increase the of post-harvest grain processing / V.I. Kurdyumov, G.V. Karpenko, A.A. Pavlushin, S.A. Sutyagin // Reports of the Russian Academy of Agricultural Sciences. - 2011. - №. 6. - P. 56-58.*
10. *Pabis, Stanisław. Grain drying: theory and practice / Stanisław Pabis, Digvir S. Jayas, Stefan Cenkowski. New York: John Wiley, 2018. Description: xii, 303 p. : ISBN: 0471573876.*
11. *Nikolaev, V. A. Grain purification from impurities and its preliminary drying: monograph / V.A. Nikolaev. - Yaroslavl: Yaroslavl State Agricultural Academy, 2017. - 212 p. - ISBN 978-5-98914-180-7.*
12. *Malin, N.I. Energy-saving grain drying / N.I. Malin. - M. : Kolos, 2004. - 240 p.*
13. *Lykov, A.V. Theory of thermal conductivity / A.V. Lykov. - M. : Higher school, 1967. - 599 p.*
14. *Pat. 2465527 Russian Federation, IPC F26B 17/04. A device for grain drying / V.I. Kurdyumov, A.A. Pavlushin, S.A. Sutyagin; patentee – FSBEI HE Ulyanovsk State Agricultural Academy named after P.A. Stolypin. - Application No. 2011119459; app. 13.05.11; publ. 27.10.12, Bul. №. 30. (5 pages).*

15. Pat. 2436630 Russian Federation, IPC B02B 1/00. A device for grain drying / V.I. Kurdyumov, A.A. Pavlushin, S.A. Sutyagin; patentee - FSBEI HE Ulyanovsk State Agricultural Academy named after P.A. Stolypin. - Application No. 2010122224; app. 31.05.10; publ. 20.12.11, Bul. №. 35. (5 pages).
16. Moises, B.B. Statistical quality control methods and experimental data processing / B.B. Moises, I.V. Plotnikova, L.A. Redko. - Tomsk: TPU, 2016. - 119 p. - ISBN 978-5-4387-0700-4.
17. Adler, Yu.P. Planning an experiment in the search for suitable conditions / Yu.P. Adler, E.V. Markova, Yu.V. Granovsky - Moscow: Nauka, 1976. - 279 p.
18. Melnikov, S.V. Planning an experiment in the study of agricultural processes / S.V. Melnikov, V.R. Alyoshkin, P.M. Roshchin. - L. : Kolos, Leningrad department, 1980. - 168 p.

SPECIFICATION OF THE ABSOLUTE SPEED OF THE SOIL DISPLACED BY THE SPHERICAL DISC OF THE RIDGE SEEDER ROLLER

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Key words: energy saving, technology, soil, crop production, cultivation

Heuristic and technical analysis of various designs of tillage rollers of row-crop seeders has led to the conclusion that they are mainly intended for destruction of lumps and soil compaction before and after sowing on a flat field surface. When studying the available methods for assessing the impact on improvement criteria of the design parameters and surface features of individual working elements of the ridge-forming rollers, it was revealed that, currently, there are unresolved issues, in particular, the method for specification of the absolute speed of the soil displaced by the spherical discs of the ridge seeder roller. Thus, it is necessary to substantiate

theoretically this parameter of the tillage roller, which directly affects the distance between the spherical discs of the roller of the ridge seeder. For the finishing operation of formation of the soil ridge of the required parameters and density simultaneously with sowing, a roller was developed, the novelty of which is confirmed by the patents of the Russian Federation № 194330, № 194348, № 196712. The design of the roller includes regulation of the angles of attack of the spherical discs and the degree of compression of the spring, because these parameters have a significant effect on the geometric dimensions of the formed ridge and the density of the soil inside it. The proposed roller is mounted on the rear beam holder of the sowing section of the ridge seeder. Moving on the surface of the field, the ridge seeder colters sow seeds on a wet compacted bed, the ridge formers form a loose soil hill above the sown seeds and the rollers compact the soil hill. The speeds and forces acting on the spherical disc of the roller have been determined. It was theoretically revealed that the absolute speed of soil particles thrown by the edge of the spherical disc towards the symmetry longitudinal axis of the soil ridge is maximum and depends on the angular velocity of the spherical disc, its radius and angle of attack, as well as the frictional properties of the soil. As moving to the center of the spherical disc, the absolute speed of soil particles thrown from a specific point of the studied roller working body decreases.

Bibliography:

1. Zykin, E.S. Development and justification of technology and means of mechanization of ridge cultivation of row crops: spec. 05.20.01 "Technologies and means of agricultural mechanization: dissertation for the degree of Doctor of Technical Sciences / Zykin Evgeny Sergeevich; Ufa. - Ulyanovsk, 2017. - 637 p.

2. Design and study of seeding devices for small selection seeding machines / V. Nemtinov, N. Kryuchin, A. Kryuchin, Y. Nemtinova // E3S Web of Conferences. - ICMTMTE, 2019. - Vol. 126.

3. 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.

4. *Strekalov, S. Designing soil tillage devices for the spiral land cultivation system / S. Strekalov, L. Strekalova // E3S Web of Conferences. - ICMTMTE, 2019. – Vol. 126.*

5. *Bogus, A. E. Substantiation of the technological scheme of pneumatic grain seeder of subsurface dense sowing / A. E. Bogus, A. D. Kuzmenko // E3S Web of Conferences. - ICMTMTE, 2019. – Vol. 126.*

6. *Process modeling of the first interrowcultivation in laboratory conditions / E. Zykin, V. Kurdyumov, S. Lazutkina, O. Dmitriev // E3S Web of Conferences. - ICMTMTE, 2020. – Vol. 193.*

7. *The experimental determination of the diameter of a flat disk in a ridge seeder / E. Zykin, V. Kurdyumov, S. Lazutkina, S. Albutov // IOP Conf. Series : Materials Science and Engineering. - ICMTMTE, 2020. – Vol. 971.*

8. *Modeling of the sowing process of row crops in laboratory conditions / E. Zykin, V. Kurdyumov, S. Albutov, O. Dmitriev // E3S Web of Conferences. - ICMTMTE, 2020. – Vol. 193.*

9. *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.*

10. *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.*

11. Erzamaev, M. P. *Improvement of the efficiency of plowing units / M.P. Erzamaev, D.S.Sazonov, E.O. Salomatov // Innovative achievements of science and technology in the agro-industrial complex: collection of scientific papers of the International Scientific and Practical Conference. - Kinel: Samara State Agricultural Academy, 2017. - P. 689-692.*

12. Emelyanov, P. A. *Theoretical and experimental studies of the disc covering organ of the onion planting machine: monograph / P. A. Emelyanov, A. V. Sibirev, A. G. Aksenov. - Penza: Penza State Agricultural Academy, 2015. - 174 p. - ISBN 978-5-94338-449-4.*

13. Sydyk, D. A. *Recommendations on resource-saving technology for cultivation of grain crops in the conditions of dry-land 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.*

14. Akramkhanov, A. *Technology of planting crops along the ridges / A. Akramkhanov // TECHNOLOGIES & BEST PRACTICES FACTSHEET. - URL: <http://www.cacilm.org/articles/detail/493> (date of access 09.05.2021).*

15. *Block-modular unit for cultivation of row crops / A. V. Balashov, A. N. Omarov, Zh. Zh. Zaynushev, A. I. Zavrzhnov, S. V. Soloviev // Vestnik of Michurinsk State Agrarian University. - 2015. - № 2. - P. 163-170.*

16. 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.*

17. 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.*

18. *State Standard GOST R 54783-2011. Tests of agricultural machinery: approved and put into effect by the Order of the Federal Agency for Technical Regulation and Metrology dated December 13, 2011 No. 995-st: introduced 2011-12-13: publishing house of standards, 2011. - Moscow. - 23 p.*

19. *State Standard GOST R 54784-2011. Agricultural machinery tests. Methods for assessing technical parameters: approved and put into effect by the Order of the Federal Agency for Technical Regulation and Metrology dated December 13, 2011 No. 996-st: introduced 2012-03-01: publishing house of standards, 2012. - Moscow. - 23 p.*

20. *Dozorov, A. V. Development of technological methods of soybean cultivation in the forest-steppe conditions of the Middle Volga region: monograph / A. V. Dozorov, Yu. V. Ermoshkin. - Ulyanovsk: USAA named after P.A. Stolypin, 2014. - 163 p. - ISBN 978-5-905970-42-9.*

**ADAPTIVE AND PRODUCTIVE POTENTIAL OF MID-EARLY CORN
HYBRIDS FOR GRAIN IN AGROLANDSCAPES CONDITIONS OF
BRYANSK REGION**

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Key words: corn, mid-early hybrids, adaptive ability, ecological plasticity, grain yield, variation coefficient, homeostaticity.

The paper presents results of agroecological assessment of adaptive ability and grain yield of mid-early corn hybrids on gray forest soils of Bryansk high plains. The study and assessment of grain yield of mid-early corn hybrids of domestic and foreign selection were carried out on the basis of the experimental field of Bryansk State Agrarian University in the period of 2016-2019. The aim of these studies was to study the adaptability parameters and the features of formation of highly productive agrocenoses of mid-early (FAO 201-300) corn hybrids for grain in the agrolandscape conditions of Bryansk region. The object of the research was 19

hybrids of the middle early group (FAO 201-300). The following tasks were solved in the course of the study: to conduct an agroecological parameter assessment of the adaptive ability of mid-early corn hybrids applying the generally accepted parameter of "yield"; to substantiate the features of formation of highly productive corn crops in grain cultivation technology in the agro-climatic conditions of the region. Parameters of ecological plasticity, stress resistance, homeostaticity, selection value were calculated. As a result of the experiments, the average corn grain yield varied from 6.07 t / ha of Ronaldinio hybrid of the KWS selection (Germany) to 8.29 t / ha of Voronezh 279 SV hybrid (Voronezh branch of the All-Russian Research Institute of Maize). The indexes of environmental conditions (Ij) within the years of research varied from - 0.2 to +0.8: the most favorable conditions for formation of high yield of corn grain appeared in 2018, and on average, 7.72 t / ha was obtained in the experiment. Such genotypes as Ronaldinio (KWS, Germany), P 8523 (Pioneer, France), DKS 2960 (Monsanto, Switzerland), Pterox (RAGN Semences, France) were noted with high parameters of homeostaticity, selection value and variation coefficient low values. High parameters of adaptive ability were identified in hybrids of domestic selection of Voronezh 279 SV, Ladoga 221 MV and foreign selection - Ronaldinio (KWS, Germany), P 8523, P 8816 (Pioneer, France) and DKS 2960 (Monsanto, Switzerland), which possessed stability, selection value, stress resistance and high grain yield in the agrolandscape conditions of the region.

Bibliography:

- 1. Madyakin, E.V. Characteristics of corn hybrids in terms of productivity and adaptive ability in the conditions of insufficient moisture / E.V. Madyakin // Vestnik of Samara Scientific Center of the Russian Academy of Sciences. - 2015. - Vol.17, №. 4 (3). -P. 588-591.*
- 2. Zezin, N.N. The results of grain technology introduction of corn cultivation in the Middle Urals / N.N. Zezin, M.A. Namyatov // Feed production. - 2018. - №. 3. - P. 11-15.*

3. *Corn and sorghum in intensive agriculture in the south-west of the Central region of Russia: monograph / V. E. Torikov, S. A. Belchenko, A. V. Dronov, V. V. Dyachenko, V. V. Lantsev. - Bryansk: Bryansk SAU, 2018. - 208p.*
4. *Wide unified CMEA classifier and international CMEA classifier of Zea mays L species. - Pavlovsk: VIR printing house, 1977. - 80p.*
5. *Methodology for state variety testing of agricultural crops. Issue 2. - Moscow: State Commission for Variety Testing of Agricultural Crops, 1989. - 197p.*
6. *Methodical recommendations for conducting experiments with corn. - Dnepropetrovsk: All-Russian Research Institute of Corn, 1980. - 36 p.*
7. *Dospekhov, B.A. Methodology of field experiment (with the basics of statistical processing of research results): a textbook for higher agricultural educational institutions / B.A. Dospekhov. - Moscow: Alliance, 2014. - 351p.*
8. *Eberhart, S. A. Stability parameters for comparing varieties / S. A. Eberhart, W. A. Russel // Crop. Sci. - 1966. - V. 6, №. 1. - P. 36-40.*
9. *Pakudin, V.Z. Assessment of ecological plasticity and stability of varieties of agricultural crops / V.Z. Pakudin, L.M. Lopatina // Agricultural biology. - 1984. - №. 4. - P. 109-113.*
10. *Sklyarova, N. P. Characteristics of new varieties of potatoes in terms of plasticity and stability parameters / N. P. Sklyarova, V. A. Zharova // Selection and seed production. - 1998. - №. 2. - P. 18-22.*
11. *Aitzhanova, S. D. Selection of strawberries in the south-western part of the Non-Black Soil Zone of Russia: 06.01.05: dissertation for the degree of Doctor of Agricultural Sciences / Aitzhanova Svetlana Dmitrievna; Bryansk State Agricultural Academy. - Bryansk, 2002. - 389p.*
12. *Dubovoi, G.A. Features of adaptive technology of potato cultivation in the southwestern part of the Non-Black Soil Zone of Russia: 06.01.09: dissertation for the degree of Candidate of Agricultural Sciences / Dubovoi Georgiy Alekseevich; Bryansk State Agricultural Academy. - Bryansk, 2003. - 154 p.*
13. *Dronov, A.V. Agrobiological substantiation of introduction of sorghum crops into the south-western region of the Non-Black Soil Region of Russia: 06.01.09:*

dissertation for the degree of Doctor of Agricultural Sciences / Dronov Alexander Viktorovich; Bryansk State Agricultural Academy. - Bryansk, 2007. - 404 p.

14. Dyachenko, V. V. Scientific support of Sudanese grass cultivation in the South-Western part of the Non-Black Soil zone: 06.01.09: dissertation for the degree of Doctor of Agricultural Sciences / Dyachenko Vladimir Viktorovich; Bryansk State Agricultural Academy. - Bryansk, 2009. - 508 p.

15. Mameev, V. V. Variability and forecast of winter wheat yield in the southwestern part of the Central region of Russia (on the example of Bryansk region) / V. V. Mameev, V. E. Torikov // Agrarian Vestnik of the Upper Volga Region. - 2017. - №. 1 (18). - P. 24-30.

16. Sapega, V. A. Directions of increasing the representativeness of assessments in the State Variety Testing, yield, ecological plasticity and homeostaticity of pea varieties / V. A. Sapega, G. Sh. Tursumbekova // Grain Economy of Russia. - 2018. - №. 2 (56). - P. 38-42.

17. Goncharenko, A. A. On the adaptability and ecological sustainability of varieties of grain crops / A. A. Goncharenko // Vestnik of the Russian Academy of Agricultural Sciences. - 2005. - №. 6. - P. 49-53.

18. Zykin, V. A. Parameters of ecological plasticity of agricultural plants, their calculation and analysis: instructional guidelines / V. A. Zykin, V. V. Meshkov, V. A. Sapega. - Novosibirsk: Siberian branch of All-Union Academy of Agricultural Sciences named after Lenin, 1984. - P. 1-24.

19. Khangildin, V.V. The problem of homeostasis in genetic selection studies / V.V. Khangildin, S.V. Biryukov // Genetic and cytological aspects in selection of agricultural plants. - 1984. - №. 1. - P. 67-76.

20. Nettevich, E. D. The influence of cultivation conditions and the study duration on the results of assessing the variety by yield parameter/ E. D. Nettevich // Vestnik of the RAAS. - 2001. - №. 3. - P. 34-38.

21. Zhivotkov, L.A. Methodology for identifying the potential productivity and adaptability of varieties and selection forms of winter wheat in terms of "yield" / L.A.

Zhivotkov, Z.A. Morozova, L.I. Sekutaeva // Selection and seed production. - 1994. - №. 2. - P. 3–6.

INFLUENCE OF LIQUID COMPLEX FERTILIZERS AND GROWTH REGULATOR ON PHOTOSYNTHETIC ACTIVITY AND PRODUCTIVITY OF AWNLESS BROME

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Key words: liquid complex fertilizers MEGAMIX, Albit growth regulator, awnless brome, leafiness, leaf surface area, photosynthetic potential, productivity of photosynthesis (kg of grain per 1000 units of photosynthetic potential), net productivity of photosynthesis, productivity.

The article presents experimental material obtained in the conditions of Mordovia on leached black soil on the effect of MEGAMIX liquid complex fertilizers and Albit growth regulator on photosynthesis production process and productivity of awnless brome. Two-factor field experiments were carried out on the crops of awnless brome on an experimental field at OAO "Mordoviyagosplem" in Ozerny village, urban district of Saransk in 2018 - 2020, according to the following scheme: Factor A - Time of application of liquid complex fertilizers and growth regulator. 1 - At the phase of spring growth, 2 - At the phase of stem elongation, 3 - At the phase of spring growth + in the phase of stem elongation. Factor B - Liquid complex fertilizers and growth regulator. 1. - Without application of liquid complex fertilizers and growth regulator (control). 2. - Megamix-pro. 3. - Megamix nitrogen. 4 - Albit. The results of our research indicate that leafiness of awnless brome prevailed (26.0 and 24.4%) when Megamix-pro and Megamix-nitrogen were used at the time of

spring growth; predominant leaf area (47.8 thousand m^2 / ha), photosynthetic potential (2.31 million $m^2 \cdot days$ / ha), dry matter yield (8.75 t / ha) were formed with application of Megamix nitrogen at the time of spring growth; and net productivity of photosynthesis was the highest without application of these preparations (5.8 g / m^2 per day) and with spraying the plants with Megamix-profi and Megamix-nitrogen (5.3 g / m^2 per day) at the phase of stem elongation. Photosynthesis productivity was the lowest in case application of Megamix-profi and Megamix-nitrogen at the spring growth phase (224 and 228 g of seeds per 1,000 PhP units).

Bibliography:

- 1. Eryashev, A. P. About the photosynthetic activity of sowing the Eastern galega in case of usage of plant protection products / A. P. Eryashev, A. G. Kataev, P. A. Eryashev // Feed production. - 2014. - № 6. - P. 17–21.*
- 2. Nefedov, V.N. Productivity and quality of peas when using plant protection products and Albit growth regulator on dark gray forest soils / V.N. Nefedov, A.P. Eryashev // Feeding of agricultural animals and feed production. - 2016. - № 2. - P. 35 - 47.*
- 3. Alenushkin, K. V. Effect of complex fertilizers on productivity of awnless brome / K. V. Alenushkin // Innovative technologies in the agro-industrial complex: theory and practice: II All-Russian scientific and practical conference: collection of articles. - Penza, 2014. - P. 8 - 11.*
- 4. Alenushkin, K.V. Influence of mineral fertilizers and the frequency of grass stand mowing on productivity of awnless brome / K.V. Alenushkin // Innovative ideas of young researchers for the agro-industrial complex of Russia. - 2013. - P. 78 - 79.*
- 5. Kshnikatkina, A. N. Seed productivity of awnless brome (BROMOPSIS INERVIS LEJSS) depending on cultivation methods in the forest-steppe conditions of the Middle Volga region / A. N. Kshnikatkina, P. G. Alenin, K. V. Alenushkin // Niva of the Volga region. - 2014. - № 1 (30). - P. 13 - 18.*

6. Kshnikatkina, A. N. *Methods for increasing the seed productivity of awnless brome* / A. N. Kshnikatkina, P. G. Alenin, K. V. Alenushkin // *Niva of the Volga region*. - 2014. - № 3 (32). - P. 26 - 31.
7. Kshnikatkina, A. N. *Methods for increasing the productivity of reed fescue (Festuca arundinacea)* / A. N. Kshnikatkina, O. A. Timoshkin, P. V. Revnivitsev // *Niva of the Volga region*. - 2018. - № 3 (48). - P. 38 - 44.
8. Kshnikatkina, A. N. *Methods for formation of highly productive agro-phytocenoses of pasture ryegrass* / A. N. Kshnikatkina, O. A. Timoshkin, P. V. Revnivitsev // *Niva of the Volga region*. - 2019. - № 1 (50). - P. 14 - 20.
9. Revnivitsev, P. V. *Influence of foliar feeding with macro- and micro-element fertilizers on agrocenosis formation of cereal grasses* / P. V. Revnivitsev // *Innovative technologies in the agro-industrial complex: theory and practice: materials of the V International scientific-practical conference Cross-sectoral scientific information center of PSAU*. - Penza: Publishing department of PSAU, 2017. - P. 110 - 115.
10. Revnivitsev, P.V. *Influence of nitrogen fertilizers on chlorophyll concentration in leaves in agrocenoses of cereal grasses* / P.V. Revnivitsev // *The role of modern selection and agricultural technology in measures to combat drought: materials of the International scientific-practical conference dedicated to the 140th birthday anniversary of Academician of Lenin All-Union Academy of Agricultural Sciences P.N. Konstantinov* / edited by V.F. Kazarin [and others]. - Kinel, 2017. - P. 210 - 214.
11. *Biodiversity increase is the most important factor in sustainable development of feed production* / A. A. Orlov, I. Yu. Yudin, P. V. Revnivitsev, A. A. Zhdanova // *Innovative technologies in crop production and ecology: materials of a scientific and practical conference*. - Vladikavkaz, 2017. - P. 240 - 243.
12. Revnivitsev, P.V. *Influence of foliar feeding with mineral and microelement fertilizers on productivity of timothy grass* / P.V. Revnivitsev // *Innovative ideas of young researchers for the agro-industrial complex of Russia: collection of articles of*

the International scientific-practical conference. - Penza: Publishing department of PSAU, 2018. - P. 193 - 196.

13. *Revnitsev, P. V. Improvement of methods of productivity increase of perennial grasses in the forest-steppe conditions of the Middle Volga region / P. V. Revnitsev // Innovative technologies in the agro-industrial complex: theory and practice: materials of the VI All-Russian scientific-practical conference Cross-sectoral scientific information center of PSAU. - Penza: Publishing department of PSAU, 2018. - P. 150 - 154.*

14. *Kshnikatkina, A. N. Improvement of methods of productivity increase of perennial grasses in the forest-steppe conditions of the Middle Volga region / A. N. Kshnikatkina, P. V. Revnitsev // Current problems of science and education in the field of natural and agricultural sciences: materials of scientific and practical conferences. - Petropavlovsk: North Kazakhstan State University named after M. Kozybaev, 2018. - P. 124 - 126.*

15. *Kshnikatkina, A.N. Efficiency of foliar feeding with mineral and microelement fertilizers on crops of pasture ryegrass / A.N. Kshnikatkina, O.A. Timoshkin, P.V. Revnitsev // Sursky Vestnik. - 2018. - № 1 (1). - P. 12 - 17.*

16. *Kshnikatkina, A. N. Influence of mineral nitrogen fertilizers on productivity of perennial cereal grasses / A. N. Kshnikatkina, O. A. Timoshkin, P. V. Revnitsev // The role of university science in solving the problems of the agro-industrial complex: materials of the All-Russian (national) scientific-practical conference dedicated to the 90th birthday anniversary of Professor G.B. Galdin. - Penza: Publishing Department of PSAU, 2018. - V. I. - P. 96 - 100.*

17. *Karlova, I.V. Productivity of herbal mixtures of perennial grasses based on awnless brome and burnet androgynous / I.V. Karlova, V.G. Vasin, A.A. Kozhaeva // Vestnik of Ulyanovsk State Agricultural Academy. - 2019. - № 1 (45). - P. 24 - 30.*

18. *Karlov, E. V. Photosynthetic activity and productivity of barley varieties in case of application of fertilizers and growth stimulants / V. G. Vasin, A. V. Vasin, E. V. Karlov // Vestnik of Samara State Agricultural Academy. - 2016. - № 3. - P. 15-19.*

19. Karlov, E.V. *Influence of growth regulators on productivity of barley varieties at different levels of mineral nutrition* // E.V. Karlov, A.V. Vasin, O.P. Kozhevnikova // *Vestnik of Samara State Agricultural Academy*. - 2017. - № 4. - P. 3-10.
20. *Application of growth stimulants and microfertilizers in cultivation of forage crops* / V. G. Vasin, A. V. Vasin, V. V. Rakitina, N. V. Vasina, A. N. Burunov, O. V. Vershinina, E. V. Karlov, I. K. Kosheleva, E. I. Kosheleva, E. I. Makarova, E. O. Trofimova // *Agriculture*. - 2017. - № 6. - P. 19-26.
21. Nichiporovich, A. A. *Photosynthesis and the theory of obtaining high yields* / A. A. Nichiporovich. - Moscow: AS of SSSR, 1961. - 93 p.
22. Shatilov, I.S. *Photosynthetic activity of maize depending on the density of plants* / I.S. Shatilov, A.G. Zamarev // *Izvestiya of TAA*. - 1965. - Issue. 3. - P. 85–88.
23. Dospikhov, B.A. *Method of field experiment (with the basics of statistical processing of research results): textbook* / B.A. Dospikhov. - 5th ed., Add. and revised - Moscow: Agropromizdat, 1985. - 351 p.

BIO PRODUCTS FOR BARLEY VEGETATION

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Key words: biological product, profitability, productivity.

The research was aimed at studying the effect of biological products during barley vegetation, to assess the feasibility of their use. The paper presents empirical data on the influence of biological products on barley development, photosynthetic activity, productivity and profitability of production. During the years of the experiments, the temperature regime, distribution and amount of precipitation

differed from long-term ones. When using Emistim, barley formed the largest leaf area on the plant (186.9 cm²), which exceeded the control by 223%. Plant survivability ranged from 70.9 to 77.9%. Productive tillering capacity increased by an average of 5-10% in comparison with the control. Treatment of plants with Binoram and Emistim made it possible to form an average of 1.34 productive stems per plant, Vitazim and Biodux - 1.33. The plants formed proper grain (from 44.6 to 46.2 grams of 1000 grains) under the influence of the biological products. Biodux and Binoram brought the opportunity to obtain a mass of grains 2.4 g more than the control. The relationship of productive tillering capacity, weight and yield is strong straight. The correlation of grain in an ear and yield is a strong straight $r = 0.917$. The increase of barley yield under the influence of biological products is associated, in priority, with the productive stalk ($r = 0.959$), and not with the grain weight. The highest biological yield was obtained under the influence of Emistim - 3.76 t / ha, which exceeded the control by 1.03 t / ha. Reliability at 95% significance level was noted in all variants. On average, over the years of the experiments, it is most profitable to use the growth regulator Biodux (73%) during the growing season.

