

THEORETICAL RESEARCH OF THE PROCESS OF BULK MATERIAL DOSING

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Keywords: *particle, bulk material, Navier-Stokes equation, dosing, movement, throughput.*

The article describes the movement of bulk material based on the hydrodynamic model using the Navier-Stokes equation for viscous fluid in vector form. A layer of transported material is studied, its thickness is significantly smaller compared to its length and width. The theoretical part of the article describes studies of the movement of bulk material in a dosing device, which takes into account the area and mass of the material. The average speed of the particles of the material is limited by the height of the raising of pins, which differs from the speed of disk rotation, since one of the main characteristics of the bulk material is the coefficient of internal friction of the particles of the material. At the same time, to determine the throughput of the measuring hopper, an equation was taken into account to determine the average speed of movement of particles of a material. An equation was derived that represents a mathematical model of an unsteady motion regime and it was analyzed taking into account boundary and initial conditions. The ratio of the velocity of the bulk material to the linear velocity of the conveyor at various points along the thickness of the layer of the material being moved at different time is found. As a result, it was revealed that the use of pins for the flow of bulk material from the loading chamber of the disk-pin dosing device allows to provide a significant increase in its throughput. The obtained theoretical studies of the movement speed specification of the bulk material by a rotating disk with spring pins allow to obtain a suitable throughput of the device when dosing particles of the material depending on the design parameters of this device and the physical and mechanical properties of the material. With the maximum height of the pins in the middle part of the material loading zone, the throughput of the device did not exceed 0.55 kg / s.

Bibliography:

1. Kryuchin, Alexander Nikolaevich. Improving the sowing quality of grass seeds with self-propelled pneumatic mini-seeder using disc-pin seeding device: author's abstract of dissertation of Candidate of Technical Sciences: 05.20.01 / A.N. Kryuchin. - Penza, 2016. - 18 p.
2. Gruzdev, I.E. Theories of screw devices / I.E. Gruzdev, R.G. Mirzoev, V.I. Yaikov. - L. : Publishing House of the University of Leningrad, 1978. - 144 p.
3. Gutyar, E.Ya. Elementary theory of vertical screw conveyor / E.Ya. Gutyar // Scientific works of Moscow Institute of Mechanization and Electrification of Agriculture named after V.M. Molotov. - M. : Mashgiz, 1956. - Volume 2. - P. 8-12.
4. Zheltov, V.P. Calculation of spiral screw conveyors / V.P. Zheltov // Vestnik of mechanical engineering. - 1975. - № 5. - P. 18-21.
5. SolidWorks 2007/2008. Computer modeling in engineering practice / A.A. Alyamovsky, A.A. Sobachkin, E.V. Odintsov, A.I. Kharitonovich, N.B. Ponomarev. - SPb. : BKhV-Petersburg, 2008. - 1040 p.
6. Mathematical modeling when improving the parameters of a contact-type drying installation / V.I. Kurdyumov, A.A. Pavlushin, S.G. Mudarisov, V.I. Dolgov // Perm Agrarian Journal. - 2016. - № 2 (14). - P. 107- 112.
7. The initial velocity of the particle of the material when moved by a spiral screw / Yu.M. Isaev, Kh.Kh. Gubeidullin, N.M. Semashkin, I.I. Shigapov // Agrarian science. - 2014. - № 10. - P. 28 - 30.
8. Semashkin, N.M. Revision of the cosmic distance duality tests / N.M. Semashkin, A.V. Nikolaev // Problems of theoretical and observational cosmology. 5th Ulyanovsk International training Seminar. - Ulyanovsk: Teacher Training University named after I.N. Ulyanov, 2016. - 69 p.
9. Optimization of research and methodology work at university in terms of the process approach / I.D. Ibragimov, R.R. Iskhakova, M.A. Galeeva, M.M. Kalashnikova, Yu.V. Ryseva, I.I. Galimzyanova, I.A. Sharonov // Journal of Sustainable Development. - 2015. - Volume 8, No. 3. - P. 234-241.
10. Vasiliev, V.F. Water jets / V.F. Vasiliev. - M.: Moscow Automobile and Highway State Technical University, 2006. - 45 p.

PECULIARITIES OF GRAIN MOVEMENT ON DRYER SPIRAL DISC

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Key words: *spiral, single grain layer, heating, grain movement, annular gap, differential equations of motion.*

The theoretical study aims at establishing quantitative and qualitative relationships between the parameters that change during the heat treatment process and the parameters of the plant being developed, as well as to justify the requirements for the electrical contact plant. Experiments and graphs outlined in the work based on the results of theoretical studies allow us to identify features of movement of a material particle by a spiral disk at different angular velocities of the spiral ω_0 . For example, the angular φ and linear s and particle movement $3s$ after the start of rotation of the spiral stabilize. The nature of the change in the angular velocity of the particle ω and its linear velocity v stabilizes within 1 second after the start of work. The authors have proposed a patented design of a contact grain dryer. The technical result achieved when using the invention is to improve the quality of grain drying and reduce energy costs for drying. This technical result is achieved by the fact that the casing is placed vertically. The transporting working body is made in the form of a flat spring. The height of the flat spring is equal to the maximum size of the dried grain. The hopper is installed above the flat spring at its outer edge. The width of the outlet box of the loading hopper is equal to the distance between adjacent turns of the flat spring. A round-shaped plate rigidly connected with the flat spring and fitted with a drive is installed on a flat spring; the plate's radius does not exceed the distance from the center of the flat spring to the outlet window of the loading hopper. The heating element is placed under the transporting working body and is made in the form of a flat ring, the outer diameter of which is equal to the inner diameter of the casing, and the inner diameter of the flat ring is equal to the diameter of the inner turn of the flat spring. The outlet window is made round and it is installed coaxially the casing under the heating element. The diameter of the outlet window is equal to the inner diameter of the flat ring.

Bibliography:

1. Trisvyatsky, L.A. Technology of receiving, processing, storage of grain and its products / L.A. Trisvyatsky, B.E. Melnik. - M.: Kolos, 1983. - 351 p.
2. Vargas, W.L. Heat conduction in granular materials / W.L. Vargas, J.J. McCarthy // AIChE Journal. – 2001. – № 47. - P. 1052-1059.
3. Baum, A.E. Drying of grain / A.E. Baum, V.A. Rezhikov. - M.: Kolos, 1983. - 223 p.
4. Yadollahinia, A.R. Design and fabrication of experimental dryer for studying agricultural products / A.R. Yadollahinia, M. Omid, S. Rafie // Int. J. Agri. Biol. - 2008. - № 10. - P. 61-65.

5. Kurdyumov, V.I. The results of contact drying of grain of various crops with thin-layer movement of the dried material / V.I. Kurdyumov, A.A. Pavlushin, G.V. Karpenko, M.A. Karpenko // Vestnik of Altai State Agrarian University. - 2013. - № 10 (108). - P.106-110.
6. Kurdyumov, V.I. Theoretical aspects of the distribution of heat in the installation of the contact type when drying grain / V.I. Kurdyumov, A.A. Pavlushin, S.A. Sutyagin // Innovations in agriculture. - 2015. - № 2 (12). - P.159-161.
7. Wang, L.J. Rapid cooling of porous and moisture foods by using vacuum cooling technology / L.J. Wang, D.W. Sun // Trends in Food Science Technology. – 2001. – № 12. - P. 174-184.
8. Pat. 96639 Russian Federation, IPC F26B 3/00. A device for grain drying / V.I. Kurdyumov, A.A. Pavlushin, I.A. Postnikov; patent holder FSEI HE Ulyanovsk State Agricultural Academy. - № 2010106454/22; appl. 24.02.10; publ. 10.08.10, Bul. № 22. - 1 p.
9. Pat. 167410 Russian Federation, IPC A23B 9/08. A device for grain drying / V.I. Kurdyumov, A.A. Pavlushin, G.V. Karpenko; S.A. Sutyagin; P.S. Ageev; V.I. Dolgov; patent holder Ulyanovsk State Agricultural Academy named after P.A. Stolypin. - № 2016130462; appl. 25.07. 16; publ. 10.01.17, Bul. № 1. - 1 p.

INFLUENCE OF FERTILIZERS AND SEEDING AMOUNT ON SEED QUALITY OF BREWING BARLEY OF GRACE VARIETY

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Key words: *barley of Grace varieties, mineral fertilizers, seeding amount, 1,000 seed weight, uniformity, nature, germination energy and seed germination*