Bibliography:

- 1. Union of Organic Farming. - URL: <https://soz.bio/> (date of access 15.02.2021).*
- 2. Ryabtseva, N.A. Problems of production of ecologically clean crop production / N.A. Ryabtseva // Priority directions of innovative development of agriculture: materials of the All-Russian scientific and practical conference. - Nalchik, 2020. -- P. 64-66.*
- 3. A list of production means for application in the system of organic and biologized agriculture based on international standards for organic agriculture. - 2021. - URL: <https://soz.bio/perechen-biopreparatov-i-bioudobren-2/> (date of access 29.01.2021).*
- 4. Influence of silicon on ontogenetic adaptation of spring barley under the oxidative stress / L.V. Osipova, I.V. Vernichenko, L.V. Romodina [et al.] // Soil Fertility. - 2020. - № 1 (112). - P. 18-21.*

5. Shpanev, A.M. *The effectiveness of microbiological products based on Bacillus subtilis and Trichoderma harzianum in protection of spring barley from diseases in the north-west of Russia* / A. M. Shpanev, E. S. Denisyuk // *Biotechnology*. - 2020. - Vol. 36, No. 1. - P. 61-72.
6. Stupina, L.A. *The influence of nitrogen-fixing bacteria products on morphogenetic parameters of spring barley* / L.A. Stupina // *Vestnik of Altai State Agrarian University*. - 2020. - № 1 (183). - P. 47-54.
7. Bezuglova, O.S. *Soils of Rostov region: a textbook* / O.S. Bezuglova, M.M. Khyrkhyrova. - Rostov-on-Don: SFedU, 2008. - 352 p. ISBN 978-5-9275-0397-1. - URL: <https://znanium.com/catalog/product/556752> (date of access 15.02.2021).
8. *Federal State Budgetary Institution "State Commission of the Russian Federation for Testing and Protection of Selection Achievements"*. - URL: <https://reestr.gossortrf.ru/sorts/9052841/> (date of access 15.02.2021).
9. *Methodology for state variety testing of agricultural crops. Issue 3 / under the general editorship of M.A.Fedin*. - Moscow, 1983. - URL: https://gossortrf.ru/wp-content/uploads/2019/08/metodica_3.pdf (date of access 15.02.2021).
10. Nichiporovich, A. A. *Photosynthetic activity in crops* / A. A. Nichiporovich, L. E. Strogonova. - Moscow: AS USSR, 1961. - 115 p.
11. *State Standard GOST ISO 520-2014. Cereals and legumes. Specification of the mass of 1000 grains (Reprinted)*. - URL: <http://docs.cntd.ru/document/1200110765/> (date of access 15.02.2021).
12. *The influence of biological products on spring barley of Belgorodsky 100 variety* / S. A. Emelev, A. V. Pomelov, M. V. Cheremisinov, G. P. Dudin // *Ecology of the native land: problems and solutions: materials of the XIV All-Russian scientific practical conference with international participation*. - 2019. - P. 203-208.
13. *Porkhuntsova, O. A. The effectiveness of application of microbiological products Azotovit and Phosphatovit in cultivation of common spring barley* / O. A. Porkhuntsova // *Vestnik of Belarusian State Agricultural Academy*. - 2020. - № 1. - P. 111-116.

14. Kozionova, E.G. *Influence of chemical and biological products on the sowing quality of seeds and yield* / E.G. Kozionova, L.V. Malenkova, O.V. Demidova // *Economy of Agriculture of Russia*. - 2020. - № 1. - P. 27-33.

15. Oued, E. *Spring barley and growth regulators* / E. Oued, S. J. Noms // *European Journal of Soil Biology*. - 2018. - Vol. 37, № 5. - P. 59-72.

**PRODUCTIVITY OF SPRING SOFT WHEAT IN CONJUNCTION WITH
THE CONTENT OF MACROELEMENTS AND BIOACTIVITY OF SOIL ON
THE BLACK SOILS OF THE SOUTHERN STEPPE ZONE OF THE
SOUTHERN URALS**

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Key words: yield, spring soft wheat, macroelements, hydrothermal index, soil biological activity, mono-seeding, crop rotation.

The article is devoted to assessment of the influence of forecrops, application of mineral fertilizers on biological activity of the southern black soil and the yield of soft spring wheat. The studies were carried out in a field long-term stationary experiment in six-field crop rotations, with mono-cultivation of soft spring wheat. The object of the study was soft spring wheat put at different levels of mineral nutrition and according to different forecrops. The article presents long-term data of stationary experiment on spring soft wheat yield, biological activity of the soil under its crops, the content and consumption of macronutrients during the growing season. The vegetation periods of the studies were characterized by aridity and were divided into three groups, 13 out of 19 years were assigned to slightly arid (hydrothermal index = 0.6 and less units). Due to aridity of the growing seasons, the yield of spring soft wheat, depending on the forecrops and the nutrition background, is presented. It

has been established that spring soft wheat reduces yield when cultivated in mono-seeding compared to multifield system, regardless of environmental factors. On average, for the period from 2002 to 2019, such forecrops of soft wheat as peas and millet were the best in the variant without application of mineral fertilizers. The yield of soft wheat was 0.93 and 0.90 tons per hectare, respectively. As a result of the study, an increased (in comparison with other variants of the experiment) consumption of nitrate nitrogen and potassium by permanent crops of spring soft wheat was established.

Bibliography:

- 1. Kaplin, V. G. Zonal features of weed infestation of soft spring wheat crops / V. G. Kaplin // Vestnik of Samara State Agricultural Academy. - 2018. - №. 2. - P. 13-20.*
- 2. Regional statistical yearbook: statistical collection. - Orenburg, 2009. - 525 p.*
- 3. Sandakova, G.N. Trends in spring wheat production / G.N. Sandakova // Resource-saving technologies in agricultural production: International collection of scientific papers of Orenburg Research Institute of Agriculture. - Orenburg, 2010. - P. 36-43.*
- 4. Dolgalev, M.P. Selection of spring durum wheat in the conditions of the Orenburg Trans-Urals / M.P. Dolgalev // Bazhanov's readings: a collection of scientific papers dedicated to the 90th anniversary of Buzuluk experimental field. - Orenburg, 2003. - P. 60-67.*
- 5. The present and the future of our agriculture / N. A. Zelenskiy, G. M. Zelenskaya, G. V. Mokrikov [and others] // Agriculture. - 2018. - № 5. - P. 4-7.*
- 6. Galeev, R.R. The influence of weather conditions on soft spring wheat yield and quality in intensive agriculture of the forest-steppe of Novosibirsk Ob region / R.R. Galeev, I.S. Samarin, Z.V. Andreeva // Vestnik of NSAU. - 2017. - № 4 (45). - P. 9-15.*
- 7. Sabitov, M.M. Cultivation of spring wheat at different intensification levels / M.M. Sabitov // Plant protection and quarantine. - 2017. - № 3. - P. 20-23.*
- 8. Loshakov, V.G. The effectiveness of joint application of crop rotation and fertilizers / V.G. Loshakov // Soil Fertility. - 2016. - № 2. - P. 37 - 41.*

9. Kryuchkov, A.G. *Dynamics of content of mobile nutrients under spring soft wheat crops* / A.G. Kryuchkov, I.N. Besaliev, A.L. Panfilov // *Agriculture*. - 2012. - № 2. - P. 15-17.
10. Orlova, O.V. *Composition and functioning of microbial community during straw decomposition of cereals in sod-podzolic soil* / O.V. Orlova // *Agricultural biology*. - 2015. - Vol. 50, № 3. - P. 305-314.
11. Shcherbakov, A. V. *Aerobic cellulolytic community of Sphagnumfaallax peat moss associates as the basis for destruction of crop residues* / A. V. Shcherbakov // *Agricultural biology*. - 2014. - Vol. 1. - P. 54-62.
12. Fedorets, N. G. *Methods of soil research of urbanized territories* / N. G. Fedorets, M. V. Medvedeva. - Petrozavodsk: Karelian Scientific Center of the Russian Academy of Sciences, 2009. – 84 p.
13. Stolyarov, O.V. *Grain forecrops and nutritional backgrounds of spring wheat* / O.V. Stolyarov // *Agriculture*. - 2004. - № 4. - P. 19.
14. Minushev, F. Kh. *Based on scientific and technical progress* / F. Kh. Minushev, L.R. Sharifullin // *High yields of spring wheat*. - Moscow: Kolos, 1975. - P. 264-281.
15. Anikiev, E.P. *The culture of spring wheat according to various forecrops on the chestnut soils of Volgograd region: dissertation for the degree of Candidate of Agricultural Sciences* / Anikiev E.P. - Volgograd, 1966. - 212 p.
16. Vrazhnov, A. V. *Protein content in grain - a function of three constituents* / A.V. Vrazhnov, E.I. Shiyaty, A.G. Medvedev // *Chief agronomist*. - 2004. - № 11. - P. 5-7.
17. Bakaeva, N.P. *Influence of spring wheat cultivation technology on agrophysical soil properties and yield* / N.P. Bakaeva, Yu. A. Gnilomedov // *Vestnik of Samara State Agricultural Academy*. - 2019. - № 3. - P. 30-34.
18. *Yield of spring soft wheat in the Orenburg Cis-Urals* / V. M. Zhdanov, V. Yu. Skorokhodov, Yu. V. Kaftan, D. V. Mitrofanov, N. A. Zenkova, V. N. Zhizhin // *Izvestiya of Orenburg State agrarian university*. - 2015. - № 1 (51). - P. 24-26.
19. Zhizhin, V.N. *Productivity and economic efficiency of millet cultivation in short-rotation crop rotations and with permanent sowing on the southern black soils of the Orenburg Cis-Urals* / V.N.Zhizhin, V. Yu. Skorokhodov, A. A. Zorov // *Resource-*

saving technologies in agricultural production: International collection of scientific papers. - Orenburg: FSBSI Orenburg Research Institute of Agriculture, 2010. - P. 252-256.

20. *Skorokhodov, V. Yu. Influence of forecrops and fertilizers on yield of agricultural crops in crop rotation with a short rotation and with permanent sowing on the black soils of the southern Orenburg Cis-Urals / V. Yu. Skorokhodov // Regional scientific and practical conference of young scientists and specialists: collection of materials. - Administration of Orenburg region, 2004. - P. 99-100.*

PROSPECTS FOR USAGE OF OIL CROPS IN CROP ROTATIONS OF THE FOREST-STEPPE ZONE OF THE VOLGA REGION

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Key words: biodiversity, oil flax, white mustard, spring rape, yield, soil tillage, plant protection, oil content.

An increase of biological diversity of field crops is relevant for modern agriculture. The aim of our study was comparative assessment of productivity of oilseeds (oil flax, white mustard and spring rape) and substantiation of primary soil tillage technology and plant protection during crop cultivation in the forest-steppe zone of the Volga region. The research results showed that the growing season of white mustard was 87-99 days, oil flax - 97-106 days and spring rape - 97-103 days. The period from harvesting to winter wheat sowing was 12-20 days for oil flax, white mustard - 20-30 days, for spring rape - 14-20 days, which makes it possible to use these crops as forecrops for winter grain crops. When cultivating oil flax, white mustard and spring rape, combined system of soil tillage in crop rotation is more effective, where, in comparison with the minimum tillage of the soil, the seed yield increased (by 8.4-23.7%), as well as vegetable fat (by 16.9- 30.5%). The adaptive

integrated plant protection system (a combination of agrotechnical, biological and chemical plant protection methods) was more effective in comparison with herbicide usage. Evaluation of economic efficiency showed that cultivation of spring rape provides a higher level of income in comparison with other crops. Combined tillage and the protection level of standard agricultural technologies (only herbicide usage) ensured an increase of net operating profit per hectare, therefore, the substantiation of plant protection system should be carried out with regard to economic limits of harmfulness.

Bibliography:

- 1. Toygildin, Alexander Leonidovich. Scientific and practical substantiation of agriculture biologization and reproduction of soil fertility of leached black soil in the forest-steppe of the Volga region: 06.01.01 - general agriculture and plant growing: abstract of dissertation of Doctor of Agricultural Sciences / A.L. Toygildin. - Ust-Kinelsky, 2018. - 41 p.*
- 2. Toygildin, A.L. Scientific and practical substantiation of agriculture biologization in the forest-steppe zone of the Volga region / A.L. Toygildin, V.I. Morozov, M.I. Podsevalov, D.E. Ayupov, I.A. Toygildina. - Ulyanovsk, 2020 - 386 p.*
- 3. Toygildin, A.L., Morozov V.I., Podsevalov M.I., Syromyatnikov V.V. The effectiveness of direct sowing technology in the cultivation of spring wheat in the conditions of the forest-steppe zone of the Volga region. International Scientific-Practical Conference "Agriculture and Food Security: Technology, Innovation, Markets, Human Resources" (FIES 2020). 2020. P. 00129.*
- 4. Akimenko, A.S. Methodology for designing crop rotations and appropriate structure of sown areas in adaptive landscape agriculture (on the example of the Central Black Soil Region) / A.S. Akimenko // Agriculture. - 2018.-№6.- P.11-13.*
- 5. Bushnev, A.S. Influence of primary tillage systems on productivity of the sector of grain-tilled crop rotation spring rape - winter wheat on leached black soil of the Western Cis-Caucasus / A.S. Bushnev // Oilseeds. Scientific and technical bulletin of*

the All-Russian Scientific Research Institute of Oilseeds. - 2012. - No. 2 (151 - 152). - P. 126-132.

6. *The role of winter wheat forecrops in crop rotation under the conditions of the Central Black Soil Zone / V.I. Turusov, V.M. Garmashov, O.A. Bogatykh, E.A. Balyunova // Agricultural science. - 2017. - No. 11-12. - P. 10-11*

7. *Karpachev, V.V. Scientific support of the rapeseed industry in Russia: results and objectives for 2016-2020. // Efficiency increase of selection, seed production and cultivation technology of rapeseed and other oilseed cabbage crops: collection of scientific reports at the international coordination meeting on rapeseed (Lipetsk, July 7-9, 2015). Elets: Elets State University named after I.A. Bunin, 2016. P. 3-10.*

8. *Komarova, N.A. The value of various fallow lands in changing the density of light gray forest soil and crop yield of crop rotation cultues / N.A. Komarova // Agricultural science of the Euro-North-East. - 2018. - No. 2 (63). - P. 58-63.*

9. *Dolgopolova, N.V. Influence of forecops on productivity and grain quality of winter wheat crops / N.V. Dolgopolova // Vestnik of Kursk State Agricultural Academy. 2015.- No. 5. - P. 49-52.*

10. *Kartamysheva, E.V. Problems and prospects of Sarepta mustard cultivation / E.V. Kartamysheva // Agriculture. - 2006.- No. 4.- P.9-14.*

11. *Oilseed crops - biodiversity, value and productivity / T.Ya. Prakhova, V.A. Prakhov, V.N. Brazhnikov, O.F. Brazhnikova // Niva of the Volga region. - 2019.- No. 3 (52). - P.30-37.*

12. *Zubkova, Tatiana Vladimirovna. Formation of highly productive crops of spring rape, depending on the main agricultural methods of cultivation in the forest-steppe of the Central Black Soil Region. 06.01.01 - general agriculture: abstract of dissertation of candidate of agricultural sciences / T.V. Zubkova. - Orel. - 2013. -- 21 p.*

13. *Sinyakova, Olga Valerievna. Features of oil flax cultivation technology in the Middle Urals: 06.01.01 - general agriculture, plant growing: abstract of dissertation of Candidate of Agricultural Sciences / O.V. Sinyakova. - Ust-Kinelsky. - 2017. - 20 p.*

14. State Standard GOST 17713-89. Phenological observations. Moscow: Publishing House of Standards, 1989. 15 p.
15. State Standard GOST 28168 - 89. Soils. Sample selection. Intr. 1990-04-01. - M.: Publishing House of Standards, 1989. - 6 p.
16. State Standard GOST 10857-64 Oil seeds. Method for specification of oil content - M.: Publishing House of Standards, 1964. - 74 p.
17. Dospekhov, B.A. Field experiment methodology / B.A. Dospekhov. - M.: Agropromizdat, 1985. - 351 p.
18. Asmus, A.A. Biologization of crop rotations and productivity of fallow sectors with winter wheat on leached black soil of the Volga forest-steppe: abstract of dissertation of Candidate of Agricultural Sciences: 06.01.01 / A.A. Asmus - 2009 - 20 p.
19. Kiryushin, V.I. Theory of adaptive landscape agriculture and design of agricultural landscapes / V.I. Kiryushin. - M.: KolosS, 2011. - 443 p.

**ZINC IN THE "SOIL-PLANT" SYSTEM IN CASE OF LONG-TERM
APPLICATION OF MINERAL FERTILIZERS IN THE CONDITIONS OF
THE SOUTHERN FOREST STEPPE OF THE OMSK REGION**

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Key words: mineral fertilizers, removal, meadow-black soil, zinc, spring wheat.

A long-term stationary experiment was carried out on meadow-black soil in the southern forest-steppe of the Omsk region of Western Siberia, it was found that systematic application of mineral fertilizers (during six rotations of a five-field grain-

fallow crop rotation) did not lead to accumulation of zinc above the APC in accordance with the Hygienic Standards GN 2.1.7.2511- 09. It has been proven that the amount of total zinc (5M HNO₃ extraction) over the years of the research decreased in comparison with the initial value by 15% in a natural background and by 25% in a fertilized background due to its greater removal by plants and migration down the soil profile. Systematic application of mineral fertilizers on average over three years (2017-2019) increased the annual zinc removal by wheat plants by 16%. The content of zinc mobile form in the soil (AAB extraction, pH = 4.8) is estimated as average (2.1-2.2 mg / kg). The dependence of zinc mobile forms on acid-soluble forms was revealed, which is described by the equation $y = 0.072x - 0.643$. The zinc content in spring wheat plants, depending on the fertilization, varied from 5.8 to 7.6 in straw and from 30.8 to 34.3 mg / kg in grain. The biological absorption coefficient was 13.1-12.8; the coefficient of biological accumulation was 14.9 -15.9, which indicates that zinc is intensively involved in the biochemical cycle of the agrocenosis during spring wheat cultivation, and its deficiency becomes a factor which limits the crop yield.

Bibliography:

- 1. Volkova, V.A. On the question of usage of copper compounds in the technology of spring soft wheat cultivation / V.A. Volkova // Agrochemical Vestnik. –2020. –№ 2. – P. 68-73.*
- 2. Sindireva, A.V. An integrated approach to assessing the action of heavy metals in the soil-plant-animal system / A.V. Sindireva // Heavy metals in the environment: materials of the II International School of Young Scientists. - Novosibirsk, 2017. – P. 17-28.*
- 3. Perelman, A.I. Geochemistry / A.I. Perelman - 2nd edition, add. and revised - M.: V. shkola, 1999. - 527 p.*
- 4. Bityutskiy, N. P. Microelements of higher plants: monograph / N.P. Bityutsky - SPb.: Publishing house of St. Petersburg University, 2011. -368 p.*

5. Azarenko, Yu.A. *Regularities of the content, distribution, inteconnections of microelements in the soil-plant system in the south of Western Siberia: monograph / Yu.A. Azarenko. - Omsk: Variant-Omsk, 2013 .- 232 p.*
6. Sychev, V.G. *Zinc in agroecosystems of Russia: monitoring and application efficiency: monograph / V.G. Sychev, A.N. Aristarkhov, T. Ya. Yakovleva. - M.: All-Russian Research Institute of Automation, 2015 .- 204 p.*
7. Krasnitsky, V.M., Schmidt A.G. *Agrochemical characteristics of arable soils and the efficiency of agricultural production in the Omsk region / V.M. Krasnitsky, A.G. Schmidt // Soil Fertility. –2018. –№ 1. - P. 64-67.*
8. Gamzikov, G.P. *The content of trace elements (Mn, Cu, Zn, Co) in the soils of the Omsk region and the responsiveness of legumes to micronutrient fertilizers: dissertation of Candidate of Agricultural Sciences: 06.01.03 / Gamzikov Gennadiy Pavlovich, Omsk. - Omsk, 1967 .- 213 p.*
9. Spitsyna, S.F. *Efficiency of application of microfertilizers for soy bean / S.F. Spitsyna, A.A. Tomarovsky, G.V. Ostvald [et al.] // Vestnik of Altai State Agrarian University. –2015. – №8 (130). -P. 43-47.*
10. *Improved technology of spring wheat cultivation in the conditions of the Omsk region (the use of foliar fertilizing with agrochemical means): recommendations / Maksheeva E.A. - Omsk :, 2018. –16 p.*
11. Geiger, E.Yu. *Microfertilizers on a chelate basis: experience and prospects of application / E.Yu. Geiger, L.D. Varlamova, V.V. Semenov [et al.] // Agrochemical Vestnik. - 2017. - № 2. - P. 29-32.*
12. Kovalevskiy, A.L. *Biogeochemistry of plants / A.L. Kovalevsky - Novosibirsk: Nauka, 1991 .- 294 p.*
13. Dospekhov, B.A. *Field experiment methodology / B.A. Dospekhov. - M .: Agrokhimizdat, 1985 .- 351 p.*
14. Syso, A.I. *Heavy metals in the environment as a threat to plants, animals and humans / A.I. Syso // Agrochemistry in the XXI century: materials of the All-Russian scientific conference with international participation, dedicated to the memory of Academician V.G. Mineev. Edited by V.A. Romanenkov. - Novosibirsk: Publishing*

house of Institute of Soil Science and Agrochemistry, Siberian Branch of the Russian Academy of Sciences, 2018 .- P. 30-33.

15. Dilmukhametova I.K. Fractional distribution of copper and zinc compounds in sod-podzolic soil in case of long-term application of mineral fertilizers and liming / I.K. Dilmukhametova, L.K. Nazarova, V.A. Romanenkov [and others] // Agrochemistry. - 2019. - № 4. - P. 39-45.

16. Mitrokhina, O. A. Assessment of the content and balance of the main microelements in the arable soils of the Central Black Soil Region / O.A. Mitrokhin // Agrochemical Vestnik. - 2020. - № 5. - P. 58-64.

17. Vazhenin, I. G. Agrochemical mapping of soils for the content of microelements / I.G. Vazhenin // Soil Chemistry. Trace elements in soils and modern methods of their study: scientific work / Soil Institute named after V.V.Dokuchaev. - M., 1985 .- P. 3-6.

18. Kukushkin, V.K. The behavior of zinc in the soil-plant system with an increased content of phosphorus and copper in the soil: abstract of dissertation of Candidate of Biological Sciences: 06.01.03 / Kukushkin Vladimir Konstantinovich, Moscow. - M., 1988 .- 22 p.

19. Balabanova, N.F. Influence of long-term usage of fertilizers in grain-grass crop rotation on the content of labile organic matter in meadow-black soil / N.F. Balabanova, N.A. Voronkova // Agrochemistry. - 2015. - № 1. - P. 16-22.

YIELD OF PERENNIAL GRASSES AND SOIL FERTILITY OF SOD- PODZOLIC SOIL IN CASE OF LONG-TERM APPLICATION OF MINERAL FERTILIZERS

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Key words: perennial grasses, productivity, quality, mineral fertilizers, sod-podzolic soil.

The article considers the effect of increasing doses and various combinations of mineral fertilizers applied to the cover crop on the yield and quality of a mixture of perennial grasses of two - years use, as well as the effect of fertilizers on the agrochemical parameters of sod-podzolic light loamy soil. The objects of the study were Stodolich meadow clover and Leningradskaya 204 meadow timothy grass. The studies were carried out in two crop rotations - with standard and reduced single doses of mineral fertilizers. The research results showed that in the years (VIII rotation) when the unit dose of fertilizers was increased to $N_{20}P_{20}K_{25}$, the yield of perennial grasses was higher compared to the harvest in the VII rotation. The most appropriate dose in the VII rotation on perennial grasses of the 1st year was $N_{30}P_{30}K_{45}$, on grasses of the 2nd year - doses of $N_{30}P_{30}K_{45}$ and $N_{40}P_{40}K_{60}$. In the VIII rotation, the highest yield of perennial grasses of the 1st year of use was obtained at a dose of $N_{160}P_{160}K_{200}$ (8.4 t / ha), of grasses of the 2nd year of use at doses of $N_{80}P_{80}K_{100}$ and $N_{100}P_{100}K_{125}$ (6.5 t / ha). Positive effect of increasing doses of mineral fertilizers on the content of soil organic matter has been noted. On the contrary, the soil acidity increased from 4.7 to 4.3 units with an increase of mineral doses. Higher doses of fertilizers increased the content of mobile forms of phosphorus and potassium in the soil.

Bibliography:

- 1. Aliev, A.M. The effectiveness of complex application of chemical agents in the Non-Black Soil Zone (the results of years of research in a long-term field experiment) / A.M. Aliev, L.N. Samoiloov, N..I Tsimbalist // Agrochemistry. - 2016. - № 2. - P. 20-30.*
- 2. Derzhavin, L.M. Recommendations on design of integrated usage of chemicals in energy-saving agricultural technologies for cultivation of winter grain crops in the*

conditions of grain farming renewal / L.M. Derzhavin. - Moscow: All-Russian Research Institute of Automation, 2012. - 40 p.