The article presents results of studying the effect of mineral fertilizers and seeding amount on a mass of 1,000 seeds, uniformity, nature, germination energy and germination of brewing barley of Grace variety. A two-factor field experiment was carried out at the State University named after N.P. Ogarev in 2012, 2014 and 2015 according to the following scheme: factor A. - mineral nutrition. 1.1 - control - without fertilizers. 1.2 - N30 P30K30. 1.3 - N60P60K60. Factor B - seeding amount. 1.1 - 3.5 million of viable seeds per hectare (control). 1.2 - 4.0. 1.3 - 4.5. 1.4 - 5.0. 1.5– 5.5. The results of our research indicate that the mass of 1,000 seeds was the largest when N60P60K60 fertilizers were applied and the seeding amount was 3.5 million seeds per hectare (53.5 g), seed uniformity prevailed, compared to

the control, in case of N30P30K30 with the seeding amount of 3.5; 4.5; 5.0 million / ha, the grain nature was maximum in case of N30P30K30 fertilizers at a seeding amount of 4.5; 5.0 and 5.5 million seeds per hectare (775.3; 756.0; 768.3 g), the highest seed germination energy was detected without fertilization at a seeding rate of 4.0; 4.5; 5.0; 5.5 million / ha (84.7 - 86.8 g); as well as on in the variant with N30P30K30 and N60P60K60 with a seeding amount of 4.0 million (85.1 - 84.4 g), seed germination had the advantage (87.7 5%) on a natural background with a seeding amount of 5.5 million of seeds.

Bibliography:

1. Kopylov, V.I. Influence of mineral fertilizers on the size and quality of the harvest of spring barley varieties in the conditions of unstable moisture: author's abstract of dissertation of Candidate of agricultural sciences 06.01.09 / V.I. Kopylov. - Saransk, 2004. - 14 p.
2. Marov, A.V. Formation of yield and grain quality of brewing barley under the influence of fertilizers and growth regulators in the forest-steppe of the Volga region: author's abstract of dissertation of Candidate of agricultural sciences 06.01.09 / A.V. Marov. - Penza, 2009. - 24 p.
3. Parfenov, A. S. Technological properties of varieties of brewing barley, depending on cultivation methods in the forest-steppe of the middle Volga region: author's abstract of dissertation of Candidate of agricultural sciences: 06.01.09 / A. S. Parfenov. - Penza, 2009. - 24 p.
4. Gritsenko, V. V. Seed science of field crops / V. V. Gritsenko, Z. M. Kaloshina. - M.: Kolos, 1984. - 272 p.
5. Godunova, K. N. Agrotechnology of highly productive varieties of grain crops / K. N. Godunova. - M.: Kolos, 1977. - 272 p.
6. Nikiferova, S. A. Efficiency of pre-sowing treatment of barley seeds with biopreparations and diatomite powder in the conditions of the Middle Volga region: author's abstract of dissertation of Candidate of agricultural sciences 06.01.09 / S. A. Nikiforova. - Saransk, 2009. - 17 p.
7. Shchennikova, I. N. Evaluation of the environmental stability of spring barley varieties / I. N. Shchennikova, N. A. Rodina, S. A. Kuts // Grain economy. - 2007. - № 3-4. - P. 7-8.
8. Badreev, R.M. The influence of seeding amounts, application methods and the level of nitrogen nutrition on the yield and grain quality of common and distichous barley on the black soil of the southern Orenburg Cis-Urals: author's abstract of dissertation of Candidate of agricultural sciences 06.01.09 / R.M. Badreev. - Orenburg, 2008. - 20 p.
9. Eryashev, A. P. Yield and quality of barley seeds depending on the background of plant nutrition / A. P. Eryashev, I. P. Bektyashkin, S. V. Kudashkina // Feed production. - 2013. - №8. - P. 14 - 16.
10. Eryashev, A. P. Common barley in Mordovia: monograph / A. P. Eryashev, A. A. Saulin. - Saransk: Mord. state Univ., 2012. - 104 p.
11. State Standard 12038 - 84. Seeds of agricultural crops. Methods for determining the germination. - M.: Standards Publishing House, 1984. - 8 p.

12. State Standard 12042–80. Crop seeds. Methods for determining the mass of 1000 seeds. - M.: Standards Publishing House, 1980. - 6 p.
13. State Standard 5060–86. Brewing barley. Technical conditions. - M.: Standards Publishing, 1986. - 16 p.
14. State Standard 10840 - 64. Grain. Methods for determining the nature (with changes). M.: Standards Publishing House, 1964. - 4 p.
15. Dospekhov, B.A. Method of field experiment (with the basics of statistical processing of research results): a textbook for universities / B.A. Dospekhov. - Moscow: Agropromizdat, 1985. - 351 p.