3. *Borisova, E.E. The role of perennial grasses in crop rotations / E.E. Borisova // Bulletin of Nizhny Novgorod State Engineering and Economic University. - 2015. - № 8 (51). - P. 12-19.*

4. *Bulatova, N.V. Soil fertility of sod-podzolic soil and yield of perennial grasses in case of long-term application of mineral fertilizers in combination with liming / N.V. Bulatova, N.V. Regorchuk // Agrarian science of the Euro-North-East. - 2017. - № 5 (60). - P. 28-32.*

5. *Dedov, A. V. Study of the influence of crop rotations on the content of soil organic matter and crop yield / A. V. Dedov, M. A. Nesmeyanova // Vestnik of Voronezh State Agrarian University. - 2020. - Vol. 13, № 1 (64). - P. 50-60.*

6. *Avdonin, N.S. Scientific basis for application of fertilizers / N.S. Avdonin. - Moscow: Kolos, 1972. - 320 p.*

7. *Ermakova, L.I. Evaluation of the effectiveness of various fertilization systems in field crop rotation in the Non-Black Soil zone / L.I. Ermakova, M.N. Novikov // Agrochemistry. - 2019. - № 10. - P. 39-45.*

8. *Izmestiev, V.M. Influence of mineral fertilizers on soil fertility of sod-podzolic soils in forage crop rotations / V.M. Izmestiev, A.K. Svechnikov, E.A. Sokolova // Agrarian science of the Euro-North-East. - 2016. - № 6 (55). - P. 37-41.*

9. *The effectiveness of long-term application of fertilizers in feed crop rotation on sod-podzolic soil / N. T. Chebotarev, A. A. Yudin, P. I. Konkin, N. V. Bulatova // Feed production. - 2018. - №11. - P. 19-22.*

10. *Ivanova, T.I. Forecasting the efficiency of fertilizers using mathematical models / T.I. Ivanova. - Moscow: Agropromizdat, 1989. - 235 p.*

11. *The best diploid varieties of meadow clover of Smolensk selection / O.V. Kurdakova, S.V. Ivanova, A.M. Konova, A. Yu. Gavrilova // Agrarian Vestnik of the Urals. - 2020. - № 5 (196). - P. 2-10.*
12. *Konova, A. M. Influence of mineral fertilizers on yield and quality of hay of perennial grasses / A. M. Konova, A. Yu. Gavrilova // News of science in the agro-industrial complex. - 2019. - № 3 (12). - P. 373-376.*
13. *Practical course on agrochemistry / edited by V.G. Mineev. - Moscow: Kolos, 2001. - 512 p.*
14. *Dospekhov, B.A. Method of field experiment / B.A. Dospekhov. - Moscow: Kolos, 1973. - 366 p.*
15. *Matais, L.N. Efficiency of feed crop rotations with different levels of saturation with meadow clover and their influence on the structure elements of grain-feed crops / L.N. Matais, O.A. Glushkova // Vestnik of the agro-industrial complex of Stavropol region. - 2018. - № 2 (30). - P. 158-160.*
16. *Prokina, L.N. Influence of chemicals on nutritional value of perennial grasses in field crop rotation / L.N. Prokina // International agricultural journal. - 2018. - № 6. - P. 56-59.*
17. *Influence of organic and mineral fertilizers on productivity and yield quality forage crops in crop rotation / N. T. Chebotarev, A. A. Yudin, G. G. Romanov, I. S. Titova // Feed production. - 2015. - № 11. - P. 17-20.*
18. *Regional farming system of Smolensk region / A. M. Konova, A. Yu. Gavrilova, E. S. Rekashus, I. V. Ponkratenkova, O. V. Kurdakova, T. A. Dytskova, L. K. Kulik, L. K. Chekhalkova, I. N. Romanova, A. G. Prudnikova, A. D. Prudnikov, S. V. Semchenkova, I. A. Karamulina, E. A. Marenkova, D. A. Ignatenkova, N. A. Mirzaeva, Z. P. Baburchenkova. - Smolensk: Agronauchservice, 2013. - 277 p.*

19. Gladysheva, O.V. *Legume-cereal grasses and mineral fertilizers in the system of measures for soil fertility improvement* / O.V. Gladysheva, A.M. Pestryakov, V.A. Svirina // *Vestnik of Russian agricultural science*. - 2016. - № 2. - P. 26-29.

20. Gladysheva, O.V. *Technology elements of soil fertility reproduction* / O.V. Gladysheva, V.A. Svirina // *Agrarian science*. - 2019. - № 7-8. - P. 43-46.

DISTRIBUTION OF SILT AND MOLE RAT SOD PILES ON THE PROFILE OF AGRICULTURAL SOILS OF CATENAE OF DIFFERENT PERIODS OF AGRICULTURAL DEVELOPMENT OF THE CENTRAL FOREST STEPPE

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Key words: soil profile, slope exposure, mole rat sod piles, arable land, radial distribution, lateral distribution, landscape catena

The work is devoted to the study of the granulometric composition of soils of 120-year and 240-year-old agricultural development of the meadow-steppe landscape on the example of the Belgorod region. In the lateral distribution of the silt fraction contained in the arable horizon, a significant increase of its share was found in the lower parts of the soil catenae of 120-year-old arable land; as for 240-year-old arable land, lateral fluctuations of the silt fraction are less noticeable. Average values of the silt content along the slope profiles of arable land of 240 years of age

showed a local maximum of silt adjacent to the subsurface horizon. An inverse correlation was found for slopes on 120-year-old arable land, namely, the fact that the percentage of the depth silt fraction increased did not lead to an increase of the same fractions in the near-arable layer. In the soil sections of the studied catenae, numerous mole rat sod piles were found, especially many of them were detected at the depth of up to one meter. The average area occupied by mole rat sod piles on the walls of the average section is 80-90% on 120-year-old arable land and 70-80% on 240-year-old arable land. Mole rat sod piles occupy 30-40% of the walls of the soil sections on the soils of the background catenae. Mole rat sod piles are more common in the soils of the catenae of the northern slopes - both for 120-year-old and 240-year-old arable land.

Bibliography:

- 1. Aleksandrovskiy, A.L. Evolution of soils and geographic environment / A.L. Aleksandrovskiy, E.I. Aleksandrovskaya. - Moscow: Nauka, 2005. - 223 p.*
- 2. Ivanov, I.V. Evolution of the forest-steppe and black soil steppe of the Central region / I.V. Ivanov, Yu. G. Chendev // Evolution of soils and soil cover. Theory, diversity of natural evolution and anthropogenic soil transformations. - Moscow: GEOS, 2015. - Ch. 13. - P. 456-469.*
- 3. Chendev, Yu. G. Stages and trends of technogenic transformation of the soil cover of the Central forest-steppe (Belgorod region) / Yu. G. Chendev, A.N. Gennadiev // Vestnik of Moscow University. Geography. - 1993. - № 5. - P. 30-39.*
- 4. Scriabin, O.A. The structure of soil cover, methods of its study / O.A. Skryabin. - Perm: PSAA, 2007. - 206 p.*
- 5. Kozlovskiy, F.I. Theory and methods of soil cover studying / F.I. Kozlovskiy. - Moscow: GEOS, 2003. - 398 p.*
- 6. Chendev, Yu. G. Evolution of forest-steppe soils of the Central Russian Upland in the Holocene / Yu. G. Chendev. - Moscow: GEOS, 2008. - 174 p.*
- 7. Distribution of organic matter in the soils of the catenae of the forest-steppe of different periods of agricultural development / Yu. G. Chendev, A. N. Gennadiev, A.*

- P. Zhidkin, T.S. Koshovskiy, I. Yu. Vagurin, E.A. Zazdravnykh // Materials of the VII International Scientific Conference. - Belgorod, 2017. - P. 274-280.*
8. *Gedroits, K.K. Soil absorbed cations and physical properties of soil / K.K. Gedroits // Journal of Applied Chemistry. - 1929. - Vol. 2, No. 3-4. - P. 16-24.*
9. *Zhukov, A.V. Spatial variability of the electrical conductivity of the soil under the influence of burrowing activity of mole rats at various scale levels / A.V. Zhukov, T.M. Konovalova // Vestnik of Dnipropetrovsk University. Biology. Medicine. - 2011. - Vol. 2, No. 2. - P. 33-40.*
10. *Zhukov, A. V. Landscape aspect of the ecological niche of mole rats (*Spalax microphthalmus guldenstaedt* 1770) / A. V. Zhukov, O. N. Kunakh, T. M. Konovalova // Biological Vestnik of Melitopol State Pedagogical University named after Bohdan Khmelnytsky. - 2011. - № 3. - P. 13-27.*
11. *Pakhomov, A.E. GIS-approach to assessing the variability of electrical conductivity of the soil under the influence of pedoturbation activity of the mole rat (*Spalax microphthalmus*) / A.E. Pakhomov, T.M. Konovalova, A.V. Zhukov // Vestnik of Dnepropetrovsk University. Biology, ecology. - 2010. - № 18-1. - P. 58-66.*
12. *Vadyunina, A.F. Methods of research of physical properties of soils / A.F. Vadyunina, Z.A. Korchagina. - Moscow: Agropromizdat, 1986. - 416 p.*
13. *Pakhomov, A.E. Influence of the burrowing activity of a mole on the microflora of soils of floodplain oak forests of the steppe zone of the southeast of the Ukrainian SSR / A.E. Pakhomov, G.I. Tyrygina // Mammals: Abstracts of the 3rd Congress of the All-Union Theriological Society. - Moscow, 1982. - V. 1. - P. 267-268.*
14. *Pakhomov, A. E. On the possibility of using the burrowing activity of mammals for the purposeful formation of soil mesofauna in the areas of forest land reclamation / A. E. Pakhomov, A. F. Pilipenko, V. L. Bulakhov // Biogeocenotic studies of forests of technogenic landscapes of the steppe zone of Ukraine. - Dnepropetrovsk: DSU, 1989. - P. 167-175.*

**ZEOLITES AND FERTILIZERS ON THEIR BASIS IN SOYBEAN
CULTIVATION TECHNOLOGY IN THE VOLGA FOREST STEPPE**

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Key words: zeolite and fertilizers based on it, soybeans, yield and product quality.

Experimental field studies were carried out on the experimental field of Ulyanovsk State Agrarian University in 2018-2020. The experiment scheme in 2019 (laid in 2018) consisted of 4 variants: 1. Control (without fertilizers); 2. Zeolite in pure form, 500 kg / ha; 3. Organic mineral fertilizer, obtained by enriching zeolites with amino acids, 500 kg / ha; 4. Zeolite 500 kg / ha + N₄₀ (carbamide at the dose of 40 kg of nitrogen per 1 ha). In 2020, the experiment was supplemented with four variants in order to identify more appropriate doses of fertilization (zeolite enriched with amino acids, 250 kg / ha; zeolite enriched with amino acids, 500 kg / ha; zeolite enriched with carbamide, 250 kg / ha; zeolite enriched with urea , 500 kg / ha). The experiments were carried out in 3-fold repetition with a randomized placement of plots. The effect of zeolite from Yushansk deposit of Ulyanovsk region and fertilizers based on it enriched with amino acids and urea were studied in the experiment, as well as their effect on general biological activity of leached black soil, on its agrochemical parameters, photosynthetic activity of soybean crops, yield and seed quality. A significant influence of experimental fertilizers on biological activity of the soil, improvement of nutrient regime, as well as the ability of zeolite to neutralize soil acidity was found. Improvement of the soil environment in case of application of zeolite enriched with amino acids and urea as a fertilizer contributed to an increase of soybean yields by 6-14% and by 12-31% to improvement of the product quality. With an increase of the dose of fertilizers, the yield of soybean seeds increased, but not proportionally.

Bibliography:

1. Umarov, M.M. *Structural and functional role of soil in the biosphere* / M.M. Umarov. - Moscow: Geos, 1999. - P. 199-134.
2. *Forecast of the soybean market development for 2020/2021: Russia and the world.* - URL: <https://specagro.ru/news/202006/rynok-soi-rossiya-i-mir> (date of access 13.04.2021).
3. *Zeolite-containing rocks of Tatarstan and their application* / A.I. Burov, A.N. Tyurin, A.V. Ekimov [and others]; edited by A. I. Burov. - Kazan: FEN AS RT, 2001. - 176p.
4. Liebig, Y. *Chemistry in application to agriculture* / Y. Liebig. - St. Petersburg: printing house of F. Viehweg and his son, 1864 (Braunschweig). - 324 p.
5. Loboda, B.P. *Application of zeolite-containing mineral raw materials in crop production* / B.P. Loboda // *Agrochemistry*. - 2000. - No. 6. - P. 78-91.
6. Samsonova, N.E. *Silicon in plants and animal organisms* / N.E. Samsonova // *Agrochemistry*. - 2019. - № 1. - P. 86-96.
7. Bocharnikova, E.A. *Silicon fertilizers and ameliorants: history of study, theory and practice of application* / E.A. Bocharnikova, V.V. Matychenkov, I.V. Matychenkov // *Agrochemistry*. - 2011. - № 7. - P. 84-96.
8. Kulikova A. Kh. *Silicon and high-siliceous rocks in fertilization system of agricultural crops* / A. Kh. Kulikova. - Ulyanovsk: Ulyanovsk State Agricultural Academy, 2013. - 176 p.
9. Ma, J. F. *Silicon uptake and accumulation in higher plants* / I. F. Ma, N. Yamaji // *Friends Plant Sci*. - 2006. - № 11. - P.342-397.
10. *Understanding the agronomics of silicon in plant and soil are essential for establishing silicon fertilization guidelines* / B. Tubana, T. Babu, B. White, F. Agostinho, W. Payl, L. Datnoff // *7th Inter. Conf. silicon. Agricuent. Proced. Abstracts*. - India, 2017. - P.10.
11. Chanchal, M. C. H. *Alleviation of a biotic and stresses in plants by silicon supplementation* / M. C. H. Chanchae, R. T. Kapoor, D. Ganyenala // *Sci.Agricnet*. - 2016. - V.13, № 2. - P.59-73.

12. *Mishustin, E.N. Microorganisms and productivity of agriculture / E.N. Mishustin. - Moscow: Nauka, 1972 .- 341 p.*
13. *Zvyagintsev, D. G. Soil Biology / D. G. Zvyagintsev, I. E. Babieva, G. I. Zemova. - Moscow: Moscow State University, 2005.- 455 p.*
14. *Mataruyeva, I.A. Microbiological patterns of formation of humus reserves of sod-podzolic soils / I.A. Mataruyeva. - Kostroma: KSAA, 2005.- 190 p.*
15. *Matychenkov, V.V. Influence of silicon fertilizers on plants and soil / V.V. Matychenkov, E.A. Bocharnikova, Ya. M. Alimosova // Agrochemistry. - 2002. - № 2. - P. 86-93.*
16. *Posypanov, G.S. Biological nitrogen. Problems of ecology and vegetable protein / G.S. Posypanov. - Moscow, 1996 .- 278 p.*
17. *Trepachev, E.P. Agrochemical aspects of biological nitrogen in modern agriculture / E.P. Trepachev. - Moscow, 1999 .- 532 p.*
18. *Drobysheva, N.I. The influence of fertilizers on formation of nodules and the yield of soybeans / N.I. Drobysheva // Agrochemistry. - 2000. - № 2. - P.59-61.*
19. *Gukova, M. M. Nutrition features of leguminous plants with free and bound nitrogen: dissertation abstract for the degree of Doctor of Biological Sciences / Gukov M. M. - Moscow, 1974. - 36 p.*
20. *Labyntsev, A. V. Symbiotic fixation of legumes in crop rotations with systematic introduction of mineral and organic fertilizers / A. V. Labyntsev, I. M. Shaposhnikova // Agrochemistry. - 1997. - № 11. - P. 15-42.*

NEW SOURCES OF SEEDLESS GRAPES OF ANAPA EXPERIMENTAL STATION SELECTION

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Key words: grapes, variety, seedlessness, source, productivity, yield.

It is commonly known that the share of seedless grape varieties in the total production in the country is very small. Of 106 table varieties included in the register, only 4 varieties are of kishmish direction (Kishmish radiant, Korinka Russian, Yuzhnoberezhny, Yalta seedless). These varieties are in great demand, since their berries are used both fresh and dried. This article presents results of long-term research on isolation of genetic seedlessness donors among grape varieties of Anapa zonal experimental station of viticulture and winemaking, such as Lotos, Zhemchug of Anapa and Kishmish pink AZOS. These studies were carried out with a simultaneous complex study of economically valuable traits and annually changing weather conditions. In addition, the assessment of these varieties was carried out according to seedlessness sign intensity in the conditions of the Anapo-Taman viticulture zone. The greatest mass of rudiments of all analyzed samples was found in Kishmish pink AZOS variety, therefore, it was assigned to the third category of seedlessness, although the mass ratio of rudiments to the mass of the berry is negligible. The rest of the studied seedless grape varieties in comparison with the control variety (Radiant Kishmish) have a higher seedless class. It particularly concerns varieties such varieties as Zhemchug of Anapa and Lotus, belonging to the first and second classes of seedlessness, respectively. Along with this, a long-term work was carried out to study the yield of these varieties and their productivity (coefficients of fruiting and fertility), the phenology of plant development depending on weather conditions. In particular, it was found that high productivity parameters are observed in all the studied varieties every year; Lotus and Zhemchug of Anapa have also high yield every year. The conducted work has shown prospects for using grape varieties of Anapa Experimental Station as future seedlessness donors.

Bibliography:

1. *Anapa ampelographic collection - the largest center for accumulation and study of the gene pool of grapes in Russia / M.I. Pankin, V.S. Petrov, A.A. Lukyanova [and others] // Vavilov journal of genetics and selection. - 2018. - Vol. 22, № 1. - P. 54–59.*
2. *Anapa ampelographic collection (biological plant resources): monograph / E.A. Egorov [and others]; executive editor V. S. Petrov. - Krasnodar: FSBSI North Caucasus Federal Scientific Center for Horticulture, Viticulture, Winemaking, 2018.- 194 p.*
3. *Database of grape varieties of Anapa ampelographic collection: Certificate of registration of the database RUS 2018620901 07.05.2018 / V. A. Bolshakov, M. I. Pankin, V. S. Petrov [and others].*
4. *Seedless varieties and hybrid forms of grapes / K. V. Smirnov, I. A. Kostrikin, L. A. Maistrenko [and others]. - Novocherkassk-Zaporozhye, 2002 .- 54 p.*
5. *Volynkin, V. A. Selection of grapes for seedlessness, large berry and early maturity at the polyploid level / V. A. Volynkin, V. A. Zlenko, V. V. Likhovskoy // Viticulture and winemaking. - 2009. - Vol. 39. - P. 9-13.*
6. *Results of selection of seedless grape varieties / L. A. Maistrenko, N. A. Duran, E. N. Medyutova, L. N. Mezentseva // Russian grapes. - 2017. - Vol. 5. - P. 29–39.*
7. *Kislov, A. V. Climatology: a textbook for students of institutions of higher professional education / A. V. Kislov. - Moscow: Academy, 2011 .- 224 p. - ISBN 978-5-7695-6223-5.*
8. *Methodological and analytical support for organizing and conducting research on grape production technology / Russian Academy of Agricultural Sciences; State Scientific Institution North Caucasus Zonal Research Institute of Horticulture and Viticulture; scientific editor K. A. Serpukhovitina. - Krasnodar: SSI North Caucasus Federal Scientific Center for Horticulture, Viticulture, 2010 .- 179 p.*
9. *Promising early table grape varieties: recommendations / A. G. Kovalenko, V. A. Bolshakov, A. A. Lukyanov [and others]. - Anapa, 2018 .- 20 p.*
10. *The program of the North Caucasus Center for selection of fruit, berry, flower and ornamental crops and grapes for the period up to 2030 / edited by E. A. Egorov.*

- Krasnodar: SSI North Caucasus Federal Scientific Center for Horticulture, Viticulture, 2013 .- 202 p.

11. Radchevsky, P. P. Seedless grape varieties / P. P. Radchevsky, L. P. Troshin. - Krasnodar: Kuban SAU, 2008 .- 160 p. - ISBN 978-5-94672-334-3.

12. Eremin, G.V. Modern methodological aspects of organization of selection process in gardening and viticulture / G.V. Eremin. - Krasnodar: North Caucasus Federal Scientific Center for Horticulture, Viticultur, 2012 .- 569 p. - ISBN 978-5-98272-081-8.

13. Modern methodology, assessment tools and selection of breeding material for garden crops and grapes: monograph / E.A. Egorov [and others]. - Krasnodar: FSBSI North Caucasus Federal Scientific Center for Horticulture, Viticulture, Winemaking, 2017 .- 282 p. - ISBN 978-5-98272-114-3.

14. Grape varieties of Anapa zonal experimental station of viticulture and winemaking: recommended practice / A.I. Vysokopoyasnyi, E.I. Kritskiy, A.I. Zhukov [and others]. - Krasnodar, 2012 .- 40 p.

15. Plant varieties included in the State Register of Selection Achievements Permitted for Use: [site] - URL: <https://reestr.gossort.com/reestr/culture/330> (date of access: 23.09.2019). - Text: electronic.

16. The Major Origin of Seedless Grapes is Associated with a Missense Mutation in the MADS-Box Gene *VviAGL11* / C. Royo, R. Torres-Perez, N. Mauri [et al.] // Plant physiology.- 2018. - V. 177, vol. 3. - P. 1234-1253.

17. Genetic variability and association among color and white seedless genotypes of grape (*Vitis vinifera*) / Saniya, J. Kanwar, I. S. Naruka, P. P. Singh // Indian journal of agricultural sciences. - 2018 .- V. 88, vol. 5. - P. 737-745.

18. Características agronômicas e sensibilidade ao rachamento de bagas de uvas semsementes / L. D. S. Da Oliveira, M. S. B. De Moura, P. C. S. De Leão, T. G. F. Da Silva, L. S. B. Souza // J. Environ. Anal. Prog. - 2017. - № 2 (3). - P. 274-282.

19. Agenetic analysis of seed and berry weight in grapevine / J. A. Cabezas, M. T. Cervera, L. Ruiz-Garcia, J. Carreno, J. M. Martinez-Zapater // Genome. - 2006. - № 49 (12). - P. 1572-1585.

20. Maul, E. *Die rebengenetischen Ressourcen in Deutschland / E. Maul // Geilweilergof aktuell: Mitt. Des Inst. Fur Rebenzuchtung. - Siebeldingen, 2006. - Jg. 34, H. 2. - P. 9 - 14.*
21. Khiari, R. *Raisin processing: physicochemical, nutritional and microbiological quality characteristics as affected by the drying process / R. Khiari, H. Zemni, D. Mihoubi // FOOD REVIEWS INTERNATIONAL. - 2018 .- Vol. 35, vol. 3. - P. 246-298.*
22. *Effect of the pre-treatment and the drying process on the phenolic composition of raisins produced with a seedless Brazilian grape cultivar / C. Olivati, Paula de Nishiyama, Teodoro de Souza [et al.] // FOOD RESEARCH INTERNATIONAL. - 2019 .- V. 116 .- P. 190-199.*
23. Alleweldt, G. *The genetic resources of Vitis / G. Alleweldt, E. Dettweiler. - Siebeldingen: FRG, 1994 .- 74 p.*
24. *Breeding of new seedless table grapes in Israel conventional and biotechnological approach / A. Perl [et al.] // Acta Hortic. - 2003. - 603 - P. 185-187.*

**ADAPTIVE ABILITIES OF CHERRY OF TURGENEVKA VARIETY IN
THE CONDITIONS OF EXTREME CONTINENTAL CLIMATE OF THE
ASTRAKHAN REGION**

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Key words: cherry, variety, stock for grafting, biometric parameters, early maturity, productivity.

The article presents results of the first stage of the study of the introduced Turgenevka cherry variety on stocks of different growth rates under the conditions of

extreme continental climate of the Northern Caspian region to substantiate its use in intensive planting of the arid zone. The aim of our research is to study the economic and biological characteristics and adaptability of Turgenevka variety to the abiotic stress factors of the winter period, which appear on the territory of the Astrakhan region. The study was carried out at the experimental field of the Caspian Agrarian Federal Scientific Center of the Russian Academy of Sciences. The records and observations were carried out in 2017-2020, in triple replication. The experiment plot was laid down in 2017. The research material is the introduced Turgenevka cherry variety. As a result of the research, the influence of stocks on periods of the main phenological phases, biometric parameters of trees, productivity, early maturity and quality of cherry fruits was revealed. At the initial stage of plant growth and development, it was found that clonal stocks slightly accelerate the start of growth and flowering of the grafted trees in comparison with the trees on seed stock. Turgenevka variety is characterized by a more restrained tree growth (1.5 m) on a well-grown seed stock (mahaleb cherry). Mahaleb cherry stock also has a positive effect on early maturity of the variety. The largest fruits, 5.7 g, were formed on VTs-13 stock. The tasting score of the fruit was 4.5 points. A complex assessment of the variety resistance to diseases and pests was carried out. The influence of the stock on chemical fruit composition was not revealed. Turgenevka variety showed good resistance to unfavorable environmental factors.

Bibliography:

1. The role of the variety and grafting stock for sweet cherry and cherry in modern orchards in the south of Russia / E. M. Alekhina, Yu. A. Dolya [and others] // Problems of intensive gardening: materials of the expanded meeting of the Academic Council dedicated to the 100th birthday anniversary of Doctor of Agricultural Sciences Trusevich Gavril Vladimirovich. Scientific works. - Krasnodar: State Scientific Institution of the North Caucasus Zonal Research Institute of Horticulture and Viticulture, 2010. - P. 71-77.

2. Solonkin, A. V. *Cherry. Selection of new varieties in the Volgograd region / monograph: monograph / A. V. Solonkin. - Volgograd: OOO Sfera, 2015.– 128 p.*
3. Grigorieva, L.V. *Influence of clonal stocks on formation of productivity of apple trees in an intensive garden / L.V. Grigorieva, O.A. Ershova // Fruit and berry growing in Russia: collection of scientific papers. - Moscow, 2012 .- Vol. XXXIV, part 1. - P. 200.*
4. *Mahaleb cherry, grafting stock for sweet cherries and cherries. - URL: <https://www.podvoy.com/antipka-c116p>.*
5. *Mahaleb cherry is type of grafting stock. - URL: <https://anteysad.by/a20962-tip-podvoya-antipka.html>.*
6. *Grafting stock for stone fruit - Description - Selection: article. - URL:*
7. Zaremchuk, R. Sh. *Cherry grafting stocks: article / R. Sh. Zaremchuk, S. R. Cherkezova. - URL:*
8. *Problems of gardening in the Middle Volga region // Samara Research Institute "Zhigulevskie sady". - Samara: OOO AsGard, 2011 .- 323 p. - ISBN 978-5-4259-0086-9.*
9. *Program and methodology for study of varieties of fruit, berry and nut crops: a collection of articles. - Orel: All-Russian Research Institute of Selection of Fruit Crops, 1999. - 608p.*
10. *Garden and vegetable garden. Turgenevskaya Cherry (Turgenevka). - URL: <https://fermilon.ru/sad-i-ogorod/kustarniki/vishnya-turgenevskaya-turgenevka.html>.*
11. *Garden and vegetable garden. Turgenevskaya Cherry (Turgenevka). - URL: <https://fermilon.ru/sad-i-ogorod/kustarniki/vishnya-turgenevskaya-turgenevka.html>.*
12. *Recurrent spring frosts - how to protect plants in the garden and vegetable garden. - URL: <https://www.ogorod.ru/now/soil/13212/Vozvratnye-vesennie-zamorozki-kak-uberech-rasteniya-v-sadu-i-ogorode.htm>.*
13. Ivanenko, E. N. *Comparative characteristics of growth and development of Renklod Altana plum variety on various grafting stocks / E. N. Ivanenko, T. I. Aleksandrova // Fruit growing and viticulture of the South of Russia. - 2020. -№ 64 (4). - P. 168-176.*

14. Evica, Nenadovik-Mratinic. *Bioloske osobine sorti sljive kombinovanih svojstava / Nenadovik-Mratinic Evica, Milatovic Dragan, Durovic Dejn // Simposium o sljivi Srbije sa medunarodnium ucesem, Cacak, 2831 avg., 2006. Vocarstvo. - 2007. - 41. - P. 31-35.*

15. Efimova, N. *Early maturation and early ripening / N. Efimova // Vestnik of the gardener. - No. 22. - URL: <https://vestnik-sadovoda.ru/index.php/osnovy-osnov/1140-skoroplodnost-i-skorospelost> //*

16. Ljubojevic, M. *Anatomically assisted cherry rootstock selection / M. Ljubojevic, L. Zoric, I. Maksimovic // Sci. Hortic. - 2017. - No. 217. - P. 197-208.*

17. *Diseases of stone fruits (cherries, sweet cherries, plums and others). - URL: <https://procvetok.com/articles> / bolezni-kostochkovyh-vishni-chereshni-slivy-i-drugih /*

18. *Species- and cultivar-dependent traits of Prunus avium and Prunus cerasus polyphenols / G. Picariello, V. Vito, P. Ferranti, M. Paolucci, M. G. Volpe // Journal of Food Composition and Analysis. - 2016. - Vol. 45. - P. 50-57.*

WHEAT RUST IDENTIFICATION USING PHYTOPATHOLOGICAL RESEARCH AND MACHINE VISION TECHNOLOGIES

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Key words: wheat diseases, yellow rust, brown rust, stem rust, phytosanitary monitoring, diagnostics, computer vision.

Wheat is the most economically important and valuable food crop cultivated in most regions of the world, and various diseases have a significant impact on yield parameters. Particular attention in wheat protection technologies from phytopathogens is given to rust, since yield losses, depending on the weather conditions of the season and the resistance of the sown varieties, can range from 30 to 100%. The article provides brief information on wheat rust diseases (yellow, brown, stem rust), as well as on current methods of their identification. Accurate and timely identification of rust pathogens is a key step in making decisions on application of plant protection products in the battle against diseases, which prevents their further development, spread and the occurrence of epiphytotic. The article describes the main method for identification and further record of yellow, brown, stem rust - this is a classic phytopathological study based on usage of human resources. The advantage of this method is its accuracy and versatility. Among the drawbacks, one should single out the labor intensity and the need for a staff of qualified phytopathologists. In view of intensive development of computer technologies and agriculture digitalization, the possibility of using machine vision based on programming of neural networks and their training in identifying the main causative agents of diseases is acquiring scientific and practical interest. A promising methodological approach to identification of phytopathogens when providing phytosanitary monitoring and algorithms used for training of neural networks and applied in machine vision technologies are presented.

Bibliography:

- 1. Yakhyaev, Kh. K. Automated monitoring system "Protection" of development and spread of harmful objects in the Republic of Uzbekistan / Kh. K. Yakhyaev, M. Rakhimov // Vestnik of Science and Practice. Electronic journal. - 2018. - V. 4, № 1. - P. 92-96. - URL: <http://www.bulletennauki.com/yakhyaev-rahimov> (date of access 15.01.2018)*
- 2. Private selection of field crops: textbook / edited by V. V. Pylneev. - St. Petersburg: Lan, 2016. - 554 p. (ISBN 978-5-8114-2096-4)*

3. *Vestnik of scientific and technical creativity of youth of Kuban SAU. In 4 parts / compiled by A. Ya. Barchukova, Ya. K. Tosunov; edited by A.I. Trubilin; executive editor A. G. Koshchaev. - Krasnodar: KubSAU, 2016. - V. 1, issue. 1. - 262 p.*
4. *Matveeva, I.P. Yellow rust of wheat. Distribution, harmfulness, control measures (review) / I.P. Matveeva, G.V. Volkova // Vestnik of the Ulyanovsk State Agricultural Academy. -2019. - № 2 (46). - P. 102-116.*
5. *Peresyphkin, V.F. Agricultural phytopathology / V.F. Peresyphkin. - 4th ed., Rev. and add. - Moscow: Agropromizdat, 1989. - 480 p.*
6. *Matveeva, I.P. Screening of sources of resistance to *Puccinia striiformis* West. among varieties of wheat of various geographical origin / I. P. Matveeva, Yu. V. Shumilov, G. V. Volkova // Scientific support of the agro-industrial complex: IX All-Russian conference of young scientists dedicated to the 75th anniversary of V.M. Shevtsov. Krasnodar, November 24-26, 2015. - Krasnodar, 2016. - P. 214-215.*
7. *Mains, E. B. Studies concerning heteroecious rusts / E. B. Mains // Mycologia. - 1933. - № 25. - P. 407-417.*
8. *Album of pests and diseases of agricultural crops of the non-black soil zone of the European part of the USSR / S. M. Volkov, L. S. Zimin, D. K. Rudenko, S. M. Tupenevich. - Moscow-Leningrad: State Publishing House of Agricultural Literature, 1955. - 488 p.*
9. *Andreev, L.N. Wheat rust: cytology and physiology / L.N. Andreev, Yu.M. Plotnikova. - Moscow: Nauka, 1989. - 304 p.*
10. *Bolton, Melvin D. Wheat leaf rust caused by *Puccinia triticina* / Melvin D Bolton, James A Kolmer, David F Garvin // Molecular Plant Pathology. - 2008. -- 9 (5). - P. 563-75. - DOI: 10.1111 / j.1364-3703.2008.00487.x*
11. *Korenyuk, E.A. Initial material for selection of spring soft wheat with resistance to leaf rust in the conditions of the Omsk Irtysh region: spec. 06.01.05: dissertation for the degree of candidate of agricultural sciences // Korenyuk Ekaterina Andreevna; Siberian Research Institute of Agriculture. - Omsk, 2015. - 165 p.*
12. *Schumann, G. L. Stem rust of wheat (black rust) / G. L. Schumann, K. J. Leonard // The Plant Health Instructor. - 2000. - DOI: 10.1094 / PHI-I-2000-0721-01*

13. *The influence of crop rotations on development of wheat diseases [Fungal diseases] / V.B. Lebedev, D.A. Yusupov, Yu.F. Kurdyukov, N.I. Strizhkov, L.M. Kudimova // Agro XXI. - 2003/2004. - N 7/12. - P. 7-9.*
14. *Zhukov, V.D. Formation of the doctrine of soils and their fertility, historical experience of soil classification / V.D. Zhukov, Z.R. Sheudzhen // Polythematic network electronic scientific journal of Kuban State Agrarian University. - 2016. - № 119. - P. 588-605.*
15. *Shumilov, Yu. V. Yellow rust of wheat requires special attention / Yu. V. Shumilov, G.V. Volkova // Plant protection and quarantine. - 2013. - № 8. - P. 13-14.*
16. *Agroinvestor. - URL: <https://www.agroinvestor.ru/technologies/article/15640-koshmary-zernovykh>*
17. *Decree of the President of the Russian Federation of 07.05.2018 No. 204 (as amended on 19.07.2018) "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024" - URL: Access from the reference legal system "Consultant Plus" (access date: 12.12.2018).*
18. *Ryazantsev, D. Yu. Diagnostics of quarantine phytopathogens by PCR in FLASH format / D. Yu. Ryazantsev, D.D. Abramov, S.K. Zavriev // Agricultural biology. - 2009. - № 3. - P. 114-117.*
19. *Fedorenko, V.F. Promising technologies for diagnostics of pathogens of agricultural plants: scientific and analytical review / V.F. Fedorenko, N.P. Mishurov, L.A. Nemenushchaya. - Moscow: FSBSI Rosinformagrotech, 2018. - 68 p.*
20. *Shamrai, S. N. Fundamentals of field research in phytopathology and phytoimmunology: teaching aid / S. N. Shamrai, V. I. Glushenko. - Kharkov: KhNU named after V.N. Karazin, 2006. - 64 p. Guidelines for registration tests of fungicides in agriculture / executive editor V. A. Dolzhenko. - St. Petersburg, 2009. - 379p.*
21. *Koishybaev M. Wheat diseases. Ankara, 2018. 365 p.*
22. *Bidaux, J. M. Screening for horizontal resistance to rice blast (*Pyricularia oryzae*) in Africa / J. M. Bidaux, I. W. Buddenhagen, G. J. Persley (Eds.) // Rice in Africa. - London: Acad. Press, 1978. - P. 159-174.*

23. *Barbedo, J. G. A. A review on the main challenges in automatic plant disease identification based on visible range images / J. G. A. Barbedo // Biosyst. Eng. - 2016. - 144. - P. 52-60. - doi: 10.1016 / j.biosystemseng.2016.01.017*
24. *Application of support vector machine for detecting rice diseases using shape and color texture features / Q. Yao, Z. Guan, Y. Zhou, J. Tang, Y. Hu, B. Yang. - 2009. - DOI: 10.1109 / ICEC.2009.73*
25. *Rice blast recognition based on principal component analysis and neural Network / M. Xiao, Y. Ma, Z. Feng, Z. Deng, S. Hou, L. Shu, Z. Lu // Computers and Electronics in Agriculture. - 2018. - 154. - P. 482–490. - DOI: <https://doi.org/10.1016/j.compag.2018.08.028>*
26. *Zeiler, M. D. Visualizing and understanding convolutional networks. CoRR abs / 1311.2901 / M. D. Zeiler, R. Fergus. - 2014. - doi: 10.1007 / 978-3-319-10590-1_53*
27. *Wang, G. Automatic image-based plant disease severity estimation using deep learning / G. Wang, Y. Sun, J. Wang // Comput. Intell. Neurosci. - 2017. - P. 2917536. - doi: 10.1155 / 2017/2917536*
28. *Can deep learning identify tomato leaf disease? / K. Zhang, Q. Wu, A. Liu, X. Meng // Adv. Multimedia. - 2018. - 3. - P.1-10. - doi: 10.1155 / 2018/6710865*
29. *A comparative study of fine-tuning deep learning models for plant disease identification / E. C. Too, L. Yujian, S. Njuki, L. Yingchun // Comput. Electron. Agric. - 2018. - 161. - P. 272–279. -doi: 10.1016 / j.compag.2018.03.032*
30. *Backpropagation Applied to Handwritten Zip Code Recognition / Y. LeCun, B. Boser, J. S. Denker, D. Henderson, R. E. Howard, W. Hubbard, L. D. Jackel // Neural Computation. - 1989. - 1 (4). - P. 541-551. - DOI: 10.1162 / neco.1989.1.4.541*
31. *The History Began from AlexNet: A Comprehensive Survey on Deep Learning Approaches / Md ZahangirAlom, Tarek M. Taha, Christopher Yakopcic, Stefan Westberg, PahedingSidike, MstShamima Nasrin, Brian C. Van Esesn, Abdul AS Awwal, Vijayan K. Asari // arXiv: 1803.01164. - 2018.*
32. *"Deep Residual Learning for Image Recognition" / He Kaiming, Zhang Xiangyu, Ren Shaoqing, Sun Jian // 2016 IEEE Conference on Computer Vision and Pattern*

Recognition (CVPR): arXiv: 1512.03385. - 2016. - P. 770-778. - doi: 10.1109 / CVPR.2016.90. ISBN 978-1-4673-8851-1.

33. *"Sque ezeDet: Unified, Small, Low Power Fully Convolutional Neural Networks for Real-Time Object Detection for Autonomous Driving " / Bichen Wu, Alvin Wan, Forrest Iandola, Peter H. Jin, Kurt Keutzer // ArXiv: 1612.01051. - 2016.*

34. *Densely Connected Convolutional Networks / Gao Huang, Zhuang Liu, Laurens van der Maaten, Kilian Q. Weinberger // arXiv: 1608.06993. - 2018.*

35. *Liu, L. B. Identification method of rice leaf blast using multilayer perception neural network / L. B. Liu, G. M. Zhou // Transactions of the Chinese Society of Agricultural Engineering. - 2009 .- 25 (S2). - DOI: 10.3969 / j.issn.1002-6819.2009.z2.041*

36. *Phadikar, S. Rice diseases classification using feature selection and rule generation techniques / S. Phadikar, J. Sil, A. K. Das // Computers and Electronics in Agriculture. - 2013. - 90. - P. 76–85. - URL: <https://doi.org/10.1016/j.compag.2012.11.001>*

37. *Gayathri, Devi T. Plant Leaf Disease Detection using K means Segmentation / Devi T. Gayathri, P. Neelamegam, A. Srinivasan // International Journal of Pure and Applied Mathematics. - 2018. –Vol. 119, No. 15. - P. 3477-3483.*

38. *Dor Bank, Noam Koenigstein, Raja Giryes Autoencoders. arXiv: 2003.05991. - 2020.*

39. *You Only Look Once: Unified, Real-Time Object Detection / J. Redmon, S. Divvala, R. Girshick, A. Farhadi // ArXiv 1506.02640. - 2016.*

40. *Platform for simulation of automated crop production / M. Hakojärvi, M. Hautala, J. Ahokas, T. Oksanen, T. Maksimow, A. Aspiala, A. Visala // Agronomy Research. - 2010 .-- 8 (1). - P. 797–806.*

41. *Solution for remote real-time visual expertise of agricultural objects / V. Komasilovs, A. Zacepins, A. Kviesis, A. Nasirahmadi, B. Sturm // Agronomy Research. - 2018 .-- 16 (2). - P. 464-473. - doi: <https://doi.org/10.15159/AR.18.050>*

42. *Kalinin, N.V. About machine vision technologies in agriculture / N.V. Kalinin // Scientific electronic journal Meridian. - 2020. - № 3 (37). - P. 1-5.*

43. Official site of "PlantVillage" company. - URL: <https://plantvillage.psu.edu/> (accessed date: 11.01.2021)
44. Oleshko, R.B. Application of machine vision in agriculture / R.B. Oleshko, L.I. Krasnoplakhtova // Synergy of Sciences. - 2017. - № 12. - P. 840-844. - URL: <http://synergy-journal.ru/archive/article0612>
45. InSTePP International Science & Technology Practice & Policy (InSTePP) center at the University of Minnesota. - URL: <https://twitter.com/instepp>

**CORRELATION ANALYSIS OF FEATURES WHICH CHARACTERIZE
YIELD AND PRODUCT QUALITY OF REPRESENTATIVES OF ALLIUM
GENUS (RHIZIRIDEUM SUBGENUS, RHIZIRIDEUM G. DON EX KOCH
SECTION)**

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Key words: Allium, Rhizirideum subgenus, Rhizirideum section, morphology, biochemistry, correlation coefficient, selection, yield

Eight samples of representatives of Allium L. genus from Rhizirideum subgenus, Rhizirideum G. Don ex Koch section were studied in the conditions of the Moscow region. The presented study is planned to determine the correlation between various traits that contribute to yield increase and accumulation of biologically active compounds in leaves. Morphological characteristics (plant height, number of leaves per plant, number of shoots per plant, leaf length, leaf width and total leaf yield) and biochemical parameters (dry matter, nitrates, ascorbic acid, mono sugars, chlorophyll, carotene, flavanoids, hydroxycinnamic acids) were analyzed. Research on introduction and mobilization of genetic resources, preservation and sustention of genetic collection of representatives of Allium L. genus were carried out within the

framework of the State Assignment. Dispersion analysis showed significant differences among the tested genotypes for all the studied parameters, namely phenotypic, biochemical and yield traits. The relation between the parameters was assessed using Pearson coefficient. A positive close connection was revealed between the plant height and leaf length (0.792), plant height and flavonoids (0.744), the number of shoots and the number of leaves (0.818), dry matter and nitrates (0.903), mono sugars and ascorbic acid (0.739), mono sugars and hydroxycinnamic acids (0.700), mono sugars and flavonoids (0.704), ascorbic acid and hydroxycinnamic acids (0.964), ascorbic acid and flavonoids (0.937), hydroxycinnamic acids and flavonoids (0.987). A negative close connection was noted between the height and number of shoots (-0.757), plant height and chlorophyll (-0.814), number of shoots and leaf length (-0.951), number of leaves and leaf length (-0.717), dry matter and mono sugars (-0.804), nitrates and mono sugars (-0.887). The revealed patterns are of interest for constructing a model of varieties and selection usage.

Bibliography:

1. Choi, H. J. A partial revision of *Allium* (*Amaryllidaceae*) in Korea and north-eastern China / H. J. Choi, B. U. Oh // *Bot. Journ. of the Linnean Society*. - 2011. - № 167. - P. 153–211.
2. Seregin, A. P. Molecular and morphological revision of the *Allium saxatile* group (*Amaryllidaceae*): geographical isolation as the driving force of underestimated speciation / A. P. Seregin, G. Anačkov, N. Friesen // *Bot. Journ. of the Linnean Society*. - 2015. - № 178. - P. 67–101. DOI: <https://doi.org/10.1111/boj.12269>
3. Sinitsyna, T. A. Dated phylogeny and biogeography of the Eurasian *Allium* section *Rhizirideum* (*Amaryllidaceae*) / T. A. Sinitsyna, T. Herden, N. Friesen // *Plant Syst. Evol.* - 2016. - № 302(9). - P. 1311–1328. - DOI:10.1007/s00606-016-1333-3.
4. Sinitsyna, T. A. Genus *Allium* L. (*Alliaceae*) Siberia / T. A. Sinitsyna // *Vavilovia*. - 2019. - № 2 (3). - P. 3-22. - DOI: 10.30901 / 2658 3860 2019 3 3-22

5. Sinitsyna, T. A. Taxonomic review of *Allium senescens* subsp. *glaucum* (Amaryllidaceae) / T. A. Sinitsyna, N. Friesen // *Feddes Repertorium*. - 2018. - № 129 (1). - P. 9–12. - DOI: 10.1002/fedr.201700008.
6. Screening of Onion (*Allium cepa* L.) Genotypes for Drought Tolerance Using Physiological and Yield Based Indices Through Multivariate Analysis / P. A. Gedam, A. Thangasamy, D. V. Shirsat, S. Ghosh, K. P. Bhagat, O. A. Sogam, A. J. Gupta, V. Mahajan, P. S. Soumia, V. N. Salunkhe, Y. P. Khade, S. J. Gawande, P. S. Hanjagi, R. S. Ramakrishnan, M. Singh.. - *Front. Plant Sci.*, 09 February 2021. – URL: <https://doi.org/10.3389/fpls.2021.600371>
7. Assessment of Genetic Variability in Onion (*Allium cepa* L.) Genotypes / U. U. Pujar, R. C. Jagadeesha, P. M. Gangadharappa, M. L. Chavan, S. Shankarappa, J. Jayappa // *Ind. J. Pure App. Biosci.* - 2019. - № 7(6). - P. 152-156. - DOI: <http://dx.doi.org/10.18782/2582-2845.7889>
8. Genetic Diversity and Taxonomic Studies of *Allium akaka* and *Allium elburzense* Native to Iran Using Morphological Characters / S. Jafari, M. R. Hassandokht, M. Taheri, A. Kashi // *Journal of Horticultural Research*. - 2017. - № 25(1). - P. 99-115.
9. Essential micronutrients - components of antioxidant protection in some species of *Allium* genus / T. I. Shirshova, I. V. Beshley, N. A. Golubkina, F. V. Golubev, E. V. Klyuikov, V. A. Cheremushkina // *Vegetables of Russia*. - 2019. - No. 1. - P. 68-79. - URL: <https://doi.org/10.18619/2072-9146-2019-1-68-79>
10. Fomina, T. I. The content of biologically active substances in the aerial part of some species of *Allium* L. / T. I. Fomina, T. A. Kukushkina // *Chemistry of vegetable material*. - 2019. - № 3. - P.177-184. - DOI: 10.14258/jcprm.2019034842.
11. Prospects for introduction into the culture of wild species of *Allium* L. genus of food direction / A. V. Soldatenko, M. I. Ivanova, A. F. Bukharov, A. I. Kashleva, T. M. Seredin // *Vegetables of Russia*. - 2021. - № 1. - P. 20-32. - URL: <https://doi.org/10.18619/2072-9146-2021-1-20-32>
12. Biochemical composition of leaves of *Allium* L. species in the conditions of the Moscow region / M.I. Ivanova, A.F. Bukharov, D.N.Baleev, A.R.Bukharova, A.I. Kashleva, T.M. Seredin, O. A. Razin // *Achievements of science and technology of the*

agro-industrial complex. -2019. - № 33 (5). - P. 47-50. - DOI: 10.24411 / 0235-2451-2019-10511

13. *Studies on leaf yield and association analysis in underutilized and cultivated Allium species* / N. Rathore, R. Gayen, V. Mahajan, A. Thangasamy, P. Ghodke // *International Journal of Chemical Studies*. - 2020. - № 8(3). - P. 57-61. - DOI: 10.22271/chemi.2020.v8.i3a.9467.

14. *Shri Dhar. Genetic variability and character association in garlic. Progressive Horticulture.*, 34 (1) : 88-91. fluids, *J Agric / Shri Dhar // Food Chem*. - 2002. - № 43. - P. 2332- 2338.

15. *Agrawal, A. Character association and path analysis in garlic (Allium sativum L.)* / A. Agrawal, R. S. Tiwari // *Vegetable Science*. - 2009. - № 36(1). - P. 69-73.

16. *Correlation and path analysis Studies in Garlic (Allium sativum L.)* / G. Kalloo, V. C. Pandey, S. Lal, M. L. Pandita // *Haryana Journal of Horticultural Science*. - 1982. - № 11. - P. 97-101.

17. *Lokhande, G. D. Correlation studies in garlic* / G. D. Lokhande, B. B. Pawar // *Journal of Maharashtra Agriculture University*. - 1988. - № 13(1). - P. 110-111.

18. *Correlation and path analysis in garlic (Allium sativum L.)* / D. P. Sharma, B. K. Verma, A. K. Mehta, R. K. Shrivastava // *Harayana J Hort. Sci*. - 1998. - № 27(4). - P. 277-280.

19. *Diversity evaluation of morphological traits and allicin content in garlic (Allium sativum L.) from China* / H. Wang, X. Li, D. Shen, Y. Oiu, J. Song // *Euphytica*. - 2014. - № 198. - P. 243–254. - DOI 10.1007/s10681-014-1097-1

WILD SPECIES OF DAUCUS L. IN SELECTION AND PRESERVATION OF EX SITU IN THE CONDITIONS OF THE MOSCOW REGION

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Key words: Daucus L., selection, genetic source, marker trait.

*Wild ancestors and close relatives provide valuable genetic resources for improving cultivated carrots (*Daucus carota* L. subsp. *Sativus* (Hoffm.) Arcang.). Remaining knowledge gaps in taxonomy, distribution and characteristics of commercially valuable traits limit their wide usage in selection and negatively affect *ex situ* (gene bank) and *in situ* (natural habitat) conservation planning. Since some populations of wild plants are adapted to extreme climatic conditions, unfavorable soils, pests and diseases, they have significant potential to contribute to selection to solve emerging and foreseeable future problems in the agrotechnology of table carrots. The aim of the study is to study wild species of *Daucus* genus by morphological characteristics in the Moscow region in order to expand their usage in selection and *ex situ* preservation. According to the research results, it was found that the trait "anthocyanin colour of the leaf petiole" of *D. setifolius* (Turkey, Antalya) is a marker when hybridizing with cultivated carrots. The marker trait "anthocyanin colour of flowers" was recorded in *D. carota* L. var. *maximus*, *D. carota* (Tajikistan), *D. carota* (Uzbekistan, Kashkadarya region). *D. carota* subsp. *halophilus* is a genetic source for resistance to salt stress. In the future, the formation of *Daucus* germ plasm collections and *ex situ* preservation contribute to the expanded usage of wild species in selection for resistance of cultivated table carrots to bio- and abiostress.*

Bibliography:

1. *Apiaceae* / G. M. Plunkett, M. G. Pimenov, J.-P. Reduron [et al.]; editors J. W. Kadereit, V. Bittrich, // *The families and genera of vascular plants*. - Springer, Berlin, Germany, 2019. - Vol. 15. - URL: https://doi.org/10.1007/978-3-319-93605-5_2.
2. *Entire plastid phylogeny of the carrot genus (Daucus, Apiaceae): Concordance with nuclear data and mitochondrial and nuclear DNA insertions to the plastid* / D. M. Spooner, H. Ruess, M. Iorizzo [et al.] // *Am. J. Bot.* - 2017. - № 104. - P. 296-312. - doi: 10.3732 / ajb.1600415.
3. *Daucus: Taxonomy, Phylogeny, Distribution* / D. M. Spooner, P. M. Iorizzo, D. Grzebelus, R. Baranski // *The Carrot Genome. Compendium of Plant Genomes*. Springer, Cham. - 2019.- URL: https://doi.org/10.1007/978-3-030-03389-7_2.
4. *Phylogeny of Apiaceae subtribe Daucinae and the taxonomic delineation of its genera* / Ł. Banasiak, A. Wojewódzka, J. Baczyński [et al.] // *Taxon*. - 2016. - №- 65. - P. 563-585. - doi: 10.12705 / 653.8.
5. *Sokolova, L. M. A cost-effective evaluation of carrot resistance to Alternaria sp. and Fusarium sp.* / L. M. Sokolova, M. V. Shatilov, O. A. Razin // *IOP Conf. Ser. : Earth Environ. Sci.* - 2019. - No. 395. - 012050. - URL: <https://doi.org/10.1088/1755-1315/395/1/012050>.
6. *Sokolova, L.M. Usage of successive selections in selection of table carrots for resistance to Fusarium sp. and Alternaria sp.* / L. M. Sokolova, A. F. Bukharov, M. I. Ivanova // *Agrarian science*. - 2020. - № 6. - P. 78-83. - doi: 10.32634 / 0869-8155-2020-339-6-78-83.
7. *Economic and academic importance.* / P. W. Simon, M. Iorizzo, D. Grzebelus [et al.] // *Compendium of plant genomes: The carrot genome*. - Cham, Switzerland: Springer Nature, 2019. - P. 1–8. - URL: <https://doi.org/10.1002/9780470650172.ch5>.
8. *Production of table carrots in Russia* / M. V. Shatilov, A. F. Razin, O. A. Razin [and others] // *Agrarian Russia*. - 2020. - №1. - P. 21-30. - doi: 10.30906 / 1999-5636-2020-1-21-30.
9. *Eggersdorfer, M. Carotenoids in human nutrition and health* / M. Eggersdorfer, A. Wyss // *Arch Biochem Biophys*. - 2018. - №. 652. - P. 18-26. –URL: <https://doi.org/10.1016/j.abb.2018.06.001>.