PRODUCTIVITY OF HERBAGE MIXTURES OF PERENNIAL GRASSES BASED ON AWNLESS BROME AND POTERIUM POLYGAMUM IN CASE OF APPLICATION OF GROWTH STIMULATORS

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Key words: *awnless brome, bluegrass alfalfa, Lotus corniculatus, Hungarian sainfoin, Poterium polygamum, shoot formation, leaf area, photosynthetic potential, net productivity, feed value.*

The use of growth stimulators in plant growing, along with other agrotechnical methods of intensive technologies of cultivation of agricultural crops, is one of the most relevant and promising methods of increasing the productivity of crops. The studies were conducted in feed crop rotation of "Feeds" research laboratory of the Department of Plant Science and Agriculture of Samara State Agricultural Academy, according to the methods of field trial, taking into account procedural details for conducting field experiments with feed crops. The results of research for 2015-2018 are given with an assessment of the parameters of plant sprout formation, leaf area, photosynthetic activity, net productivity, feed value of various agrophytocenoses in case of application of growth stimulators in the conditions of the forest-steppe of the Middle Volga region. The two-factor experiment included vegetation treatment in the third leaf phase of leguminous component with growth stimulators - Growth Matrix and Gumi 20M (factor A) and grass mixture variants (factor B). Our research shows that the leaf area of plants gradually increases as they progress through the phenological phases. The results of the conducted research allow to make conclusions about the effectiveness of crop treatment during vegetation with the Gumi 20M and Growth Matrix in the conditions of the forest-steppe of the Middle Volga region. The highest results are observed in the phase of fruit formation with the maximum values in grass mixtures with legumes. Four-component herbage mixtures of awnless bone, Bromopsis erekta hubs., Poterium polygamum with Hungarian sainfoin or bluegrass alfalfa have the best yield of feed units.

Bibliography:

1. Perennial grasses in mono and mixed crops in the green conveyor system / V.G.Vasin, A.V. Vasin, L.V. Kiseleva, A.A. Bragin // Feed production. - 2009. - № 2. - P. 14-17.
2. Vasin, V.G. The productivity of sainfoin - awnless brome grass mixture / V.G. Vasin, V.S. Rogov, A.Yu. Poleshko // Feed production. - 2009. - № 2. - P. 22-24.
3. Vasin, V.G. The state and prospects for feed production development in Samara region / V.G. Vasin, A.V. Vasin // Vestnik of Ulyanovsk State Agricultural Academy. - 2011. - № 1. - P. 7-12.
4. Evaluation of new perennial feed crops in comparison with traditional herbs / E. P. Denisov, A. M. Mars, B. Z. Shagiev, O. I. Kolomiets // Niva Povilzhiya. - 2010. - № 4 (17). - P. 7-12.
5. Kshnikatkina, A.N. Formation of highly productive agrocenoses of feed crops using adaptive non-traditional plants / A.N. Kshnikatkina, V.N. Eskin, D.I. Petrov // Niva Povilzhiya. - 2008. - № 3. - P. 35-38.
6. Kshnikatkina, A.N. Feed productivity of *Poterium polygamum* in the conditions of the forest-steppe of the Middle Volga region / A.N. Kshnikatkina, I.A. Voronov // Niva Povilzhiya. - 2016. - № 4 (41). - P. 36-42.
7. Kudryavtseva, T. G. Peculiarities of photosynthetic activity of polyspecies agrophytocenosis / T. G. Kudryavtseva, E. Yu. Rakotsa // ACTA BIOMEDICA SCIENTIFICA.- 2006. - № 2 (48).
8. Timoshkin, O.A. Photosynthetic activity of legumes using micronutrients and bioregulators / O.A.Timoshkin, O.Yu.Timoshkina, A.A. Yakovlev // Achievements of science and technology of AIC. - 2013. - №7. - P.58-60.
9. Podsvirova, V. A. Feed qualitative parametres of legume-grass mixtures depending on seeding amount and component correlation / V. A. Podsvirova, V. I. Sviridov // Collection of scientific works of Stavropol Scientific Research Institute of Livestock and Feed Production. -2009.- №3, Volume 3.- P. 22-27.
10. Surovtsev, V.N. The feed quality is a factor in increasing the competitiveness of milk production / V.N. Surovtsev // Feed production.- 2009. -№2.- P. 22-24.

FORMATION OF CHICKPEA CROP IN CASE OF APPLICATION OF FERTILIZERS AND GROWTH STIMULATORS

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Key words: chickpea, seed treatment, growth stimulators, leaf area, photosynthetic potential, crop structure, 1000 seed weight, yield.