10. *A global perspective on carotenoids: metabolism, biotechnology, and benefits for nutrition and health* / M. Rodríguez-Concepción, J. Avalos, M. L. Bonet [et al.] // *Prog Lip Res.* - 2018. - № 70. - P. 62-93. - URL: <https://doi.org/10.1016/j.plipres.2018.04.004>.
11. *Meléndez-Martínez, A. J. An overview of carotenoids, apocarotenoids, and vitamin A in agro-food, nutrition, health, and disease* / A. J. Meléndez-Martínez // *Mol Nutr Food Res.* - 2019. - № 63. - URL: <https://doi.org/10.1002/mnfr.201801045>.
12. *Simpson, K. Carotenoid Biosynthesis in *Daucus carota** / K. Simpson, A. Cerda, C. Stange // *Carotenoids in Nature. Subcellular Biochemistry.* - Springer, Cham, 2016. - Vol. 79. - URL: https://doi.org/10.1007/978-3-319-39126-7_7.
13. *Carotenoid presence is associated with the Or gene in domesticated carrot* / S. L. Ellison, C. H. Luby, K. E. Corak [et al.] // *Genetics.* - 2018. - № 210. - P. 1497-1508. - URL: <https://doi.org/10.1534/genetics.118.301299>.
14. *Distinct transcription profile of genes involved in carotenoid biosynthesis among six different color carrot (*Daucus carota* L.) cultivars* / J. Ma, Z. Xu, G. Tan [et al.] // *Acta Biochimica et Biophysica Sinica.* - 2017. - Vol. 49, is. 9. - P.817-826. - URL: <https://doi.org/10.1093/abbs/gmx081>.
15. *Carotenoid gene expression explains the difference of carotenoid accumulation in carrot root tissues* / F. Perrin, L. Hartmann, C. Dubois-Laurent [et al.] // *Planta.* - 2017. - No. 245. - P. 737-747. - URL: <https://doi.org/10.1007/s00425-016-2637-9>.
16. *Transcript profiling of genes involved in carotenoid biosynthesis among three carrot cultivars with various taproot colors* / Y. H. Wang, T. Li, R. R. Zhang [et al.] // *Protoplasma.* - 2020. - № 257. - P. 949-963. - URL: <https://doi.org/10.1007/s00709-020-01482-4>.
17. *Sauer, L. Ocular carotenoid status in health and disease* / L. Sauer, B. Li, P. S. Bernstein // *Annu Rev Nutr.* - 2019. - № 39. - P. 95-120. - doi: 10.1146 / annurev-nutr-082018-124555.
18. *Giordano, E. Lutein, zeaxanthin and mammalian development: metabolism, functions and implications for health* / E. Giordano, L. Quadro // *Arch Biochem*

Biophys. - 2018. - № 647. - P. 33-40. - URL: <https://doi.org/10.1016/j.abb.2018.04.008>.

19. *A high-quality carrot genome assembly provides new insights into carotenoid accumulation and asterid genome evolution / M. Iorizzo, S. Ellison, D. Senalik [et al.] // Nat Genet.* - 2016. - № 48. - P. 657-666. - URL: <https://doi.org/10.1038/ng.3565>.

20. *Patterns of Gene Flow between Crop and Wild Carrot, Daucus carota (Apiaceae) in the United States / J. R. Mandel, A. J. Ramsey, M. Iorizzo [et al.] // PLoS ONE.* - 2016. - № 11 (9). - e0161971. - URL: <https://doi.org/10.1371/journal.pone.0161971>.

21. *Wild carrot diversity for new sources of abiotic stress tolerance to strengthen vegetable breeding in Bangladesh and Pakistan / P. W. Simon, W. R. Rolling, D. Senalik [et al.] // Crop Science.* - 2021. - № 61. - P. 163–176. - URL: <https://doi.org/10.1002/csc2.20333>.

22. *Genetics and genomics of carrot abiotic stress / P. W. Simon, M. Iorizzo, D. Grzebelus, R. Baranski // Compendium of plant genomes: The carrot genome Cham, Switzerland: Springer Nature.* - 2019. - P. 363–372. - URL: <https://doi.org/10.1002/9780470650172.ch5>.

23. *Genome-Assisted Improvement Strategies for Climate-Resilient Carrots / A. Bolton, M. Klimek-Chodacka, E. Martin-Millar [et al.]; C. Kole // Genomic Designing of Climate-Smart Vegetable Crops.* - Springer, Cham, 2020. -- URL: https://doi.org/10.1007/978-3-319-97415-6_6.

24. *An automated image analysis pipeline enables genetic studies of shoot and root morphology in carrot (Daucus carota L.) / S. D. Turner, S. Ellison, D. A. Senalik [et al.] // Frontiers in Plant Science.* - 2018. - № 9. - P. 1703. - URL: <https://doi.org/10.3389/fpls.2018.01703>.

25. *Carrot. Handbook of Crop Breeding / P. W. Simon, R. E. Freeman, J. V. Vieira [et al.]; editor M. J. Prohens, F. N. Carena // Vegetable Breeding.* - Heidelberg, Germany: Springer-Verlag, GmBHP, 2008. - Vol. 1. - P. 327–357.

26. Tas, P. *Evaluating resistance to Alternaria dauci and related traits among diverse germplasm of Daucus carota* / P. Tas // *Ph. D. diss., Univ. Wisconsin, Madison, 2016.*
27. Bonnet, A. *Source of resistance to powdery mildew for breeding cultivated carrots* / A. Bonnet // *Agronomie. - 1983. - № 3. - P. 33–38. - doi: 10.1051 / agro: 19830105.*
28. Luby, CH *Genetic and phenological variation of tocochromanol (vitamin E) content in wild (Daucus carota L. var. Carota) and domesticated carrot (D. carota L. var. Sativa)* / CH Luby, HA Maeda, IL Goldman // *Hortic. Res. - 2014. - № 1. - P. 14015. - doi: 10.1038 / hortres. 2014.15.*
29. Bolton, A. *Variation for salinity tolerance during seed germination in diverse carrot [Daucus carota (L.)] germplasm* / A. Bolton, P. W. Simon // *HortScience. - 2019. - № 54. - P. 38–44. - doi: 10.21273 / HORTSCI13333–18.*
30. Rahim, M. A. *Carrot field trial results of CWR under, heat, drought and saline areas of Bangladesh* / M. A. Rahim, A. T. M. M. Mannan // *Annual Progress Report, BAURES, BAU. - 2019. - P. 90–99.*
31. *Cell membrane stability and relative cell injury in response to heat stress during early and late seedling stages of diverse carrot (Daucus carota L.) germplasm* / A. Nijabat, A. Bolton, M. Mahmood-ur-Rehman [et al.] // *Hortscience. - 2020. - № 55. - P. 1446-1452. - doi: <https://doi.org/10.21273/HORTSCI15058-20>.*
32. *Distributions and conservation status of carrot wild relatives in Tunisia: A case study in the western Mediterranean basin* / N. Mezghani, C. K. Khoury, D. Carver [et al.] // *Crop Science. - 2019. - № 59. - P. 2317-2328. - URL: <https://doi.org/10.2135/cropsci2019.05.0333>.*
33. Miller, R. E. *The gene pool concep. t applied to crop wild relatives: An evolutionary perspective* / R. E. Miller, C. K. Khoury; editors S. L. Greene // *North American crop wild relatives. Conservation strategies. Springer, Cham, Switzerland. - 2018. - Vol. 1. - P. 167–188. - doi: 10.1007 / 978–3–319–95101–0_6.*
34. *Genetic diversity using single nucleotide polymorphism (SNPs) and screening for salinity tolerance in rice germplasm at reproductive stage* / W. B. Barrera, C. B. Dela

Vina, N. A. Vispo [et al.] // *Plant Genetic Resources*. - 2019. - № 17. - P. 522-535. - doi: <https://doi.org/10.1017/S1479262119000364>.

35. *In situ conservation-harnessing natural and human-derived evolutionary forces to ensure future crop adaptation* / M. R. Bellon, E. Dulloo, J. Sardos [et al.] // *Evol. Appl.* - 2017. - No.10. - P. 965-977. - doi: 10.1111 / eva.12521.

36. *Green plants in the red: A baseline global assessment for the IUCN Sampled Red List Index for plants* / NA Brummitt, SP Bachman, J. Griffiths-Lee, M. Lutz, JF Moat, A. Farjon, [et al.] // *PLoS One*. - 2015 .- 10. - e0135152. - doi: 10.1371 / journal.pone.0135152

37. *Global conservation priorities for crop wild relatives* / N. P. Castañeda-Álvarez, C. K. Houry, H. A. Achicanoy, V. Bernau, H. Dempewolf, R. J. Eastwood [et al.] // *Nat. Plants*. - 2016. - 2. - 16022. - doi: 10.1038 / nplants.2016.22

38. *Comprehensiveness of conservation of useful wild plants: An operational indicator for biodiversity and sustainable development targets* / C. K. Houry, D. Amariles, J. S. Soto [et al.] // *Ecol. Indic.* - 2019. - № 98. - P. 420-429. - doi: 10.1016 / j.ecolind.2018.11.016.

39. *Data for the calculation of an indicator of the comprehensiveness of conservation of useful wild plants* / C. K. Houry, D. Amariles, J. S. Soto [et al.] // *Data Brief*. - 2019. - № 22. - P. 90–97. - doi: 10.1016 / j.dib.2018.11.125.

40. *Genotyping-by-sequencing provides the discriminating power to investigate the subspecies of *Daucus carota* (Apiaceae)* / C. I. Arbizu, S. L. Ellison, D. Senalik [et al.] // *BMC Evolution ary Biology*. - 2016. - №. 16. - P. 234.

41. *Subspecies Variation of *Daucus carota* Coastal (Gummifer) Morphotypes (Apiaceae) Using Genotyping-by-Sequencing* / F. Martinez-Flores, M. B. Crespo, P. W. Simon [et al.] // *Systematic Botany*. - 2020. - №. 45 (3). - P. 688–702. - doi: 10.1600 / 036364420X15935294613527.

42. *Korovin, E.P. Vegetation of Central Asia and South Kazakhstan* / E.P. Korovin. - Tashkent: Academy of Sciences of the Uzbek SSR, 1962 .- P. 162-163.

43. *Extended studies of interspecific relationships in *Daucus* (Apiaceae) using DNA sequences from ten nuclear orthologues.* / F. Martinez-Flores, M. B. Crespo, E.

Geoffriau, C. Allender, H. Ruess, C. I. Arbizu, P. Simon, D. M. Spooner // *Botanical Journal of the Linnean Society*. - 2019. - 191. - P. 164-187.

44. *Genotyping-by-sequencing reveals the origin of the Tunisian relatives of cultivated carrot (Daucus carota)* / N. Mezghani, H. Ruess, N. Tarchoun [et al.] // *Genet. Resour. Crop Evol.* - 2018. - № 65. - P. 1359-1368. - doi: 10.1007 / s10722-018-0619-4.

45. *CarrotDiverse: understanding variation in a wild relative of carrot* / E. Geoffriau, T. Charpentier, S. Huet, A. Hägnefelt, V. Lopes, T. Nothnagel, U. Lohwasser, C. Mallor Gimenez, C. Allender // *Acta Hort.* - 2019. - № 1264. - P. 151-156. - doi: 10.17660 / ActaHortic.2019.1264.18

46. Pimenov, M. *An updated synopsis of the Umbelliferae of China: nomenclature, synonymy, typification, distribution* / M. Pimenov // *Turczaninowia*. - 2017. - Vol. 20, No. 2. - P. 106-239. - URL: <http://turczaninowia.asu.ru/article/view/2429>.

47. Pimenov, M. *An updated synopsis of the Umbelliferae of Central Asia and Kazakhstan: nomenclature, synonymy, typification, distribution* / M.

Pimenov // *Turczaninowia*. - 2020. - Vol. 23, №. 4. - P. 127–257. - doi: 10.14258 / turczaninowia.23.4.12.

ANALYSIS OF MORTALITY STRUCTURE OF MATURE STRAY DOGS (SECTIONAL STUDY)

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Key words: stray animals, dogs, mortality, analysis, autopsy.

Stray animals are such animals that are left without owner's care, they are part of society, serving as sources of zoonoses. There are no works devoted to analysis and classification of death causes of stray animals on Altai Territory.

Objective of the research is to study mortality structure of stray mature dogs. The objects of research were the corpses of 41 sexually mature stray dogs from the Altai Territory, and kept by volunteers and animal protection organizations in the period 2017-2020. Research methods include registration of an animal; autopsy; photographing; statistical processing and analysis of the obtained data. The results showed that 33% of the studied stray dogs died as a result of the action of toxic substances of unknown nature (poisoning), at the age of 3-4 years and 7-8 years; 22% - infectious diseases, at the age of from 6 months up to 5-6 years old; 15% - dirofilariasis, at the age of 2 years and 4-7 years 4 10% - extensive heart thrombosis, at the age of 1-3 years, 5-6 years and over 10 years; 10% - mechanical injuries (car injuries), at the age of 3-8 years; 7% - mechanical asphyxia, at the age of 5, 6 and 10 years; 2% - cancer, at the age of 2 years. The death causes of stray dogs are the result of the action of toxic substances of unknown nature (poisoning); infectious diseases (plague of carnivores and piroplasmosis); autointoxication (sources: stomach, intestines, liver, pancreas); car injuries; closing of the larynx lumen with a foreign object and liver cancer with metastases.

Bibliography:

- 1. Article 17. On Responsible Treatment of Animals and on Amending Certain Legislative Acts of the Russian Federation: Federal Law N 498-FZ of December 27, 2018 (as amended on 27.12.2019).*
- 2. Izgarova, A.I. Ethological and ecological features of stray dogs / A.I. Izgarova // Days of student science: collection of scientific papers of the II International student conference. - Kazan: Limited Liability Company Print-Service-XXI century, 2019.- P. 125-127.*
- 3. Sedova, N. A. Biotic relations of stray dogs with other animal species: deposited manuscript / N. A. Sedova. –Petrozavodsk: All-Russian Institute of Scientific and Technical Information, 2007. - 11p.*
- 4. Spread of non-contagious pathology among stray dogs in the city of Ryazan / K. A. Gertseva, E. V. Kiseleva, D. V. Dubov, A. V. Rudnaya, Yu. R. Gorshkova // Vestnik of*

Ryazan State Agrotechnological University named after P.A. Kostychev. - 2019. - № 4 (44). - P. 18-24.

5. *Rybalko, V.N. Review of world experience in solving the problem of homeless animals / V.N. Rybalko // Veterinary pathology. - 2006. - № 2 (17). - P. 12-18.*

6. *Gorin, M.A. The nature of clinical and epizootic manifestation of mono- and mixed parasitosis of domestic carnivores in the conditions of N. Novgorod: abstract of dissertation for the degree of candidate of veterinary sciences 03.02.11 - parasitology 06.02.02 - veterinary microbiology, virology, epizootology, mycology with mycotoxicology and immunology / Gorin Mikhail Alexandrovich. - Nizhny Novgorod: Nizhny Novgorod State Agricultural Academy, 2015 .- 22 p.*

7. *Shamsuvaleeva, E. Sh. Ecology features of stray dogs in the city of Kazan and its suburbs / E. Sh. Shamsuvaleeva, I.I. Rakhimov. - Kazan: ZAO Novoe znanie, 2013 .- 168 p.*

8. *Maksimova, E. V. Problems and ways of minimizing the risk to public health from homeless animals in the city / E. V. Maksimova // Fundamental and applied aspects of the analysis of public health risk: materials of the All-Russian scientific and practical Internet conference of young scientists and specialists of Russian Federal State Agency of Health and Consumer Rights, (09-13 October 2017 Perm). - Perm: Perm National Research Polytechnic University, 2017 .- P. 65-69.*

9. *Gorin, M. A. The role and place of viral diseases in the nosological profile of the infectious pathology of carnivores in an urbanized area / M. A. Gorin // Innovative projects of young scientists in the agro-industrial complex: materials of the All-Russian conference of young scientists dedicated to the 85th anniversary of the Federal State Budgetary Educational Institution HE Nizhny Novgorod State Agricultural Academy. - 2016 .- P. 91-97.*

10. *Buryakova, E.V. Study of certain aspects of the problem of stray dogs in the city / E.V. Buryakova // Student scientific search - to science and education of the XXI century: materials of the X International student scientific and practical conference. - Ryazan: Modern Technical University, 2018 .- P. 169-171.*

11. Ziyatdinova, A.R. *Experience of treating a stray dog with skin lesions* / A.R. Ziyatdinova, D.R. Shapirova // *In the world of scientific discoveries: materials of the International student scientific conference*. - Ulyanovsk: FSEI HE Ulyanovsk SAU, 2017. - P. 177-178.
12. Tkachenko, L. V. *Analysis of kidney pathology of stray animals (autopsy research)* / L. V. Tkachenko // *Vestnik of Altai State Agrarian University*. - 2019. - No. 4. - P. 135-139.
13. Tkachenko, L. V. *Pancreatitis of stray animals (sectional study)* / L. V. Tkachenko // *Vestnik of Altai State Agrarian University*. - 2019. - № 8 (178). - P. 153-157.
14. Tkachenko, L.V. *Analysis of pathologies of stomach and intestines of stray dogs (autopsy study)* / L.V. Tkachenko // *Vestnik of Altai State Agrarian University*. - 2020. - № 12 (194). - P. 74-79.
15. *Forensic and veterinary examination of the animal corpse*. - URL: <https://helpiks.org/5-40655.html>. (Date of access: 01.05.2021). - Text: electronic.
16. *Rules and techniques for autopsy of animal corpses*. - URL: <https://lektsia.com/3x92e6.html>. (Date of access: 02.05.2021). - Text: electronic.
17. *Types of photography and the features of photographing forensic objects*. - URL: <https://helpiks.org/3-58908.html>. (Date of access: 02.05.2021). - Text: electronic.
18. *Statistical analysis of experimental data. Methods for primary processing of experimental results*. - URL: <https://studfile.net/preview/5247753/page:4/>. (Date of access: 02.05.2021). - Text: electronic.
19. *Comparative analysis of formation of infectious pathology among domestic carnivores within the administrative territories of the city* / Yu. V. Pashkina, A. V. Pashkin, S. V. Atrokhova, L. N. Kartushina, D. V. Karelkin, E. V. Chernikova, O.V. Vorontsov // *Issues of legal regulation in veterinary medicine*. - 2014. - № 4. - P. 42-46.
20. Kamarli, A. A.-S. *Epidemiological monitoring of infectious diseases of carnivores* / A. A.-S. Kamarli, E.K. Akmatova, I.U. Saadanov // *Vestnik of Altai State Agrarian University*. - 2016. - № 8 (142). - P. 125-129.

21. *Monitoring of dirofilariasis of dogs in the Republic of Armenia / R. V. Slobodyanik, S. S. Zykova, A. T. Asatryan, V. A. Shiryayeva // International veterinary bulletin. - 2020. - № 1. - P. 19-23.*

DEVELOPMENT OF ISOLATION SCHEME AND BACTERIOLOGICAL IDENTIFICATION OF PSEUDOMONAS SYRINGAE BACTERIA AND ITS APPROBATION

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Key words: bacteriological scheme, Pseudomonas syringae, bacteriosis, properties, culture, identification

The article presents results of studies on development of isolation scheme and bacteriological identification of Pseudomonas syringae bacteria and its approbation. The introduction of the article describes the objects of Pseudomonas syringae contamination - fruit trees and shrubs, agricultural plants, which proves the relevance of the research in the field of expanding of laboratory methods for identifying phytopathogenic microorganisms. The author's bacteriological scheme includes the use of King B Medium (Pseudomonas F Agar; Pronadisa 1532) as a selective medium. Initially, the isolated bacteria are differentiated to Pseudomonas genus, the following parameters are studied: anaerobic fermentation, production of enzymes catalase, lecithinase, lipase; hydrolysis of starch and gelatin; fermentation of glucose and lactose, also, a test for maceration is put. The second stage of the research includes the study of the growth of bacterial cultures on meat-and-peptone

agar at 41 ° C and at 5% of NaCl; oxidase production, arginine hydrolase; fermentation of mannose and sorbitol; formation of levan, hydrogen sulfide and indole, esculin, a hypersensitivity reaction is set. The determined parameters allow to type the representatives of the genus to *Pseudomonas syringae* species within 192 hours. During the research, a collection of 12 strains of *Pseudomonas syringae* bacteria was formed, isolated from 97 objects of phytosanitary supervision and identified according to the developed technique. The proposed bacteriological scheme allows to differentiate the above microorganisms on the basis of the analysis of 25 parameters. The application of a phage biological product as a diagnosticum (according to the Otto method) expands the spectrum of the analyzed biological properties of the isolated and identified *Pseudomonas syringae* bacteria.

Bibliography:

- 1. Maslova, M.V. Resistance of rootstock forms and varieties of apple to toxins of the causative agent of bacterial necrosis of fruit crops Pseudomonas syringae van Hall / M.V. Maslova // Priority directions of gardening development: I Potapov's readings. - 2019. - P. 122-125.*
- 2. Pseudomonas syringae in wheat agrophytocenosis / L. A. Pasichnik, E. A. Savenko, L. N. Butsenko, V. F. Patyka // Science and World. - 2014. - Vol. 1, № 4. - P. 52-56.*
- 3. Zdorovenko, G.M. Features of composition, structure and biological properties of lipopolysaccharides from various strains of Pseudomonas syringae pv. atrofaciens / G. M. Zdorovenko, E. L. Zdorovenko, L. D. Varbanets // Microbiology. - 2007. - Vol. 76, № 6. - P. 774-789.*
- 4. Kozaeva, M.I. Influence of toxins of endophytic Pseudomonas syringae bacterium on different varieties and forms of strawberries / M.I. Kozaeva // Colloquium-journal. - Holopristsansky regional employment center, 2019. - № 6-3. - P. 22-23.*
- 5. Dzhaimurzina, A.A. Sensitivity of phytopathogenic Erwinia amylovora and Pseudomonas syringae bacteria to copper-containing fungicides / A.A. Dzhaimurzina, M.M. Isin, Zh. Z. Umiraliyeva // Potato protection. - 2014. - № 2. - P. 33-35.*

6. *Bacterial diseases of cabbage and measures to combat them: guidelines / edited by V. A. Pavlyushin. - St. Petersburg, 2004. - 56 p.*
7. *Bacterial diseases of sunflower / S. G. Borodin, I. A. Kotlyarova, G. A. Tereshchenko, N. V. Pashayan // Oil crops. - 2012. - No. 1 (150). - URL: <https://cyberleninka.ru/article/n/bakterialnye-bolezni-podsolnechnika> - date of access: 05.05.2020.*
8. *Red light delays programmed cell death in non-host interaction between Pseudomonas syringae pv tomato DC3000 and tobacco plants / L. Moyano, M. P. Lopéz-Fernández, A. Carrau [et.al.] // Plant Science. - 2020. - Vol. 291. - P. 110361.*
9. *Cornelis, Pierre. Pseudomonas: Genomic and Molecular Biology / Pierre Cornelis // Norfolk, UK. - 2008. - P. 1–19.*
10. *Khussein, A.S. PCR identification of Pseudomonas genus bacteria / A.S. Khussein, A.A. Nalbandyan, G.A. Selivanova // Scientific and practical journal. - 2017. - P. 20.*
11. *The application of polymerase chain reaction for characterizing strains of Pseudomonas syringae isolated from New Zealand rivers / J. Vanneste, D. Cornish, J. Yu, C. Morris // Plant Diseases. - 2009. - Vol. 62. - P. 256–261.*
12. *Bergey's Manual of Systematic Bacteriology - Springer. - 2001. - Vol. 3. - 1450 p.*
13. *Bergey's Manual of Systematic Bacteriology - Springer. - 2005. - Vol. 2. - 1106 p.*
14. *Bergey's Manual of Systematic Bacteriology - Springer. - 2007. - Vol. 2. - 1136 p.*
15. *Bacillus subtilis bacteriophages: isolation and study of properties / N. A. Feoktistova, D. A. Vasiliev, D. D. Khusainova, E. V. Saygusheva, G. Z. Baltaeva, M. I. Suleimanova // Current problems of agricultural science: state and development trends: materials of National Scientific and Practical Conference. - 2019. - P. 153-156.*
16. *Xin, X. F. Pseudomonas syringae: what it takes to be a pathogen / X. F. Xin, B. Kvitko, S. Y. He // Nature Reviews Microbiology. - 2018. - Vol. 16, № 5. - P. 316.*
17. *The relationship of host range, physiology, and genotype to virulence on cantaloupe in Pseudomonas syringae from cantaloupe blight epidemics in France / C. E. Morris [et al.] // Phytopathology. - 2000. - Vol. 90. - P. 636-646.*

18. Patyka, V. P. *Phytopathogenic bacteria in contemporary agriculture* / V. P. Patyka // *Microbiological journal*. - 2016. - № 78 (6). - P. 71-83.
19. Krzysztof, K. *Kosakonia cowanii as the New Bacterial Pathogen Affecting Soybean (Glycine max Willd.)* / K. Krzysztof, B. F. Natasza // *European Journal of Plant Pathology*. - 2020. - Vol. 157, № 1. - P. 173-183.
20. *Tomato wall-associated kinase SlWak1 depends on Fls2 / Fls3 to promote apoplastic immune responses to Pseudomonas syringae* / N. Zhang, M. A. Pombo, H. G. Rosli, G. B. Martin // *Plant physiology*. - 2020. - Vol. 183, № 4. - P. 1869-1882.

ADAPTATION DYNAMICS OF THE RABIES VIRUS OF "RV-97" VACCINE STRAIN TO MONOLAYER VNK-21/13 CELL CULTURE

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Key words: adaptation, rabies, RV-97 strain, cell culture, VNK -21, infectious activity, cell culture infectious dose CCID₅₀ / cm³.

The problem of rabies as one of the most dangerous zoonoses continues to be relevant almost all over the world. In development of a live vaccine, an important stage is to obtain an active component - a virus that retains the given phenotypic properties, pathogen cultivation system plays the main role. The aim of this work was to adapt the rabies virus of "RV-97" strain to the finite cell line of the Syrian hamster kidney (VNK -21/13) of the Swedish subline, as well as to carry out a comparative analysis of virus accumulation at different passages. The number of passages that need to be carried out for adaptation of RV-97 strain to the monolayer culture of VNK -21/13 cells was determined. We used a 2-day culture of VNK -21/13 cells in the phase of logarithmic growth (80-90% formation of a cell monolayer). VNK -21/13 cell culture grown as a monolayer in the wells of flat-bottomed plastic plates was

used as a test system for infectious activity. A fluorescent label was used to indicate infected cells. It was determined that the smallest number of passages at which the rabies virus of "RV-97" strain is adapted to the finite cell culture of VNK -21/13 of the Swedish subline is the 6th passage level. It was found that the titer of infectious activity of attenuated rabies virus of "RV-97" strain at the 6th passage level is $7.33 \pm 0.17 \lg CCID_{50} / cm^3$.

Bibliography:

- 1. Makarov, V. V. Current concepts about rabies in 2018 / V. V. Makarov // Vestnik of hunting studies. - 2018. - Vol.15, № 3. - P. 215-227.*
- 2. Evaluation of effectiveness of antiepidemiologic measures against rabies, carried out in the Russian Federation / S. V. Shcherbinin, T. V. Vadopalas, F. I. Korennoy [and others] // Veterinary medicine today. - 2020. - № 3 (34). - P. 162-167.*
- 3. Introduction history of rabies control by vaccination / A. C. Banyard, L. M. McElhinney, N. Johnson, A. R. Fooks // Rev. Sci. Tech. OIE. - 2018. - Vol. 37, № 2. - P. 305-322.*
- 4. Gruzdev, K.N. Animal rabies / K.N. Gruzdev, A.E. Metlin. - Vladimir: FSBI ARRIAH, 2019. - 394 p.*
- 5. Oral vaccination of wild carnivores against rabies in Belarus: a review / N. A. Kovalev, D. V. Buchukuri, Yu. V. Lomako [et al.] // Ecology and animal world. - 2020. - № 2. - P. 42-51.*
- 6. Lapteva, O.G. Technology improvement of production inactivated rabies vaccine: spec. 16.00.03: dissertation for the degree of candidate of veterinary sciences / Lapteva Oksana Georgiev. - Pokrov, 2003. - 113 p.*
- 7. Volkova, A. V. Cultivation of the rabies virus of Vnukovo-32 strain in the culture of finite cells for production of anti-rabies vaccines: spec. 03.00.06: author's abstract of dissertation for the degree of candidate of biological sciences / Volkova Aelita Vitalievna. - Moscow, 1997. - 20p.*
- 8. Gochmuradov, M.G. Technology improvement of industrial production of inactivated cultural vaccine against rabies: spec. 16.00.03: author's abstract of*

dissertation for the degree of candidate of sciences / Gochmuradov Murad Gazakovich. - Vladimir, 1999. - 23 p.

9. *Cultivation of the rabies virus in cell cultures of various origins / V. A. Balabanov, T. V. Sologub, I. V. Nikishin [and others] // Questions of veterinary virology, microbiology and epizootology: abstracts of the scientific conference. - Pokrov, 1990. - P. 120-122.*

10. *Development of a new purified VERO cell rabies vaccine (Rabivax-S) at the serum institute of India Pvt Ltd / S. P. Kulkarni, A. Sahai, B. Gunale, R. M. Dhere // Expert Rev Vaccines. - 2017. - Vol. 16, № 4. - P. 303-311.*

11. *King, A. A. Culture of rabies virus in vitro / A. A. King // Rabies. - Boston: Kluwez Acad. Publ, 1988. P. 47-66.*

12. *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Mammals, Birds and Bees). Chapter 3.1.17. Rabies (infection with rabies virus) and other lyssaviruses. - Paris, 2018. - P. 1-35.*

13. *Molecular and immunogenic characterization of BHK-21 cell line adapted CVS-11 strain of rabies virus and future prospect in vaccination strategy / C. A. Patel, V. Upmanyu, S. Ramasamy [et al.] // Virusdisease. - 2015. - Vol. 26, № 4. - P. 288-296.*

14. *Slivko, I.A. Immunobiological properties of TS-80 and 71 BelNIIEV-VGNKI vaccine strains of rabies virus: spec. 16.00.03: author's abstract of dissertation for the degree of candidate of veterinary sciences / Slivko Igor Aleksandrovich. - Pokrov, 2003. - 22 p.*

15. *Vero cell platform in vaccine production: moving towards cell culture-based viral vaccines / P. N. Barrett, W. Mundt, O. Kistner, M. K. Howard // Expert Rev ... Vaccines. - 2009. - Vol. 85. - P. 607-618.*

16. *Borisov, A. V. Technology development for production of virus vaccines against rabies of wild carnivores: spec. 16.00.03: author's abstract of dissertation for the degree of candidate of veterinary sciences / Borisov Aleksey Valerievich. - Vladimir, 2003. - 22 p.*

17. Gruzdev, L.K. *Study of reproduction of a fixed strain in cell cultures* / L.K. Gruzdev, A.E. Deshevykh, K.N. Gruzdev // *Issues of applied ecology (nature management), hunting and fur farming*. - 1997. - P. 285-286.
18. *Characterization of Russian rabies virus vaccine strain RV-97* / A. Metlin, L. Paulin, S. Suomalainen [et al.] // *Virus Research*. - 2008. - Vol. 132. - P. 242-247.
19. *Methodical recommendations for analysis of parameters in the "dose-effect" systems with an alternative method of assessment* / V. Yu. Kulakov, S. N. Kolosov, A. V. Konstantinov [and others]. - Vladimir: FSBI ARRIAH, 2016. - 31 p.
20. Pollard, D. *Reference book of computational methods of statistics* / D. Pollard. - Moscow: Finance and Statistics, 1982. - P.182-184.

ESTIMATION OF RELIABILITY OF CLINICAL STUDY RESULT OF BOVHYALURONIDASE AZOXYMER MEDICATION APPLIED TO CATS WITH UROLOGICAL DISEASES

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Key words: urethrostomy, catheterization, cystotomy, validity assessment, bovyhaluronidase azoxymer.

The article interprets the results of a randomized, blind, placebo-controlled, confirmatory clinical study of the efficacy of bovyhaluronidase azoxymer (BA) applied to cats with urological diseases, conducted in parallel groups on the basis of "Bars" veterinary clinics in Petersburg and the Department of Obstetrics and Operative Surgery of St. Petersburg State University of Veterinary Medicine from November 2018 to August 2020. To prove the causal relationship between the application of BA and a significant decrease of the number of complications in the postoperative period, we used a three-stage system for analyzing the results. The reliability of our study is confirmed by the following: 1) a sufficient sample number corresponding to that calculated at the planning stage of the clinical study (53 cats:

24 were included in the experimental group and 29 were in the control group) that had indications for surgery on the urethra and / or bladder; 2) a sufficient value of the confirmed effect: when BA was used, the risk of complications was 80.9% lower, and the chance of complications decreased by 12.2 times; 3) correct randomization and blinding, which made it possible to obtain representative samples: block randomization and blinding by territory were carried out; 4) standardization of animal registration and data collection: all animals were examined in accordance with the requirements of GOST R 58090-2018 "Clinical examination of nonproductive animals"; 5) the presence of placebo control. The revealed decrease of the frequency of complications with BA is explained by the action mechanism of the studied medication in the body. The results of clinical studies indicate that application of BA medication in the therapy of companion animals is clinically justified and can be extended beyond the observed population. The obtained results allow us to assert that application of BA significantly reduces the complications associated with the performed surgical intervention or the recurrence of the disease within six months after the first operation.

Bibliography:

- 1. Tikhova, G.P. Workshop on the analysis of clinical data. Interpretation of clinical research results: strategy and tactics of making the evidence base / G. P. Tikhova // Regional anesthesia and treatment of acute pain. - 2014. - Vol. VIII, № 4. - P. 62–72.*
- 2. Evidence based medicine: what it is and what it isn't / D. L. Sackett, W. M. Rosenberg, J. A. Gray, R. B. Haynes, W. S. Richardson // BMJ. – 1996. - Jan 13. - 312(7023). – P.71-72. - doi: 10.1136/bmj.312.7023.71. PMID: 8555924; PMCID: PMC2349778.*
- 3. GOST R 58090-2018. Clinical examination of nonproductive animals. General requirements. - Moscow: Standartinform, 2018. - 12 p.*
- 4. Results of a pilot study of the effect of bovyhaluronidase azoxymer on the frequency of complications after surgery on the urethra and bladder of cats / A. A. Stekolnikov, A. V. Nazarova, B. S. Semenov, T. Sh. Kuznetsova // International Vestnik of veterinary medicine. - 2019. - № 4. - P. 158–165. - DOI: 10.17238 / issn2072-2419.2019.4.158*
- 5. Nazarova, A. V. Calculation of the sample volume when planning a clinical research of bovyhaluronidase azoxymer in the urological practice of small domestic*

animals / A. V. Nazarova // *International veterinary vestnik*. - 2020. - № 1. - P. 140–144. - DOI: 10.17238 / issn 2072-2419.2020.1.140

6. Milyukov, V. E. *Criteria for formation of age groups of patients in medical research* / V. E. Milyukov, T. S. Zharikova // *Clinical medicine*. - 2015. - № 11. - P. 5–11.

7. GOST R R52379-2005. *Good Clinical Practice. (GCP)*. - Moscow: Standartinform, 2006. - 33 p.

8. *Statistical Principles for Clinical Research (ICH E9). Translation: PharmAdvisor, translation version of 31.03.2019*. - URL: <http://pharmadvisor.ru/document/tr3536/> (access date: 11.08.2020).

9. *Use of poliglecaprone 25 for perineal urethrostomy in cats: 61 cases (2007-2013)* / D. L. Frem, H. A. Hottinger, S. L. Hunter, N. J. Trout // *Javma-Journal of the American Veterinary Medical Association*. – 2017. – V. 251, № 8. – P. 935-940.

10. *Broux, O. Urethral intussusception following traumatic catheterization in a male cat* / O. Broux, A. L. Etienne, A. Hamaide // *Canadian Veterinary Journal-Revue Veterinaire Canadienne*. – 2018. – V. 59, № 4. – P. 385-387.

11. *Obstructive bacterial cystitis following cystotomy in a Persian cat* / Z. Nikousefat, M. Hashemnia, M. Javdani, A. Ghashghaii // *Veterinary Research Forum*. – 2018. – V. 9, № 2. – P. 199-203.

12. *Clinical outcomes of 28 cats 12-24 months after urethrostomy* / R. P. Sousa, D. C. S. Nunes-Pinheiro, K. O. Sampaio, E. C. B. da Silva, G. Cavalcanti, M. da Cunha // *Journal of Feline Medicine and Surgery*. — 2019. — P. 1–8.

13. *Zaitsev, A.V. Inflammation and connective tissue hyperplasia in urology - is there a problem?* / A. V. Zaitsev // *Effective pharmacotherapy*. - 2018. - № 2. - P. 50–56.

14. *Features of the action of hyaluronidases of various origins on the connective tissue* / R. U. Khabriev, N. O. Kamaev, T. I. Danilova, E. G. Kakhoyan // *Biomedical chemistry*. - 2016. - V. 62, № 1. - P. 82–88.

15. *Nazarova, A. V. Application of Bovhyaluronidase azoxymer to improve the treatment effectiveness of dogs with urological diseases* / A. V. Nazarova, B. S. Semenov, T. Sh. Kuznetsova // *Vestnik of Altai State Agrarian University*. - 2021. - № 1 (186). - P. 69–75.

16. *The use of Bovhyaluronidaze azoximer preparation in the treatment of suppurative wounds in companion animals* / A. V. Nazarova, B. S. Semenov, A. A.

Stekolnikov, T. Sh. Kuznetsova // BIO Web of Conferences : International Scientific-Practical Conference “Agriculture and Food Security: Technology, Innovation, Markets, Human Resources” (FIES 2020). - 2020. – Vol. 27. — DOI: <https://doi.org/10.1051/bioconf/20202700026>.

EFFICIENCY OF DIFFERENT ASSESSMENT METHODS OF BREEDING BULLS OF BLACK-AND-WHITE BREED BY THE OFFSPRING QUALITY

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Key words: black-and-white breed, Holstein breed, selection, heredity, population, genetic progress, selection effect, correlation coefficient, genealogical structure, valuation

The paper presents results of assessing black-and-white bulls by the quality of the offspring with application of different methods. The evaluation of bulls was carried out with application of the “daughter-mother” method in the conditions of Volzhsky Research Institute of Hydraulic Engineering and Land Reclamation. The valuation showed that the bulls Aist 7 and Muscat 8 increased milk yield of daughters, in comparison with mothers, by 951 and 486 kg, or by 26.7 and 12.9%. The rest of the servicing bulls reduced milk yield of the offspring by 46 - 1019 kg (1.1 - 24.7%). When assessing the bulls using the “daughter-peer” method, the highest milk productivity was shown by the descendants of Sazan 25 and Aist 7 of Vis Back

Ideal line, which surpassed their peers in milk yield by 273 and 419 kg, or by 3.8 and 5.7%, respectively. The producers Snop 57 (his 17 daughters had average milk yield of 4224 kg for the first lactation with milk fat of 3.80%) and Muscat 8 (with an average milk yield of daughters of 4254 kg, milk fat - 3.83%) are also of significant value for the breeding work of this farm. According to the assessment results, the producer Aist 7 was assigned to the breeding category of A₁ of milk yield improvers. Bulls Sazan 25 and Muscat 8 are also rated as daughters' milk yield improvers and are categorized as A2 and A3. All bulls evaluated by comparing daughters to the breed standards are improvers of daughters' milk yield (+ 454-1860 kg).

Bibliography:

- 1. Velmatov, A.P. Productive characteristics of red-and-white cows of different exterior-constitutional types / A.P. Velmatov, T.N. Tishkina, O.V. Kostin // Vestnik of Ulyanovsk State Agricultural Academy. - 2019. - №. 2 (46). - P. 161-165.*
- 2. Breeding work in animal husbandry / L.K. Ernst, N.A. Kravchenko, A.P. Soldatov, V.A. Kovalenko, D.T. Vinnichuk, E.A. Naidenko. - Moscow: Agropromizdat, 1987. - 286 p.*
- 3. Eisner, F.F. Breeding work with dairy cattle / F.F. Eisner. - Moscow: Agropromizdat, 1986. - 183 p.*
- 4. Ruzskiy, S. A. Breeding work in cattle breeding / S. A. Ruzskiy. - Moscow: Kolos, 1977. - 320 p.*
- 5. Velmatov, A.P. Efficiency of using Holstein bulls of Dutch selection when creating the Volga type of red-and-white breed / A.P. Velmatov, A.A. Velmatov, N.N. Neyaskin // Vestnik of Altai State Agrarian University. - 2011. - №. 6 (80). - P. 49-53.*
- 6. Eisner, F.F. Theory and practice of selection in cattle breeding / F.F. Eisner. - Kiev: Urozhai, 1981. - 190 p.*
- 7. Basovskiy, N.Z. Population genetics in selection of dairy cattle / N.Z. Basovskiy. - Moscow: Kolos, 1983. - 256 p.*
- 8. Instructions for checking and evaluating bulls of dairy and dairy-meat breeds for quality of the offspring. - Moscow: Kolos, 1980. - 16 p.*

9. *Instructions for valuation of cattle of dairy and dairy-meat breeds.* - Moscow: Kolos, 1975 .- 28 p.

10. *Baryshnikova, K.V. The influence of selection on breeding qualities of Simmental bulls / K.V. Baryshnikova // Progressive technologies for the production of milk, meat, wool in the Volga region.* - Saratov, 1992 .- P. 13-19.

11. *Genetic-statistical methods of analysis of animal populations by qualitative and quantitative characteristics / P.S. Katmakov, V.P. Gavrilenko, A.V. Bushov, E.I. Anisimova.* - Ulyanovsk, 2019 .- 225 p.

12. *Modern assessment of cattle breeding value in the dairy direction of productivity / D. Yu. Suslov, A. V. Voevodin, S. A. Kholev, S. E. Tyapugin // Dairy and meat cattle breeding.* - 2018. - №. 1. - P. 9 -12.

13. *Gavrilenko, V. P. The breeding value of servicing bulls depending on the additive and non-additive forms of inheritance of milk yield of their daughters / V. P. Gavrilenko, A. V. Bushov, A. N. Prokofiev // Vestnik of Ulyanovsk State Agricultural Academy.* - 2019. - № 4 (48). - P. 191 - 201.

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

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

The development of dairy cattle breeding largely depends on the culture of young cattle breeding. It is very difficult to obtain and preserve young animals.

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

Bibliography:

1. Economic efficiency of productive qualities of animals of different genotypes / E.A. Anisimova, E.R. Gosteva, A.S. Baragaliev, E.A. Aleshina // Animal husbandry. - 2015. - No. 5. - P. 14 - 17.

2. Gridina, S. L. *Assessment of breeding and productive qualities of black-and-white cattle in the regions and republics of the Urals for 2013* / S. L. Gridina, V. F. Gridin. - Ekaterinburg, 2014. - 65 p.

3. Egiazaryan, A. *Improvement of the genetic potential of dairy herds in Leningrad region by imported bulls* / A. Egiazaryan // *Dairy and beef cattle breeding*. - 2012. - Special iss. - P. 25–26.

4. Leshonok, O.I. *The relationship between the exterior and milk productivity of first-calf cows* / O.I. Leshonok, A.V. Novikov // *Agro-food policy of Russia*. - 2014. - No. 4. - P. 49–52.

5. Pimkina, T.N. *Black-and-white breed and its features* / T.N. Pimkina // *Science today: reality and prospects: materials of the International scientific-practical conference*. - Vologda: Scientific Center Dispute, 2017. - P. 54-55.

6. Babich, E. A. *Exterior and productive characteristics of first calf cows of the black-and-white breed of "Karatomar" intra-breed type* / E. A. Babich, L. Yu. Ovchinnikova // *Agrarian science: search, problems, solutions: materials of student scientific conferences*. - 2015. - P. 79-84.

7. Malyavko, I.V. *Growth and development of calves depending on the advance feeding of their mothers before calving* / I.V. Malyavko, V.A. Malyavko // *Animal husbandry*. - 2016. - No. 5. - P. 15-17.

8. *The role of servicing bulls in increasing the realization level of genetic potential of dairy herds: monograph* / O. A. Basonov, V. V. Klipova, N. P. Shkilev, I. A. Elfimova. - Moscow: RUSAYNS, 2019. - 118 p.

9. *Comparative characteristics of live weight and exterior features of cows of different lines in Pushkinskoye breeding farm* / O.A. Basonov, N.V. Vorobieva, M.E. Taigunov, S.S. Basonova // *Animal husbandry*. - 2010. - No. 7. - P. 14-15.

10. Svetova, Yu. A. *Growth and development of heifers of the Holstein breed of various ecogenesis* / Yu. A. Svetova, T.A. Guseva // *Animal husbandry*. - 2014. - No. 10. - P. 17-18.

11. Soydan, E. *Calving season affects reproductive performance of high yielding but not low yielding Jersey cows* / E. Sirin, Z. Ulutas, M. Kuran // *EAAP Annual Meeting, Uppsala, Sweden.* – 2005. – P. 5-8.

12. Azimova, G.V. *Reproductive qualities of cows of different branches of particular lines* / G.V. Azimova // *Agrarian science - innovative development of the agro-industrial complex in modern conditions: materials of the All-Russian scientific and practical conference.* - Izhevsk: FSBEI HPE Izhevsk State Agricultural Academy, 2013. - Vol. 3. - P. 103-106.

13. Chizhik, I. A. *Constitution and exterior of farm animals* / I. A. Chizhik. - Leningrad: Kolos, 1979. - 376 p.

14. Nardid, A. *Breeding efficiency of black-and-white cows of different genotypes* / A. Nardid, N. Ivanova // *Dairy and meat cattle breeding.* - 2011. - No. 6. - P. 17-18.

15. Chu, M. X. *Phenotypic factor analysis for linear type traits in Beijing Holstein cows* / M. X. Chu, S. K. Shi // *Asian Australas J Anim Sci.* – 2002. – 15. – P.1527–1530.

16. Němcová, E. *Genetic parameters for linear type traits in Holstein cattle* / E. Němcová, M. Štípková, L. Zavadilová // *Czech Journal of Animal Science.* – 2011. – 56. – P. 157–162.

17. Strekozov, N.I. *The efficiency of using cows of Simmental and black-and-white dairy cattle breeds in the regions of their joint breeding in Russia* / N.I. Strekozov // *Economy of agricultural and processing enterprises.* - 2019. - No. 6. - P. 16-21.

18. Ovcharenko, A.S. *Milk productivity and duration of economic use of cows depending on the housing system* / A.S. Ovcharenko, L.V. Kharina // *Vestnik of Omsk State Agrarian University.* - 2018. - No. 1 (29). - P.43-50.

19. Vasilieva, O. K. *Dynamics of productive longevity parameters of cows in agricultural enterprises in Russia* / O. K. Vasilieva // *Izvestia of St. Petersburg SAU.* - 2020. - No. 3 (60). - P. 80-87.

20. Gromova, T.V. *Linear assessment of the exterior of first-calf heifers of the black-and-white breed and its connection with milk production / T.V. Gromova, P.V. Konorev // Vestnik of Altai State Agrarian University. - 2018. - No. 2 (160). - P. 96-102.*

THE INFLUENCE OF REPRODUCTIVE QUALITIES ON DAIRY PRODUCTIVITY OF COWS OF THE SIMMENTAL BREED

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Key words: reproductive qualities, milk productivity, cows, dry period, animal husbandry, livestock production.

The applicability of the work is to identify the possibility of productivity increase of cows of the Simmental breed due to reproductive qualities. The aim of the work is to assess the influence of the first insemination age, service period and dry period on milk productivity of Simmental cows. The research is aimed at studying milk productivity of Simmental cows with different levels of reproductive qualities. The obtained data were statistically processed in Excel. Descriptive statistics methods were used. The object of the research were Simmental cows of "Tasaliyev D.M." farm of Kaliningrad region. As a result of the study, a relation was established between the age of the first successful insemination, the service period duration, the dry period duration and parameters of milk productivity. The age of the first successful insemination at 18-24 months has the most beneficial effect on subsequent milk productivity. A service period of 90-120 days has a positive effect on milk yield increase for 305 days of lactation, a longer service period negatively affects the mass fraction of milk fat. Prolonged service period results in a calf loss of 100 calves per year. With an increase of dry period duration, the mass fraction of milk fat increases, but milk yield decreases. The influence of reproductive qualities on mass fraction of milk protein is insignificant. According to the results of the

studies, it can be considered that reproductive qualities, in combination with other factors, influence milk productivity of Simmental cows.

Bibliography:

- 1. Tunikov, G.M. Biological foundations of cattle productivity of: a textbook / G.M. Tunikov, I. Yu. Bystrova. - Ryazan: PRIZE, 2014 .- 368 p.*
- 2. Stetskevich, E.K. The timing of physiological maturity and reproductive capacity of heifers obtained by different biotechnological methods / E.K. Stetskevich. - Grodno: EO Grodno State Agrarian University, 2015 .- P. 109-110.*
- 3. Shesternenkova, A. A. Influence of the genotype of cows on reproductive function parameters / A. A. Shesternenkova, I. V. Manicheva // Scientific journal of young scientists. - 2019. - № 1. - P. 24-26.*
- 4. Bekenev, V. A. Productive longevity of animals, methods of its prediction and extension / V. A. Bekenev // Agricultural Biology. - 2019. - V. 54, № 4. - P. 655-666.*
- 5. Ulimbashev, M. B. Adaptive ability of Holstein cattle introduced into new habital conditions / M. B. Ulimbashev, Zh. T. Alagirova // Agricultural Biology. - 2016. - V. 51, № 2. - P. 247-254.*
- 6. Kishkevich, O.M. Influence of the age of first calving and linearity on milk productivity of first-calf cows / O.M. Kishkevich, Yu. V. Istranin // Young researchers of agroindustrial and forestry complexes - to the regions. - Vitebsk: EO Vitebsk State Aviation Museum, 2019 .- Vol. 3. - P. 185-191.*
- 7. Istranin, Yu. V. Influence of Holsteinization on milk productivity of cows / Yu. V. Istranin, Zh. A. Istranina // Selection on modern populations of domestic dairy cattle as the basis for import substitution of livestock products: materials of the All-Russian scientific and practical conference with international participation . - Belgorod: Belgorod Federal Agrarian Scientific Center of the Russian Academy of Sciences, 2018 .- P. 159.*
- 8. Analytical assessment of modern use of industrial and highly specialized technologies for cattle feeding / E. A. Levkin [and others] // Veterinary Journal of Belarus. - 2018. - № 2. - P. 42-46.*
- 9. Ways to intensify herd reproduction in cattle breeding: recommendations / A.V. Glaz [et al.]. - Grodno: GSAU, 2011 .- 80 p.*

10. Ulimbashev, M.B. *Reproductive ability and immunological status of Simmental and mixed cattle / M.B. Ulimbashev, A.S. Tkhashigugova, E.R. Gosteva // Izvestiya of TAA. - 2015. - № 2. - P. 82-91.*

11. Gafarova, F. M. *Dairy productivity and milk quality of first-calf heifers depending on service period duration / F. M. Gafarova, F. A. Gafarov // Features of development of the agro-industrial complex at the present stage: materials of the All-Russian scientific-practical conference in the framework of the XXI International specialized exhibition "AgroComplex-2011". - Ufa, 2011. - P. 138-140.*

12. Vorobiev, P. V. *Dairy productivity and milk quality of first-calf cows with different duration of the service period / P. V. Vorobiev, A. F. Gabdrakhimova, E. O. Nikulina // Modern problems of animal husbandry in the context of innovative development of the industry : materials of the All-Russian scientific-practical conference. - Ufa, 2017. - P. 41-44.*

13. *Milk productivity of first-calf heifers of Holstein and Simmental breeds with different levels of reproductive qualities / S.M. Anokhin [et al.] // Vvestnik of IRSAA. - 2019. - № 93. - P. 121-130.*

14. Lyashuk, R.N. *Influence of service period duration on milk productivity and reproductive ability of cows / R.N. Lyashuk, O.A. Mikhailova // Vestnik of OrelSAU. - 2016. - № 6. - P.93-101.*

EVALUATION OF KARAKUL LAMB BY PHENOTYPE IN CASE OF A LARGE NUMBER OF BREEDING TRAITS

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Key words: lambs, karakul, assessment, selection, fertility.

Methods for assessing krimmer lamb productivity, constitutional and reproductive characteristics used in Karakul sheep breeding have been studied. It has been established that there are several dozens of krimmer breeds, except karakul,

as well as crossbreeds with them, from which karakul is also obtained in the world. Sheep selection of these breeds differs significantly from selection of other breeds by the fact that decisions on animal production purpose are made as soon as this animal is born. The selection is carried out according to a large number of characteristics, mainly parameters of krimmer lamb skin quality. Such techniques are numerous and have certain differences in different breeds and different countries, however, there are also common properties. Most of the selection parameters are determined subjectively, and the only decision is made - whether to leave the lamb for breeding or to remove the krimmer. Obviously, a method is needed which includes all the selected traits and it would be expressed in one complex parameter. In the course of this study, a new, suitable for automation method for increasing the objectivity of phenotype assessing of Karakul sheep by a complex of traits was designed and described. Specifically, a special card is proposed and shown in the appendix, which facilitates the collection of individual data from a newborn lamb and their processing using spreadsheet application. From our own observations and production experience, the practicability of obtaining marketable milk from krimmer sheep, free from suckling lambs, is shown. Folk traditions of improving sheep milk yield that exist in sheep-breeding countries are described. Examples of successful use of Romanov sheep on karakul ewes and creation of multiparous karakul on their basis are shown.