The results of studies for 2016-2018 are given, including assessment of leaf area, *photosynthetic potential, crop structure, chickpea variety productivity of the*

following varieties: Privo 1, Volgogradsky 10, Volzhanin in case of different methods of crop treatment with growth stimulator Growth Matrix and microfertilizer Megamix Profi, Aminokat + Raykat Development. The multifactor experiment on the study of different varieties of chickpea, doses of mineral fertilizers and crop treatment during the growing season included: two backgrounds of mineral nutrition: control without fertilizers, application of fertilizers $N_{12}P_{52}$ (factor A); three varieties of chickpea: "Privo 1", "Volzhanin", "Volgogradsky-10" (factor B); vegetation treatment: control (without treatment), Growth Matrix, Megamix Profi, Aminokat + Raykat Development (factor C). Research has revealed that all variants of crop treatments improve the photosynthetic activity of plants and increase chickpea productivity. The maximum chickpea yield was achieved when $N_{12}P_{52}$ was introduced in Volzhanin variety, in the variant with vegetation processing of the crops by Megamix Profi and Aminokat + Raykat Development and amounted to 2.04 t / ha and 2.00 t / ha.

1. Zotikov, V.I. The current state of grain and cereal crops in Russia / V.I. Zotikov, T.S. Naumkina, V.S. Sidorenko // Vestnik of Orel SAU. - 2006. - Issue 1. - P. 14-17.
2. Pea and chickpea of different varieties in feed production / S.I. Kononenko, Yu.I. Levakhin, A.G. Meshcheryakov, A.M. Ispanova // Zootechnical science of Belarus. - 2015. - Volume 50, No. 2. - P. 3-11.
3. Comparative assessment of the nutritional value of pea and chickpea grain in drought conditions/ A.G. Meshcheryakov, V.A. Shakhov, V.L. Korolev, V.A. Dotsenko // Izvestiya of Orenburg State Agrarian University. - 2014. - №5 - P.180-183.
4. Semenov V.V. Nutrition and amino acid composition of sorghum grain varieties used in animal feeding / V.V. Semenov, S.I. Kononenko, I.S. Kononenko // Collection of scientific works of Stavropol research institute of animal breeding and feed production. - Stavropol, 2011. - Volume 1, No. 4-1. - P. 86-88.
5. Germantseva, N.I. Chickpea – culture of arid farming / N.I.Germantseva.– Saratov, 2011. - 199 p.
6. Qualitative characteristic of protein and fiber of the main feed crops of the steppe zone of the Southern Urals / A. G. Meshcheryakov, G.I. Levakhin, A.A. Ziganshin, V.A. Dotsenko [and others] // Izvestiya of Orenburg State Agrarian University. - 2009. - № 3. - P. 264-267.
7. Vasin, V.G. The productivity of chickpea Privo 1 in case of application of growth regulators at different levels of mineral nutrition in the conditions of the forest-steppe of the Middle Volga / V.G. Vasin, E.I. Makarova, V.V. Rakitina // Current problems of agrarian science and ways to solve them: collection of scientific works. - Kinel: Publishing centre of SSAA, 2015. - 324 p.
8. Vasin, V.G. Methods of presowing treatment of seeds and crops of chickpea with growth biostimulators / V.G. Vasin, O.N. Lysak, O.V. Vershinina // Current problems of agrarian science and ways to solve them: a collection of scientific papers. - Kinel: Publishing centre of SSAA, 2015. - 324 p.

9. Erokhin, A.I. The effectiveness of the use of biological products in the presowing treatment of seeds and vegetative plants of leguminous crops / A.I. Erokhin // Leguminous and cereal crops. - 2015. - №1 (13). - P.29.

**PRODUCTIVITY AND ECOLOGICAL AND CHEMICAL
CHARACTERISTICS OF SOWN MEADOWS OF PODESENYE IN
NATURAL CONDITIONS (BRYANSK REGION)**

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Key words: *seeded meadows, background habitats, old-developed region, radio-ecological control, heavy metals, Bryansk region*

*The paper presents data of background monitoring of seeded meadows within the agricultural areas of Bryansk region as an old-developed region. Yields, feed characteristics and fiber content for the six main types of sown meadows are the main ecological and biological characteristics of the meadows to develop a strategy to intensify the production of high-quality vegetable feed. It has been established that the cultivation of perennial grass mixtures of *Arrhenatherum elatius* (L.) J. & C. Presl, *Dactylis glomerata* L., *Phleum pratense* L. is the most favourable. When analyzing specific activity and the total content of four heavy metals in herbage meadows, exceedance of hygienic standards for plant shoot biomass has not been established. It is recommended to include in the monitoring parameters data of radioecological control for baseline or background studies. The herbage accumulates only copper as mobile essential element, which makes it possible to recommend to include study of its concentration in the monitoring for background conditions. Kovelos Growth can be recommended for remediation and improvement of biochemical processes in the grass stand of sown meadows, as a decrease of accumulation factors of the dose-forming radionuclide in the biomass of all types of seeded meadows has been revealed.*

Bibliography:

1. Natural resources and the environment of Bryansk region / edited by N.G. Rybalsky, E.D. Samotesov, A.G. Mityukova. - M.: SIA Priroda, 2007. - 1144 p.