Bibliography:

- 1. Pascal, C. Researches regarding quality of sheep skins obtained from Karakul from Botosani sheep / C. Pascal // Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine of Iasi January. Biotechnology in Animal Husbandry. - 2011 .- 27 (3). - DOI: 10.2298 / BAH1103123P. - URL: [researchgate.net ›... 267226865... of sheep... Karakul... sheep.](https://www.researchgate.net/publication/267226865...)*
- 2. Valuation of karakul sheep. - URL: [studbooks.net ›1107132 / agropromyshlennost ... ovets.](https://studbooks.net/1107132/agropromyshlennost...)*

3. State Standard GOST 10231-77. Dressed krimmer lamb skin. Technical conditions. - *Internet-Law.ru* ›Catalog› gost / 33539.
4. Lourens, A. Evaluation of pelt traits in Karakul sheep applying linear and threshold models July / A. Lourens, Gj. Erasmus, Sj. Schoeman // *South African Journal of Animal Science*. - 2009. - 29 (1). - DOI: 10.4314 / sajas.v29i1.44222. - URL: *researchgate.net* ›publication... of... Karakul sheep...
5. Yagupova, E. V. Formation of a system of accounting and analytical documentation on sheep-breeding farms / E. V. Yagupova, N. V. Chernoiivanova // *Vestnik of Nizhnevolzhsky agricultural university complex: science and higher professional education*. - 2017. - № 2 (46). - P. 297-303.
6. *Sheep Production and Record Keeping*. - URL: *afghanag.ucdavis.edu* ›educational-materials / files.
7. *The most fashionable fur of the season* // *Journal of the Masters' Fair*. - URL: *livemaster.ru* ›topic / 950863-samyj-modnyj-meh-sezona.
8. *Best Prices in Kiev and the Ukraine* // *Chicly-Furs*. - URL: *chicly-furs.com* ›Karakul fur coats.
- 9 *About meat-eating and killing of animals*. - URL: *newsland.com* ›Personal blog›... -zhivotnykh / 3934214.
10. *Karakul breeding. Survival in the wild*. - URL: *survinat.ru* ›2011/05 / karakulevodstvo.
11. *Cheese market in Russia. Market analysis in 2021, 2020*. - URL: <https://alto-group.ru/otchet/rossija/290-rynok-syra-v-rossii-tekuschaja-situacija-i-prognoz-2020-2024-gg.html>.
12. *Malich (sheep breeding). Farming*. - URL: *yfermer.ru* ›fermerskoe hozyaistvo / 253281.html.
13. *Bessarabian sheep breed* // *AgroXXI*. - URL: *AgroXXI.ru* ›wiki ... ovcy ... ovec / smushkovye-ovcy ... ovec.
14. *Ismagulov, M. S. Efficiency of production of mixed karakul from Tsigai ewes culled for meat: spec. 06.02.04: abstract of dissertation for the degree of candidate of*

agricultural sciences / Ismagulov Maksut Satlganovich; Department of sheep breeding of VIZh. – Dubrovitsy v., 1996. - 18 p.

15. *Krimmer sheep breeds. Encyclopedia. - URL: AgroXXI.ru ›wiki-animal ... porody-ovec / smushkovye-ovcy.*

16. *Багатоплідний радянський каракуль. - URL: runo.ks.ua›istoria/plemen/93-ist2.html.*

17. *Kotov, M.I. Biological and economic significance of individual variability of live weight of Karakul lambs at birth: abstract of dissertation for the degree of candidate of sciences / Mikhail Ivanovich Kotov. - Moscow, 1947. - P. 12-13.*

18. *Gigineishvili, N.S. Breeding work in color karakul breeding / N.S. Gigineishvili. - Moscow: Kolos, 1976. - 191 p.*

19. *Breeding of Karakul sheep in small herds: instructional guidelines / A. M. Zhiryakov, L. I. Kaplinskaya [and others]. - Elista: Kalmyk book publishing house, 2004. - 20 p.*

20. *Felicity, N. Karakul sheep and its association with the fashion industry / N. Felicity. - URL: farm4trade.com ›karakul-sheep... association... industry / 24 January 2020.*

21. *Certificate of official registration of the computer program № 2007611563 Breeder - 2005 dated April 13, 2007. Federal Service for Intellectual Property, Patents and Trademarks. - 2007 / Lukshin S. A. [and others].*

EXPERIENCE OF SELECTION AND BREEDING WORK WITH CATTLE OF RED-SPOTTED BREED

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Key words: line, lactation, genetic potential of productivity, gene pool, heredity, genealogical structure, adaptive ability, proband, breeding background, selection.

The article presents assessment results of red-and-white breed lines on milk productivity, live weight and intensity of milk yield. It was found that almost all the descendants of the bulls belonging to the lines of V.B. Ideal 1014315, M. Chieftain 95679, R. Sovering 198998, R. Citation 267150 are characterized by high milk yield. The only exception was the daughters of the bulls from R. Sovering 198998 line, who were inferior to their peers in milk yield by 225-250 kg (4.1-4.5%) during 305 - day lactation. There were no significant interline differences in the content of fat and protein in milk. It was found that positive results were obtained from crosses of V.B. Ideal × M. Chieftain (+204 kg of milk), M. Chieftain × V.B. Ideal (+300 kg), M. Chieftain × R. Sovering (+185 kg), R. Sovering × R. Sheilimar. Intraline selection on milk yield in all cases was ineffective. Assessment of servicing bulls of V.B. Ideal line showed that the improvers of the daughters' milk yield are the bulls Kumir 1242 (+283 kg to their peers), Leonardo 218 (+244 kg), Jul 43 (+143 kg). Bulls Clemens 12700 (- 201 kg) and Furgon 1268 (- 679 kg) were recognized as deteriorating the milk yield. As for R. Sovering line, the bulls Service 101 (+403 kg) and Mills 284 (+263 kg) are the milk yield improvers, and the bull Berkut 3473 (+0.38%) improves fat content of milk of the daughters.

Bibliography:

- 1. Eisner, F.F. Breeding work in dairy cattle breeding. - Moscow: Agropromizdat, 1986. - 184 p.*
- 2. Seltsov, V.I. Improvement of breeding work and genealogical structure of the Simmental breed of domestic and import selection: guidelines / V.I. Seltsov, A.A. Sermyagin, N.V. Sivkin. - 2nd ed. - Dubrovitsy, 2013. - 71 p.*

3. *Selection-genetic and ecological-technological valence of dairy cows for long-term productive use / edited by E. Ya. Lebedko. - Bryansk, 2012 .- 278 p.*
4. *Productive qualities of crosses of Simmental and Holstein breeds / A. A. Velmatov, A. V. Erzamaev, T. N. Tishkina, A. I. A. A. Khamza, A. P. Velmatov // Chief livestock technician. - 2018. - № 1. - P. 43-50.*
5. *Kravchenko, N. A. Breeding selection for line breeding / N. A. Kravchenko. - Moscow: Selkhozgiz, 1954 .- 242 p.*
6. *Dedov, M. D. Creation of a factory type of Simmental cattle by the method of pure-bred selection / M. D. Dedov, N. V. Spivak // Agrarian Russia. - 1999. - № 2 (3). - P. 38-45.*
7. *Katmakov, P.S. Improvement of the Simmental breed by methods of intra-breed selection and crossing: monograph / P.S. Katmakov, E.I. Anisimova. - Ulyanovsk: Ulyanovsk SAU, 2017 .- 188 p.*
8. *Vostroilov, A. The role of mother families in creating a highly productive herd in GPZ "Druzhba" of Voronezh region / A. Vostroilov, E. Artemov // Dairy and meat cattle breeding. - 2008. - № 2. - P.5-7.*
9. *Baltsanov, A.I. Methods of creating a red-and-white breed: a textbook / A. Baltsanov. - Saransk: Moscow State University, 1987 .- 76 p.*
10. *New population of red- and-white dairy cattle / I.M. Dunin, N.V. Dugushkin, V.I. Erofeev, A.P. Velmatov. - Moscow: All-Russian Research Institute of Breeding, 1998. - 316 p.*
11. *Baryshnikova, K. V. Simmental cattle of the Saratov region and methods of its improvement / K. V. Baryshnikova, L. P. Efimenko. - Saratov, 1991 .- 71 p.*
12. *Comparative assessment of servicing bulls of red- and-white breed by origin and quality of offspring by the method of daughter-peer (D-P) / I. M. Dunin, A. I. Golubkov, K. K. Adzhibekov, A. M Chekushkin, G.S. Lozova // Vestnik of KrasSAU. - 2015. - № 108. - P.212-218.*
13. *Instructions for checking and evaluating bulls of dairy and dairy-meat breeds for quality of the offspring. - Moscow: Kolos, 1980 .- 16 p.*

14. Plokhinskiy, N. A. *Guidance on biometrics for livestock specialists* / N. A. Plokhinskiy. - Moscow: Kolos, 1969. - 256 p.

15. *Usage of Holstein producers of Dutch and Danish breeding for improvement of red-and-white cattle* / A. P. Velmatov, A. M. Guriyanova, D. N. Kharitonov, A. A. Velmatov // *Agricultural science of the Euro-North-East*. - 2009. - № 12 (1). - P. 85-88.

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

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

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

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

Bibliography:

1. *Konstandoglo, A. The relationship between Holstein cows exterior and dairy productivity by various breeding / A. Konstandoglo, V. Foksha, V. Granaci // Scientific Papers. Series D. Animal Science. - 2019. - Vol. LXII, No.2. - P.29-33.*
2. *Chupsheva, N. Yu. Productive longevity of black-and-white cattle, depending on some genetic factors / N. Yu. Chupsheva // Vestnik of Buryat State Agricultural Academy named after V.R. Filippov. - 2019. - № 1 (54). - P. 68-76.*
3. *Batanov, S.D. Selection and genetic parameters of the exterior and a complex assessment of dairy cattle body type / S.D. Batanov, I.A. Baranova, O.S. Starostina // Trends in development of science and education. - 2018. - № 43 (6). - P. 13–20.*
4. *Brade, W. Body size of Holstein cows –A critical analysis from the point of view of breeding and animal welfare / W. Brade // BerichteueberLanwirtschaft. - 2017. - № 95 (3). P. 26-32*

5. *The breeding value of animals of the red-and-white breed, depending on the blood of the Holstein breed and lineage* / E. Ya. Daulakova, E. I. Khachkaeva, M. G. Tleinsheva, M. O. Baytaev, M. M. Shakhmurzov, T. Kh. Tlupov, T.Z. Tarchokov // *Vestnik of Kurgan State Agricultural Academy*. - 2017. - № 2 (22). - P.34-38.
6. *Genealogy of black-and-white Holstein cattle* / Ministry of Agriculture and Food of the Russian Federation; Department of Livestock and Breeding; All-Russian Scientific Research Institute of Breeding. - Moscow: All-Russian Scientific Research Institute of Breeding, 1999. - 502 p.
7. *Krysova, E. V. Matching of servicing bulls using body type assessment of first-calf heifers* / E. V. Krysova // *Effective animal husbandry*. - 2018. - № 5 (144). - P.28-29.
8. *Němcová, E. Genetic parameters for linear type traits in Czech Holstein cattle* / E. Němcová, M. Štípková, L. Zavadilová // *Czech J. Anim. Sci.* - 2011. - 56 (4). - P. 157-162.
9. *Labinov, V. V. Productive longevity of cows* / V. V. Labinov // *FARMANIMALS: scientific and practical journal*. - 2014. - № 2 (6). - P. 8-10.
10. *Breeder of the Moscow region* / N. A. Savenko [and others]. - Moscow: Ministry of Agriculture and Food of Moscow region, 2006. - 84p.
11. *BLUPF90 and related programs (BGF90). Proceedings of the 7th world congress on genetics applied to livestock production* / I. Misztal, S. Tsruta, T. Strabel, B. Auvray, T. Druet, D. H. Lee // *Montpellier, Communication*. - 2002. - V. 28, No. 28-27. - P. 21-22.
12. *Misztal, I. Computational techniques in animal breeding. University of Georgia* / I. Misztal. - Athens: USA, 2014. - 200 p.
13. *Semenova, N. V. Assessment of heritability and genetic correlations of productive and technological traits of dairy cattle and their application in practical breeding* / N. V. Semenova // *Achievements of science and technology of the agro-industrial complex*. - 2015. - № 4. - P.44-46.
14. *Assessment of the breeding value of servicing bulls of black-and-white cattle population in Moscow region by the constitution type of daughters* / A.F. Konte, A.N.

Ermilov, N.G. Bychkunova, A.A. Sermyagin // Izvestiya of the Lower Volga Agro-University complex. - 2019. - № 3 (55). - P.275-283.

15. Konte, A.F. Assessment of the dynamics of genetic variability for body type parameters of first-calf cows of the Holsteinized black-and-white breed of the Moscow region / A.F. Konte, A.N. Ermilov, A.A. Sermyagin // Vestnik of KrasSAU. - 2020. - № 8. - P.69-78.

16. Usage of Holsteinization of black and white cattle on the farms of Kirov region: scientific and production recommendations / G.P. Babailova, T.I. Berezina, O.N. Tselishcheva [and others]. - Kirov: Vyatka State Agricultural Academy, 2017. - 54p.

17. Plavinsky, S. Yu. Characteristics of economically useful traits of daughters of bulls of different lines on the example of AO "Luch" of Ivanovo district of the Amur region / S. Yu. Plavinsky, V. A. Gogulov // Far Eastern Agrarian Vestnik. - 2018. - № 2 (46). - P.67-71.

18. Gagloev, A. Ch. Exterior-productive qualities of cows of different lines of black-and-white improved cattle / A. Ch. Gagloev, A. N. Negreeva, T. N. Gagloeva // Current problems of intensive development of animal husbandry. - 2018. - № 21 (2). - P.340-347.

19. Batanov, S. D. Productive qualities and exterior traits of black-and-white cows of different lines / S. D. Batanov, M. M. Shaydullina // Scientific notes of Kazan State Academy of Veterinary Medicine named after N.E. Bauman. - 2019. - Vol. 239, No. 3. - P.29-35.

20. Heritability of linear parameters of the exterior of cows / D. V. Karlikov, D. R. Kazarbin, S. A. Mayorov, I. G. Telpis // Modern problems of herd reproduction of farm animals and the HR tasks: abstracts of scientific-practical conference of Russian Academy of Management in Livestock. - Bykovo, 1996. - P. 18-20.

21. Karlikov, D. V. Disadvantages and defects of the exterior of black-and-white cattle / D. V. Karlikov, I. V. Kleimenova // Animal husbandry. - 1997. - № 1. - P.8-10.

22. Variability of selection and genetic parameters of linear assessment of the body type of daughters of bulls in the population of Holsteinized black-and-white cattle / A.

F. Konte, S. N. Kharitonov, A. A. Sermyagin [et al.] // Dairy and beef cattle breeding. - 2017. - № 8. - P.3-9.

PRODUCTIVE QUALITIES OF MARAL STAGS OF NOVOTALITSK LINE OF ALTAI-SAYAN BREED

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Key words: valuation, weight, productivity, age, line, breed.

Antlers are the main product obtained from marals. The problem of increasing antler production in maral breeding remains relevant. Purpose of the research is analysis of antler productivity of first-antler stags and stags of marals of Novotalitsk line of Altai-Sayan breed. The work was carried out on the maral farms of OS Novotalitskoye Department of Federal State Budgetary Scientific Institution "Federal Altai Scientific Center of Agrobiotechnologies during the antler-cutting campaign from May to July 2020. A total of 1661 animals were valued, including 266 first-antler stags. The most marals are at the age from 2 to 8 years old, the most numerous is the group of first-antler stags (16%). The average antler productivity per one first-antler stag is 1.5 kg, per one stag - 5.2 kg. The antlers of the first-antler stags are characterized by the following parametric data: beam length - 35.8 ± 0.41 cm, beam girth - 12.4 ± 0.08 cm, supraorbital process length - 16.1 ± 0.30 cm, ice process length - $15, 0 \pm 0.36$ cm, the length of the middle process is 11.1 ± 0.32 cm, the depth of the split is 1.9 ± 0.07 cm. As for stags, the beam length is 55.7 ± 0.30 cm, the beam girth is $16, 5 \pm 0.07$ cm, the length of the supraorbital process is 27.6 ± 0.18 cm, the length of the ice process is 29.6 ± 0.25 cm, the length of the middle

process is 23.4 ± 0.21 cm, the split depth is 5.5 ± 0.13 cm. The marals have the following crown shapes: fork, shovel, goblet-like, round, triplet, boot. The most common form is the fork, the highest productivity in the herd is shown by marals with a goblet-like crown of antlers (7.1 ± 0.35 kg).

Bibliography:

- 1. Lunitsyn, V. G. The first domestic breed of marals - Altai-Sayan / V. G. Lunitsyn, S. I. Ognev, V. A. Chelakh // Achievements of science and technology of the agro-industrial complex. - 2009. - No. 6. - P. 45-48.*
- 2. Lunitsyn, V.G. Characteristics of the exterior and productive qualities of marals of Altai-Sayan breed / V.G. Lunitsyn, S.I. Ognev; RAAS, All-Russian Research Institute of antler reindeer breeding. - Barnaul: Azbuka, 2010. - 283 p. (ISBN 978-5-93957-393-1)*
- 3. Altai-Sayan breed of marals / A.S. Donchenko, V.G. Lunitsyn, S.I. Ognev, P.I. Krasnoslobodtsev // Siberian Vestnik of Agricultural Science. - 2008. - No. 1 (181). - P. 84-89.*
- 4. Lunitsyn, V.G. Age group and antler productivity of maral stags of Altai-Sayan breed / V.G. Lunitsyn, S.I. Ognev // Siberian Vestnik of Agricultural Science. - 2008. - No. 12 (192). - P. 48-54.*
- 5. Ognev, S.I. Scientific and practical substantiation of productive and biological characteristics of Altai-Sayan marals: 06.02.10: abstract of dissertation for the degree of Doctor of Agricultural Sciences / Sergei Ilyich Ognev; - Barnaul, 2011. - 42 p.*
- 6. Chelakh, V.A. Productive qualities of maral stags of Abai line of Altai-Sayan breed, methods of processing antler products: dissertation of Candidate of Agricultural Sciences: 06.02.10 / Chelakh Viktor Avangardovich. - Barnaul, 2010. - P. 139.*
- 7. Lunitsyn, V.G. Productivity and parametric data of stag antlers depending on crossing methods / V.G. Lunitsyn; RAAS, All-Russian Research Institute of antler reindeer breeding. - Barnaul, 2013. - 110 p. (ISBN 978-5-93957-668-0)*

8. Shendakov, A.I. *The results of a comprehensive assessment of biological parameters in selection of farm animals* / A.I. Shendakov // *Vestnik of Oryol State Agrarian University*. - 2012. - No. 6 (39). - P. 53-63.
9. Arnautovsky, I. D. *Veterinary selection for breeding farm animals in the Far Eastern Federal District* / I.D. Arnautovsky, V.A. Gogulov, I.S. Palamarchuk // *Problems of zootechnics, veterinary medicine and animal biology*. - 2017. - P. 5-10.
10. Duishekeev, O.D. *Physiological genetics as the basis for selection of highly productive animals* / O.D. Duishekeev, A.K. Kydyrmaev, U.A. Shergaev // *Vestnik of Kyrgyz National Agrarian University named after K.I. Scryabin*. - 2014. - 2 (31). - P. 159-162.
11. Dirin, D.A. *Animal husbandry of the Altai Republic: structure, territorial organization and development specification* / D.A. Dirin // *Geography and Nature Management of Siberia*. - No. 20. - 2015. - P. 46-66.
12. Golubkov A.I. *Genomic selection in animal husbandry and its positive aspects in specifying the breeding value of animals* / A.I. Golubkov, A.A. Golubkov // *Scientific support of animal husbandry in Siberia: Materials of the II international scientific-practical conference. Krasnoyarsk Research Institute of Animal Breeding*. - 2018. - P. 73-86.
13. Lunitsyn, V.G. *Productivity of marals of Novotalitsk line of Altai-Sayan breed in case of intraline selection* / V.G. Lunitsyn, V.V. Takhanov // *Siberian Vestnik of Agricultural Science*. - 2012. - No. 6. - P. 64 - 68.
14. *The study of the connection of the age of Altai-Sayan marals and the mass of raw antlers and their measurements* / L. V. Rastopshina, D. A. Kazantsev, V. A. Chelakh [and others] // *Vestnik of Altai State Agrarian University*. - 2017. - No. 5. - P. 95-99.
15. Bessonova, N. M. *Improvement of selection and breeding work of Altai-Sayan maral breed in the Altai Republic* / N. M. Bessonova, N. S. Petruseva // *Current problems of agriculture in mountainous areas: materials of the VII International scientific and practical conference dedicated to the 70th anniversary of Gorno-Altai State University*. - 2019. - P. 134-136.

16. *Organization of selection and breeding work in maral breeding of the Russian Federation. Manual / V. G. Lunitsyn, M. N. Sankevich, E. V. Tishkova, N. P. Borisov. - Barnaul: RAAS, Siberian branch of All-Russian Research Institute of antler reindeer breeding, 2005 .- 35 p.*
17. *Rastopshina, L.V. The relationship between the mass of raw antlers and the age of marals of the Altai-Sayan breed / L.V. Rastopshina, I.S. Kondrashkova, N.M. Patrakhina // Vestnik of Altai State Agrarian University. - 2016. - No. 11 (145). - P. 102-106.*
18. *Tishkova, E. V. The shape of the crown of raw antlers / E. V. Tishkova // Scientific support of animal husbandry in Siberia: materials of the III International scientific-practical conference. - 2019 .- P. 254-257.*
19. *Tishkova, E. V. Some differences in the shape of the crown of maral antlers / E. V. Tishkova // Veterinary science, animal husbandry and biotechnology. - 2020. - No. 5. - P. 73-77.*
20. *Kazantsev, D.A. Mass of raw antlers depending on the shape of the crown and the number of tines / D.A. Kazantsev, L.V. Rastopshina // Science and innovations: vectors of development: materials of the International scientific-practical conference of young scientists. - Barnaul, 2018 .- P. 158-161.*

COW REPRODUCTION FEATURES UNDER THE CONDITIONS OF INDUSTRIAL TECHNOLOGY OF MILK PRODUCTION

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Key words: reproduction, genotype, fertility index, milk yield, calving interval, service period, dry period, fertility index.

Milk productivity of cows depends on the duration of the service period. Thus, with an increase of the service period from 60 to 121 days after the first calving, milk productivity of cows increases by 937 kg ($P \geq 0.95$), after the second calving - by 745 kg and after the third calving - by 926 kg ($P \geq 0.95$). Cows with a service period of less than 60 days had the lowest milk productivity of 6751 kg. Cows with a service period of more than 120 days gave 7688-8251 kg of milk. Milk productivity of cows is also influenced by the length of the dry period. Too short, as well as too long dry period has a negative effect on milk productivity. So, cows with a dry period of less than 40 days gave an average of 7011 kg of milk, with an increase of the dry period, milk productivity parameters increase. Cows with a dry period of 41-50 days produced 7465 kg, with a dry period of 51-60 days - 7785 kg, with an increase of the dry period from 61 to 70 days milk productivity increased to 8042 kg, finally, dry period of over 70 days leads to a decrease of milk productivity of cows up to 7211 kg. In terms of the calving interval, the experimental cows corresponded to the parameters of highly productive cows, being within the period of 12-14 months. The analysis of reproductive ability showed that the animals have average values for reproductive ability.

Bibliography:

1. Dunin, I.M. Influence of Holstein bulls on fertility of daughters in Kuibyshev region / I.M. Dunin, L.L. Smirnova, K.K. Adzhibekov // Usage of world genetic

resources to improve domestic cattle breeds. - Moscow: All-Russian Scientific Research Institute of Breeding, 1990. - P. 93–98.

2. *Shcheglov, E.V. Largescale selection in dairy cattle breeding: 06.02.01: abstract of dissertation for the degree of Doctor of Agricultural Sciences / Shcheglov Evgeniy Vladimirovich. State Agroindustrial Committee of the USSR; Moscow Veterinary Academy named after K.I. Skryabin. - Moscow, 1989. - 32 p.*

3. *Eisner, F.F. Breeding work with dairy cattle / F.F. Eisner. - Moscow: Agropromizdat, 1986. - 182 p.*

4. *Control of steroidogenesis in small and large bovine luteal cells / W. Hansel, H. Alila, J. Dowd, Z. Yang // Austr. J. Biol. Sci. - 1987. - 40. - P. 331-347.*

5. *Graml, R. Zuchtung auf Kasereitauglichkeit der Milch / R. Graml, J. Buchberger, F. Pirchner // Zuchtungskunde. - 1988. - Vol. 60, № 1. - P. 1123.*

6. *Bozo, S. Erste Ergebnisse der Kreuzungen Ungarischen Fleckvien x Holstein-Friesian Rosse / S. Bozo // Allattenyesztes. - 1973. - P. 495-504.*

7. *Zaabal, M. Analyzing the immunogenetic constituents of dams, sires and calves in relation to placental retention in a Friesian herd / M. Zaabal, W. Ahmed // Global veterinaria. - 2009. - № 3 (1). - P. 32-36.*

8. *Reshetnikova, N.M. Features of cows' reproduction process in the conditions of industrial milk production technology / N.M. Reshetnikova // Increase of the productivity of dairy cattle. - Moscow, 1981. - P. 54-62.*

9. *Reshetnikova, N.M. Reproductive ability of highly productive cows and ways of its improvement / N.M. Reshetnikova // Increase of productivity of dairy cattle. - Moscow, 1982. - P. 111-116.*

10. *Reshetnikova, N.M. Modern trends in herd reproduction / N.M. Reshetnikova, A.M. Malinovsky, T.A. Moroz // Past, present and future of zootechnical science: materials of the International scientific-practical conference. - Dubrovitsy, 2004. - Vol. 3, iss. 62. - P. 39-44.*

11. *Ratoshnyi, A. N. Increase of the efficiency of feed usage in the diets of dairy cows / A. N. Ratoshnyi, N. V. Andreeva, A. I. Babunov // Past, present and future of*

zootechnical science: materials of the International scientific-practical conference. - Dubrovitsy, 2004. - Vol. 3, iss. 62 .- P. 267-272.