2. State Standard 17.4.4.02-84. Methods of sampling and sample preparation for chemical, bacteriological, helminthological analysis [Electronic resource]. - Access from the reference system "Consultant". - URL: [http:// www.consultant.ru](http://www.consultant.ru).
3. State Standard 17.4.3.01-83 Soils. General requirements for sampling [Electronic resource]. - Access from the reference system "Consultant". - URL: <http:// www.consultant.ru>.
4. M 049-P / 04. Methods for measuring the mass fraction of metals and metal oxides in powdered soil samples by X-ray fluorescence analysis. - S-Pb .: Scientific Production Association "Spectron", 2004.- 20 p.
5. Methods of measuring the activity of radionuclides using a scintillation gamma spectrometer with the Progress software. - Mendeleevo: All-Russian Research Institute of Physico-Technical and Radio Engineering Measurements, 2003. - 30 p.
6. Hygienic requirements for safety and nutritional value of food: sanitary-epidemiological rules and regulations SanPiN from 2.3.2.1078-01. - M .: Ministry of Health of the Russian Federation, 2002. - 164 p.
7. Resolution of the Chief State Sanitary Doctor of the Russian Federation of 07.07.2009 No. 47 "On approval of SanPiN 2.6.1.2523-09" together with "NRB-99/2009. SanPiN 2.6.1.2523-09. Radiation safety standards: sanitary rules and standards of 14.08.2009 N 14534 [Electronic resource]. - Access from the reference system "Consultant". - URL: <http:// www.consultant.ru>.
8. Forest. Person. Chernobyl. Forest ecosystems after the accident at the Chernobyl nuclear power plant: state, forecast, population reaction, ways of rehabilitation / V.A. Ipatiev, V.F. Baginsky, I.M. Bulavik [et al.]; ed. by V.A. Ipatiev. - Gomel: Forestry Institute of the National Academy of Sciences of Belarus, 1999. - 396 p.
9. Cherepanov, S.K. Vascular plants of Russia and neighboring countries / S.K. Cherepanov. - St. Petersburg: World and Family, 1995. - 992 p.
10. Bulokhov, A.D. Grass vegetation of the South-Western Non-Black soil region of Russia / A.D. Bulokhov. - Bryansk: BSU named after I. G. Petrovsky, 2001. - 296 p.
11. Potsepai, S.N. The state of natural meadows in the Desna basin of the Non-Black soil region as the basis for their rational use / S.N. Potsepai, L.N. Anishchenko, S.A. Belchenko // Vestnik of Kursk State Agricultural Academy. - № 5. - 2018. – P. 35-41.
12. Accumulation of ^{137}Cs by plants of meadow ecosystems in the border areas of Bryansk, Gomel and Chernigov regions / A.D. Bulokhov, N.A. Skovorodnikova, N.M. Daineko, A.V. Lukash, N.N. Panasenko, Yu.A. Semenishchenkov // Scientific dialogue. - 2014. - № 1 (25). - P. 5–13.

13. Matychenkov, Ivan Vladimirovich. Mutual influence of silicon, phosphorus and nitrogen fertilizers in the system: soil-plant: dissertation of Candidate of Biological Sciences 06.01.04 / I.V. Matychenkov. - M.: MSU, 2014. - 136 p.

14. Heavy metals of the components of meadow cenoses in the conditions of anthropogenic burden [Electronic resource] / A.D. Bulokhov, L.N. Anishchenko, N.N. Panasenko, Yu.A. Semenishchenkov, N.A. Skovorodnikova // Current problems of science and education. - 2014. - № 3. - URL: <http://www.science-education.ru/117-13337>

PRINCIPLES OF POTASSIUM STATE CHANGE OF LIGHT GRAY FOREST SOIL IN CASE OF LONG TERM APPLICATION OF CHEMICALS

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Key words: *light gray forest soil, mineral fertilizers, liming, potassium, potassium forms, potassium balance.*

The influence of systematic application of mineral fertilizers and the aftereffects of various doses of lime on potassium regime and the balance of this element has been studied In a long-term stationary experiment on light gray forest soil. The studies were conducted according to a scheme including six gradations according to the "liming" factor with a step of 0.5 g. and four gradations according to the "NPK" factor. It was established that non-fertilized soil retained the content of mobile forms of potassium at initial level over 40 years of use, fertilizer application provided an increase in its amount by 18-108 mg / kg. Studies of liming consequences did not reveal any clear patterns between the dose of dolomite flour and the concentration of K_2O in the soil. The degree of variability in the potassium content in the soil, expressed by the coefficient of variation, was 9.8–52.2% and, as a rule, was directly related to the element content (variability in most cases increased as the availability of potassium soil increased). The share of lightly mobile, exchangeable and non-exchangeable potassium in formation of gross reserves of the element was 0.4, 1.2 and 7.5%, respectively. Long-term use of mineral fertilizers contributed to an increase in the content of potassium forms potentially available to plants, the amount of which increased significantly with an

increase in the dose of fertilizers., A positive potassium balance was formed in the variants with application of the maximum experimental dose of mineral fertilizers.

Bibliography:

1. Titova, V.I. Phosphorus in agriculture of Nizhny Novgorod region / V.I. Titova, O.D. Shafronov, L.D. Varlamova. - N. Novgorod: Volgo-Vyatka Academy of Public Administration Publishing House, 2005. - 219 p.
2. Borisova, E.E. The impact of crops and green manure on spring wheat yield on light gray forest soils of Nizhny Novgorod region / E.E. Borisova // Vestnik of Krasnoyarsk State Agrarian University. - 2014. - № 8. - P. 61-64.
3. Ashaeva, O.V. The influence of the variety on grain yield of spring hard wheat in the conditions of Bolsheboldinsky State Variety Test Plot of Nizhny Novgorod region / O.V. Ashaeva, V.N. Shakhlova, O.N. Balandina // Nizhny Novgorod State Agricultural Academy. - 2013. - Volume 3. - P. 224-229.
4. Abramov, A.I. State of fertility of arable land in Nizhny Novgorod region / A.I. Abramov, E.A. Krymova // Currant problems of agriculture of the Euro-North-East of the Russian Federation. - N. Novgorod: Dyatlov Mountains Publishing House, 2013. - P. 15-23.
5. Mineev, V.G. The problem of potassium in modern agriculture / V.G. Mineev // Fertility. - 2002. - № 1. - P.15-18.
6. Sizova, Yu.V. Analysis of the chemical soil composition of Nizhny Novgorod region / Yu.V. Sizova, E.E. Borisova, D.A. Tarakanova // Vestnik of Michurinsky State Agrarian University. - 2018. - № 2. - P. 46-68.
7. Korchenkina, N.A. The effect of long-term liming consequences and the systematic application of fertilizers on the agrochemical properties of light-gray forest soil and crop productivity / N.A. Korchenkina, V.S. Komissarova // Results of the implementation of the program of basic scientific research of state academies for 2013–2020: collection of conference proceedings April 16–17, 2018. - M.: URSRI of agrochemistry named after D.N. Pryanishnikov, 2018. - P. 139-152.
8. Korchenkina, N.A. The effect of mineral fertilizers and liming aftereffect on the dynamics of content of mobile forms of potassium in light gray forest soil / N.A. Korchenkina, R.M. Makhalov // Fertility. - 2015. - № 6. - P. 8-10.
9. Afanasyev, R.A. Content of mobile potassium in soils in case of long-term use of fertilizers / R.A. Afanasyev, G.E. Merzlaya // Agrochemistry. - 2013. - № 6. - P. 5-11.
10. The effect of potassium fertilizers on crop yields and soil potassium state of Nizhny Novgorod region / Ye.G. Tyurnikova [et al.] // Agrochemical vestnik. - 2011. - № 2. - P. 10-12.

11. Volodina, T.I. The influence of fertilizer systems on the content of mobile phosphorus and exchange potassium in sod-weakly podzolized soil / T.I. Volodina, A.I. Makarova // Agrochemistry. - 2010. - № 9. - P. 31-35.
12. The effect of long-term use of fertilizers on dynamics of potassium in the grain-beetroot crop rotation / V.V. Nikitin [et al.] // Vestnik of Kursk State Agricultural Academy. - 2012. - № 8. - P.45-47.
13. Davlyatshin, I.D. Potassium in arable soil of the forest-steppe / L.D. Davlyatshin, A.A. Lukmanov, A.N. Badikov // Fertility. - 2013. - № 2. - P. 27-28.
14. Karabutov, A.P. The influence of elements of agrotechnology on potassium soil regime in long-term experiments / A.P. Karabutov, G.I. Uvarov // Scientific statements. - 2015. - № 3. - P. 125-132.
15. Yakimenko, V.N. Evaluation and regulation of potassium state of arable soil / V.N. Yakimenko // Theory and practice of modern agrarian science: a collection of national All-Russian scientific conference. - Novosibirsk: NSAU, 2018. - P. 97-101.