12. *Karamaev, S. V. Influence of reproductive ability on productive longevity of Holsteinized cows in case of different housing methods / S. V. Karamaev, Kh. Z. Valitov // Education, science, practice: innovative aspect: materials of the International Scientific and Practical Conference dedicated to the memory of Professor A.F. Blinokhvatov. - Penza, 2008 .- P. 465-468.*

13. *Aleksandrov, Yu. A. Improvement of feeding and housing of cows in the conditions of the Republic of Mari-El / Yu. A. Aleksandrov // Current issues of improving the technology of production and processing of agricultural products: materials of the International Scientific and Practical Conference. - Yoshkar-Ola: Mari State University, 2008. - Issue. X. - P. 270-279.*

14. *Erofeev, V. I. Features of herd reproduction on modern complexes and farms with loose housing / V. I. Erofeev, T. D. Orlova, A. S. Medov // Increase of animal husbandry competitiveness and HR tasks. – Bykovo v., Moscow region, 2010 .- P. 88-91.*

15. *Erofeev, V.I. Influence of milk productivity level on reproductive ability of cows / V.I. Erofeev // Materials of the XIII International Scientific and Practical Conference dedicated to the memory of S.A. Lapshin. - Saransk, 2012 .- P. 57-59.*

16. *Agalakova, T.V. Methods of cattle reproduction intensification / T.V. Agalakova, E.A. Tyapugin. - Vologda - Molochnoye: Publishing Center of Vologda State Dairy Academy, 2013 .- 216 p.*

17. *Petrov, E.B. Main technological parameters of modern milk production technology at livestock complexes. Recommendations / E. B. Petrov, V. M. Taratorkin. - Moscow: FSSI Rosinformagrotech, 2007 .- 176 p.*

18. *Dokhi, I. Simple method of expressing fertility / I. Dokhi // Vestnik of the Hungarian agricultural science. - 1961. - No. 3. - P. 27-29.*

19. *Merkurieva, E.K. Biometrics in animal husbandry / E.K. Merkurieva. - Moscow: Kolos, 1977 .- 311p.*

20. Plokhinsky, N. A. *Guidance on biometrics for a livestock technician* / N. A. Plokhinsky. - Moscow: Kolos, 1969. - 25p.

21. *Raising a calf from birth to a highly productive cow: technological, feed and veterinary aspects: textbook* / L.I. Podobed, N.P. Buryakov, G. Yu. Laptev [and others]. - St. Petersburg: RIGHT PRINTING YUG, 2017. - 580 p.

INFLUENCE OF PROBIOTIC ADDITIVES ON PRODUCTIVITY AND NITROGEN USAGE OF YOUNG PIGS AT DIFFERENT TIME OF WEANING

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Key words: young pigs, weaning, feed mixture, growth, nitrogen, probiotics.

The article provides experimental data on the study of application of two probiotic additives - "Sitexflor - 1" and "SGOL-1-40", included at different dosages in the diets for young pigs, on usage of the supplied nitrogen and their productivity. Such parameters were taken into account when forming the groups as: weaning time (60 and 45 days), preliminary feeding the mothers with the probiotic supplements under study during the suckling period. The results, characterizing the piglet productivity in case of application of "Sitexflor - 1", convince that the most effective dose is 30 mg per head per day, which provided an average daily gain of 351 g,

which is 7.3% more than the control, primarily due to greater nitrogen retention in the body (by 9.91%), but with lower consumption of energy feed units per 1 kg of gain -4.43 (by 11.4%). The results, characterizing the piglet productivity when applying "SGOL -1-40", reliably confirm its most effective dosage of 2.5% of the dry matter of the diet, which provided an average daily gain of 404 g, which is 15% more than the control, due to greater nitrogen retention in their body (by 4%). Introduction of "SGOL -1-40" in the diet provided a significant reduction in the cost of energy feed units per 1 kg of gain in comparison with the control by 14.3%. The nitrogen balance in the body of young pigs was positive in both experiments, but the amount of nitrogen retained in the body was different. At the same time, even a greater amount of deposited nitrogen in animals in the first experiment did not allow to achieve the expected live weight increase, and in the second experiment, on the contrary, even surpassed it. Such data indicate that the supplied nitrogen with a diet enriched with a probiotic supplement was more effectively used in the body, exceeding the physiological level of its transformation into products.

Bibliography:

- 1. Voitenko, O.S. Growth, survivability, reproduction of pigs and products of pig breeding with application of probiotic products / O.S. Voitenko, Yu. S. Voitenko // Scientific life. - 2019. - № 2. - P. 86-92.*
- 2. Usage of a new Enzymesporin probiotic in breeding of young pigs / R.V. Nekrasov [et al.] // Animal husbandry. - 2016. - № 10. - P. 13-17.*
- 3. The influence of giving "Hydrolactive" probiotic to piglets on their growth and meat qualities / G.S. Pokhodnya [et al.] // Vestnik of Kursk State Agricultural Academy. - 2016. - № 9. - P. 147-152.*
- 4. The influence of Sitexflor No. 2 and Sitexflor No. 5 probiotics on survivability and growth rate of suckling piglets / L. N. Gamko, T. L. Talyzina, V. V. Chernenok, Yu. N. Chernenok, I. I. Sidorov // Veterinary medicine. - 2010. - № 10. - P. 48-50.*

5. *Innovative preprobiotic feed additive for farm animals / V. E. Ulitko [et al.] // Catalogue of scientific developments and innovative projects: collection. - Ulyanovsk, 2015. - P. 25.*
6. *Chernenok, Yu. N. Influence of different doses of Sitexflor No. 1 and Sitexflor No. 5 probiotics on some morphological and biochemical blood parameters of lactating sows / Yu. N. Chernenok, V. V. Chernenok // Current problems of veterinary medicine and intensive animal husbandry: materials of national scientific and practical conference dedicated to the 82th birthday anniversary of the Honored Worker of the Higher School of the Russian Federation, Honorary Professor of Bryansk State Agricultural Academy, Doctor of Veterinary Sciences, Professor Anatoly Alekseevich Tkachev. - 2020. - P. 173-177.*
7. *The influence of a probiotic complex on productive qualities and metabolic processes of growing fattening young pigs / I.M. Magomedaliev [et al.] // Agrarian science. - 2020. - № 1. - P. 22-26.*
8. *Chernenok, V.V. The influence of probiotics on blood parameters and growth rate of suckling pigs / V.V. Chernenok, Yu. N. Chernenok, Yu. I. Simonov // Animal husbandry. - 2016. - № 5. - P. 24-25.*
9. *Productivity and parameters of blood of sows fed with probiotic supplements / L. N. Gamko, T. L. Talyzina¹, V. E. Podolnikov, I. I. Sidorov, A. G. Menyakina // BIO Web of Conferences. - 2020. - Vol. 27. -- DOI: <https://doi.org/10.1051/bioconf/20202700025>).*
10. *Sorption-probiotic supplement in the diet of calves and its effect on the functional maturity of their rumen, morpho-biochemical blood status and productivity / E. V. Alexandrova, O. A. Desyatov, V. E. Ulitko, A. V. Kornienko // BIO WEB OF CONFERENCES. International Scientific-Practical Conference “Agriculture and Food Security: Technology, Innovation, Markets, Human Resources” (FIES 2020). - 2020. - P. 00089.*
11. *Talyzina, T.L. Metabolic status of young pigs when using probiotic supplements in the diet / T.L. Talyzina, L.N. Gamko, I.I. Sidorov // Current problems of innovative*

development of animal husbandry: International scientific and practical conference. - Bryansk: Bryansk SAU, 2019. - P. 436-439.

12. Sorption-probiotic supplement in the diet of cows and its effect on morphobiochemical blood composition and productivity / A. A. Volchkov, Yu. K. Volchkova, V. E. Ulitko, O. E. Erisanova, O. A. Desyatov, L. A. Pykhtina // Veterinarian. - 2020. - № 3. - P. 4-10.

13. The ecological cleanliness of milk and products of its processing when using the sorption-probiotic supplement in the diet of cows / V. E. Ulitko, S. P. Lifanova, L. A. Pykhtina, O. E. Erisanova // BIO WEB OF CONFERENCES. International Scientific-Practical Conference "Agriculture and Food Security: Technology, Innovation, Markets, Human Resources" (FIES 2020). - 2020. - P. 00006.

14. Kornienko, A. V. Usage of Coretron and Biokoretron sorbing additives with pre- and probiotic properties in the diets of sows and their influence on live weight changes during gestation and suckling periods / A. V. Kornienko, V. E. Ulitko, E. V. Savina // Fundamental and applied problems of increasing the productivity of animals and the competitiveness of livestock products in the modern economic conditions of the agro-industrial complex of the Russian Federation: materials of the International Scientific and Practical Conference. - 2015. - P. 33-36.

15. Productivity increase of piglets reared from 1 to 2 months when feeding them with "HydroLaktiVe" feed additive / A.T. Mysik [et al.] // Animal husbandry. - 2016. - № 11. - P. 21-23.

16. The influence of a probiotic product based on LACTOBACILLUS PARACASEI B-6253 strain on natural organism resistance and biochemical parameters of blood during pigs' growing / R.V. Nekrasov [et al.] // Veterinary medicine and feeding. - 2014. - № 4. - P. 26-28.

17. The chemical composition of colostrum and milk of sows when using probiotic and sorbing pre-probiotic additives in diets / A. V. Kornienko, V. E. Ulitko, L. A. Pykhtina, E. V. Savina // Animal husbandry. - 2016. - № 3. - P. 25-27.

18. Complex feed additive "Coretron". Specifications 9291-011-25310144-2009. Group C 14 / V. E. Ulitko [and others]. - Inza, 2011. - 18 p.

19. Chernenok, Yu. N. *About application of Sitexflor No. 1 and No. 5 probiotics for prevention of gastrointestinal diseases of piglets / Yu. N. Chernenok, V.V. Chernenok // Agroconsultant. - 2013. - № 2. - P. 11-13.*

20. Ulitko, V.E. *Pre-probiotic preparation in pig diets and its influence on potential of their meat productivity / V. E. Ulitko, Yu. V. Semyonova // Agricultural science and education at the present stage of development: experience, problems and solutions: materials of the V International scientific and practical conference / editor-in-chief A. V. Dozorov; responsible: V. A. Isaichev, I. I. Bogdanov. - Ulyanovsk State Agricultural Academy, 2013. - P. 243-245.*

21. Ovsyannikov, A.I. *Methodology for setting experiments on feed digestibility / A.I. Ovsyannikov // Fundamentals of experimental work in animal husbandry. - Moscow: Kolos, 1976. - P. 131-132.*

HUMIC FEED ADDITIVE IN THE DIET FOR LAYING HENS

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Key words: feed additive, humic substances, laying hens, egg production, feed costs, profitability level

The studies were carried out in the vivarium of FSBSI "Krasnodar Scientific Center of Animal Science and Veterinary Medicine", in Krasnodar, on laying hens of Hisex Brown cross. The aim of the research was to study the effect of "Relikt A®" humic feed additive based on brown coal on productivity of laying hens of "Hisex Brown" cross. Four groups of young egg birds at the age of 130 days were formed for the research by the method of analogue pairs. The stabilization period lasted 10

days. Each group consisted of 40 heads. The experience lasted 3 months. It was found that there was a significant increase in the number of laid eggs per average laying hen by 14.9% in the group which received 0.06% of "Relic A®" of feed weight, compared to the control. Also, the application of the studied additive in the diets of laying hens of the groups that received 0.06% and 0.1% of the humic additive contributed to a decrease of feed costs for production of 10 eggs by 12.9 and 4.9%, respectively. Survivability of the population was maintained at the level of 100% in all groups throughout the entire experimental period. The oviposition intensity was significantly higher in the groups that received the humic supplement. The proceeds from the production of goods for a month increased in the control groups by 8.5; 14.9 and 4.8% according to the groups. The cost of 10 eggs decreased in the control groups by 8.3; 12.9 and 4.9%, respectively. The level of profitability also increased relative to the control in the second group by 6.53% and in the third by 10.13%, in the fourth by 3.82%. The feed additive based on brown coal can be considered as a natural feed ingredient; it is necessary to develop further a complex feed additive from natural components that fully satisfies the need of poultry for biologically active substances and micronutrients.

Bibliography:

- 1. Zeece, M. Chapter Seven - Food additives / M. Zeece // Introduction to the Chemistry of Food. - 2020. - P. 251-311.*
- 2. Barylo, B.O. The effect of humic preparations from brown coal and lowland peat on a test culture / B.O. Barylo, M.V. Gilmanova, I.V. Grekhova // Collection of materials of the LII International student scientific and practical conference. - 2018 .- P. 17-21.*
- 3. Antipova, D.V. Prospects for usage of humic substances in poultry farming / D.V. Antipova // Collection of articles based on the materials of the XI All-Russian conference of young scientists dedicated to the 95th anniversary of Kuban State*

Agrarian University and the 80th anniversary of entity of the Krasnodar Territory. - 2017. - P. 98-99.

4. Kryukova, A. D. *Obtaining humates from oxidized coal / A.D. Kryukova et al. // Collection of materials of the innovative convention "Kuzbass: education, science, innovation". - Kemerovo, 2015 - P. 64-65.*

5. Savelieva, A.V. *Study of the composition and properties of humic acids of natural and mechanochemically oxidized brown coal / A.V. Savelieva, A.A. Ivanov, N. V. Yudina, O. I. Lomovskiy // Chemistry of Solid Fuel. - 2015. - № 4. - P. 3.*

6. Korsakov, K.V. *Influence of the product of humic acids on hatchability of hatching eggs and the quality of hatched young birds / K.V. Korsakov // Fundamentals and prospects of organic biotechnology. - 2018. - № 4. - P. 27-30.*

7. *Humic acids as a biogenic stimulator of meat productivity of broiler chickens / I.V. Simakova, A.A. Vasiliev, K.V. Korsakov // Materials of the X International Scientific and Practical Conference dedicated to the 20th anniversary of the Department of Food Technologies and the 100th anniversary of the Faculty of Veterinary Medicine, Food and Biotechnology. Saratov. - 2018. - P. 132-137*

8. *Antioxidant properties of humic acids from brown coal / S.L. Khilko, I. V. Efimova, O. V. Smirnova // Chemistry of Solid Fuel. - 2011. - № 6. - P. 3.*

9. *High-carotenoid biofortified maize is an alternative to color additives in poultry feed / J. Díaz-Gómez J.A. Moreno, E. Angulo, G. Sandmann, C. Zhu, A.J. Ramos, T. Capell, P. Christoud, C. Nogareda // Animal Feed Science and Technology. 2017. - Vol. 231. – P. 38-46.*

10. *Humic acid and enzymes inclusion in canola-based diets generate different responses in growth performance, protein utilization dynamics, and hemato-biochemical parameters in broiler chickens / A.R.P. Disetlhe, U. Marume, V. Mlambo // Poultry Science. - 2018. - Vol. 97. Issue 8. P. 2745-2753.*

11. *The effects of feeding Canola meal from high protein or conventional varieties of Canola seeds on pork carcass characteristics and cutability / K.L. Little, B.M. Bohrer, T. Maison, Y. Liu, H.H. Stein, D.D. Boler // J. Anim. Sci 93 (2015) P. 1284-1297.*

12. *White blood cell counts and neutrophil to lymphocyte ratio in the diagnosis of testicular cancer: A simple secondary serum tumor marker / O.H. Yuksel, A. Verit, A. Sahin, A. Urkmez, F Uruc // Int. Braz. J. Urol., 42 (2016), P. 1251-1252.*

13. *Mayorova, Zh.S. Influence of a humic feed additive on productive qualities of young animals / Zh.S. Mayorova // Innovative ways of import substitution of agricultural products: materials of the international scientific and practical conference. Ryazan. - 2015. - P. 44-49.*

14. *The value, theory and practice of using humic acids in animal husbandry / A.A. Vasiliev, A.P. Korobov, S.P. Moskalenko, L.A. Sivokhina, M. Yu. Kuznetsov // Agricultural scientific journal. - 2018. - № 1. - P. 3-6.*

15. *Humic acids of oxidized brown coals of some deposits of Russia and Mongolia / N.V. Lukiyarov A.M. Syroezhko, V.A. Itskovich, N.V. Slavoshevskaya // Izvestiya of St. Petersburg State Technological Institute (Technical University). - 2013. - № 22 (48). - P. 053-055.*

THE EXPERIENCE OF JOINT USAGE OF SORBENTS AND PROBIOTICS IN POULTY BREEDING

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Key words: broiler chickens, sorbent, probiotic, muscle development, development of internal organs.

The studies were carried out in the conditions of ZAO PPF "Kavkaz" of the Krasnodar Territory. The article presents results of studies on separate and combined usage of active coal feed additive (ACFA) as a sorbent and "Sporothermin" probiotic for development of muscles and internal organs of broiler chickens of "Cobb-500" cross. The studies were carried out in accordance with the "Methodology for conducting scientific and industrial research on agricultural poultry." At the end of the experimental period, the development of the muscles and internal organs of the bird was studied. In the course of the experiment, the survivability of the bird, the increase of live weight, and the cost of feed were also determined. As a result of the studies, it was revealed that the use of a probiotic and a sorbent increases the live weight of an un-gutted carcass by 5.0-8.7%. With the combined application of a sorbent and a probiotic, the mass of the glandular stomach was significantly increased by 0.15 abs. % ($P < 0.001$). Intestinal mass significantly grew up with application of ACFA sorbent by 0.42 abs. % ($p < 0.05$). Intestinal length evidently decreased by 8.5% ($p < 0.001$) when using "Sporothermine" probiotic. It should be noted that the mass of the thigh muscles significantly increased by 29.0% ($p < 0.05$) in the second experimental group with usage of ACFA, in relation to the control. At the end of the experiment, the live weight of poultry increased by 4.2% ($p < 0.01$) in the second group with ACFA application. In the third group, where "Sporothermin" was used, the live weight grew up by 9.0% ($p < 0.001$). In the fourth experimental group, which was fed with both the sorbent and the probiotic, the best results were obtained and the live weight significantly increased by 9.7% ($p < 0.001$). Over the entire experiment period, feed costs per unit of production have been reduced by 4.3-8.6%. The survivability of the poultry population was 94.4% in the control. In the second and third groups, the survival rate was also high and exceeded the control by 3.0%, in the fourth - by 5.6%.

Bibliography:

- 1. Combination of probiotics and sorbent in mixed feeds for broiler chickens / Z. V. Pskhatsieva, N. A. Yurina, I. R. Tletseruk, V. A. Ovsepyan // Collection of scientific papers of Krasnodar Scientific Center of Animal Science and Veterinary Medicine. - 2018. - Vol. 7, № 1. - P. 291-295.*
- 2. Marinchenko, T.E. State and trends in poultry farming in the EU / T.E. Marinchenko // Innovative provision of egg and meat poultry farming in Russia:*

materials of the XVIII International conference. - World Scientific Poultry Association, Russian Branch; NP Scientific Center for Poultry, 2015. - P. 546-551.

3. Aldobaeva, N. A. *Usage of new effective medications in animal husbandry and poultry farming / N. A. Aldobaeva // Intenet scientific journal OrelSAU. - 2016. - № 1 (6). - P. 5-9.*

4. Nimaeva, V. Ts. *Usage of "Creamino" feed additive in feeding of broiler chickens in the conditions of LLC "Amur Broiler". Problems of zootechnics, veterinary medicine and animal biology in the Far East / V. Ts. Nimaeva; executive editor V. A. Gogulov // Collection of scientific papers. - Blagoveshchensk, 2018. - P. 66-72.*

5. Sharaviev, P.V. *Efficiency of egg production in case of application of feed additives "Toxinon" and "Bacell-M" / P.V. Sharaviev // Agrarian Vestnik of the Urals. - 2015. - № 12 (142). - P. 59-63.*

6. *The influence of a functional biological product on growth and safety of quails / E. S. Volobueva, A. N. Gneush, M. V. Aniskina, A. I. Petenko, N. A. Yurina, A. A. Danilova // Agrarian Scientific journal. - 2019. - № 10. - P. 49-52.*

7. Dubrovsky, A. A. *The introduction of "Fitos" phytosorbent in diets of broiler chickens / A. A. Dubrovsky, O. E. Tatyanchikova, I. A. Boyko // Modern problems of science and education. - 2015. - № 2-3. - P. 274.*

8. Pskhatsieva, Z.V. *Balance of substances of broiler chickens when feeding them with sorbents and probiotics / Z.V. Pskhatsieva, I.R. Tletseruk, S.V. Bulatseva // Effective animal husbandry. - 2015. - № 10 (119). - P. 22-23.*

9. *Joint application of probiotics and sorbents in poultry farming / A. A. Danilova, A. N. Ratoshnyi, D. V. Osepchuk, N. A. Yurina, V. A. Ovsepyan // Collection of scientific papers of Krasnodar Scientific Center of Animal Science and veterinary medicine. - 2020. - Vol. 9, № 1. - P. 338-344.*

10. Shatskikh, E. V. *"Prostor" probiotic product in feeding of broiler chickens / E. V. Shatskikh, O. A. Shevkunov // Agrarian Vestnik of the Urals. - 2019. - № 2 (181). - P. 36-41.*

11. Tukhbatov, I.A. *Effectiveness of usage of complex feed additives / I.A. Tukhbatov // Agrarian Vestnik of the Urals. - 2016. - № 8 (150). - P. 64-69.*

12. Logvinov, O.L. *Influence of "Probian forte" probiotic feed additive on production and hematological parameters of broiler chickens / O.L. Logvinov // Zootechnical science of Belarus. - 2019. - Vol. 54, № 2. - P. 187-192.*

13. Andrianova, E.N. *Prevention of mycotoxicosis in poultry farming. Sorbents - a problem of choice* / E. N. Andrianova // *Poultry*. - 2017. - № 6. - P. 13-16.

14. *Increase of stress resistance, productivity and ecological purity of production of cows, laying hens and broilers when using sorbent and antioxidant additives in diets: monograph* / V.E. Ulitko, S.P. Lifanova, O.E. Erisanova, L. A. Pykhtina, L. Yu. Gulyaeva, O. A. Desyatov, E. V. Savina, A. A. Volchkov. - Ulyanovsk: USAU named after P.A. Stolypin, 2019. - 434 p.

15. Ovsepyan, V. A. *Usage of "Kovelos-sorb" sorbent in diets of broiler chickens* / V. A. Ovsepyan, I. R. Tletseruk // *Feeding of agricultural animals and feed production*. - 2017. - № 12. - P. 24-36.

16. Sharaviev, P.V. *Productive qualities of laying hens when using Toxinon sorbent and Bacell-M probiotic: spec. 06.02.10 "Private zootechnics, technology of production of livestock products: abstract of dissertation of candidate of agricultural sciences* / Pavel Viktorovich Sharaviev; Orenburg State Agrarian University. - Orenburg, 2016. - 16 p.

17. Prosekova, E.A. *Comparative study of the effect of Vetom-1.1 probiotic and Enterogel enterosorbent on duodenum development of broilers* / E.A. Prosekova, V.P. Panov // *Sustainable development of science and education*. - 2017. - №. 7. - P. 177-181.

18. Ovsepyan, V. A. *Usage of "Kovelos-sorb" sorbent and "Prolam" probiotic in diets of broiler chickens* / V. A. Ovsepyan // *Feeding of farm animals and feed production*. - 2018. - № 5. - P. 49-59.

19. *Methodology for conducting scientific and industrial research on poultry feeding / under the general editorship of V. I. Fisinin*. - Sergiev Posad: All-Russian Scientific Research and Technological Institute of Poultry ", 2005. - 33 p.

20. Plokhinsky, N. A. *Biometrics: a text book* / N. A. Plokhinsky. - 2nd ed. - Moscow: Moscow State University, 1970. - 367 p.

USAGE OF METABOLISM ENERGY IN FORMATION OF BODY THERMAL STATE OF THE CATTLE

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Scientific advances in biological sciences make it possible to significantly increase the energy efficiency of productive livestock. For life, as the highest form of existence of matter, thermal energy is of particular importance. It does not only connect the actions and interactions of all types of matter, it creates order from the chaotic movements of discrete heat sources, determining the measure of irreversible energy dissipation (entropy) and the change gradient of metabolic processes, "outflow and inflow of energy", the state of saturation and deficiency of nutrients in the body. Metabolic energy is the energy of nutrients entering the tissues and cells of the body from the digestive tract. In the process of intracellular metabolism, substances are converted into new compounds, energy is released and accumulated. Approximately half of the energy is used in the electrochemical reactions of the synthesis of substances inherent in this organism. Heredity, age, environment, condition of animals influence their quantity and quality. The second half of the energy generated in the basic metabolism is "dissipated" and released into the internal and external environment. This part of the energy, in the thermoregulation process, provides isothermal state of the body of animals. Thermal homeostasis, the range of fluctuations in body temperature within the physiological norm is a significant part of the metabolic energy consumption. The article presents results of studying such consumptions when adapting to feeding factors and changes of weather conditions of cattle of different age and productivity.

Bibliography:

1. Recommendations on stabilization of cattle population and accomplishment of its genetic potential on the farms of the Russian Federation / V. Fisinin, I. Dunin [and others]. - Moscow, 2006 .- 58 p.

2. *Biological resources and restrictions in improving dairy cattle / G.G. Cherepanov, I.K. Medvedev, Z.N. Manar, B.D Kalnitskiy // Agricultural biology. - 2001. - № 4. - P. 3 - 23.*

3. *Mokhov, B.P. Specification of the breeding value of productive animals and improvement of methods for their selection / B.P. Mokhov // Animal science. -2017. - № 9. - P. 11-13.*

4. *Ugolev, A. M. Food behavior and homeostasis regulation / A. M. Ugolev, V. G. Kassil // Complex forms of behavior: book. - Moscow - Leningrad: Nauka, 1965 .- P. 41-59.*

5. *Samoilov, V.O. Bioenergetics / V.O. Samoilov // Medical biophysics: special literature. - St. Petersburg, 2007 .- P. 213-229.*

6. *Plokhinsky, N. A. Regression. Exponential functions / N. A. Plokhinsky // Biometrics: book. - Moscow: Moscow University, 1970 .- P. 210 - 273.*

7. *Schmidt - Nielsen, K. The sizes of animals: why are they so important? / K. Schmidt - Nielsen. - Moscow: Mir, 1987 .- 259 p.*

8. *Prosser, L. Temperature / L. Prosser, F. Brown // Comparative physiology of animals: book. - Moscow: Mir, 1967 .- P. 283-332.*

9. *Robertis, E. Cell biology / E. Robertis, V. Novinskiy, F. Saes. - Moscow: Mir, 1967.- 473p.*

10. *Grachev, I.I. Cytophysiology of milk secretion / I.I. Grachev, S.M. Popov, V.G. Skopichev. - Leningrad: Nauka, 1978 .- 241p.*

11. *Mokhov, B.P. Section of cattle for a positive behavior stereotype / B.P. Mokhov // Report of All-Union Academy of Agricultural Sciences named after Lenin. - 1983. - № 9. - P. 32 - 35.*

12. *Mokhov, B.P. Adaptation and productivity of cattle of various ecogenesis / B.P. Mokhov, A. Malyshev, E. Shabalina // Reports of the Russian Academy of Agricultural Sciences. - 2012. - №1. - P. 40-41.*

13. *Evaluation of dairy breeds by reproductive and adaptive abilities / N.I. Strekozov, N.V. Sivkin [et al.] // Animal husbandry. - 2017. - № 7. - P. 2-6.*

14. Aliev, A. A. *Physiology of the lymphatic system* / A. A. Aliev // *Physiology of agricultural animals: book*. - Leningrad: Nauka, 1978. - P. 362-412.