**YIELD OF VARIETIES OF COMMON BEANS IN CASE OF
CULTIVATION ACCORDING TO RESOURCE-SAVING
TECHNOLOGY IN THE CONDITIONS OF THE SOUTHERN TRANS
URALS**

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Key words: common beans, variety, resistance, yield, phytopathogens, Fusarium.

The aim of our research was to study the seed productivity of common varieties of beans of various selection centers in the climatic conditions of the Southern Trans-Urals. Seed productivity of varieties depends on their resistance to biotic and abiotic environmental factors. Ordinary fungal diseases reduce the yield of bean seeds. Root rot was caused in the experiment by fungi of Fusarium genus regardless of the varieties. The underground organs were infected with Fusarium fungi from 40 to 87%. The percentage of the fungi of Alternaria genus ranged from 0 to 57% in the pathogenic complex of root bean rot. The average seed yield of common beans varieties of grain direction over the 3 years of study was formed at a good level and amounted to: Rubin - 2.31, Snezhana (Krasnodar) - 2.54, Oran - 2.12 t / ha. Vegetable bean varieties formed a good harvest for the climatic zone, respectively: Moskovskaya belaya (standard) - 2.75, Sobrat (Krasnodar) - 1.53,

Amaltea (Krasnodar) - 1.79 t / ha; productivity of Novosibirsk vegetable bean varieties: Darina - 1.53, Solnyshko - 1.47, Viola - 1.40, Yantarnaya - 1.47 t / ha.

Bibliography:

1. Plant cultivation / P.P. Vavilov, V.V. Gritsenko, V.S. Kuznetsov [et al.]; ed. by P.P. Vavilov.- M.: Agropromizdat, 1986. - 512 p.
2. Gorobey, I.M. Fusarium of legumes in the forest-steppe zone of Western Siberia / I.M. Gorobey, L.F. Ashmarina, N.M. Konyayeva // Protection and quarantine of plants. - 2011.- № 2. - P.14-16.
3. Kazydub, N.G. Influence of planting dates on growth and development, yield and quality of various varieties of vegetable beans in the conditions of the southern forest-steppe of Western Siberia / N.G. Kazydub, V.M. Kazydub, A.P. Kling // Achievements of science and technology of agrarian and industrial complex. - 2010. - №2.- P. 24-26.
4. Kazydub, Nina Grigoryevna. Evaluation of the collection of grain beans and development of source material for selection in the conditions of the southern forest-steppe of Western Siberia: author's abstract of dissertation of Candidate of Agriculture: 06.01.05 / N.G. Kazydub. - Omsk, 2005.- 43p.
5. Karpuk, V.V. Crop production: textbook / V.V. Karpuk, S.G. Sidorova. - Minsk: BSU, 2011. - 351 pp.
6. Study and adaptation of varieties of beans of various selection centers with application of phytosanitary cultivation technology in the Trans-Urals / I.N. Porsev, I.A. Subbotin, V.V. Polovnikova, A.O. Abylkanova // Scientific works of Kuban State Agrarian University. –2017. - No. 66. - P.195-198.
7. The influence of the study area on productivity of common bean varieties and development of root rot in the conditions of the Trans-Urals / I.N. Porsev, A.O. Abylkanova, V.V. Polovnikova, I.A. Subbotin // Vestnik of Kurgan State Agricultural Academy. - 2018. - № 2 (26). -P. - 56-59.
8. Russkikh, I.A. Diseases of beans in Belarus / I.A. Russkikh // Protection and quarantine of plants. - 2008. - №12. - P. 17-18.
9. Saveliev, V.A. Seed research of field crops: textbook / V.A. Saveliev. - SPb.: Lan publishing house, 2018. - 276 p.
10. Saveliev, V.A. Weed plants and measures against them: a textbook / V.A. Saveliev. - SPb.: Lan publishing house, 2018. - 296 p.
11. Solovyeva, L.P. The effect of mineral fertilizers on yield and grain quality of chickling vetch in the conditions of Kurgan region / L.P. Solovyeva, D.V. Gladkov // Vestnik of Kurgan State Agricultural Academy. - 2016. - № 3. - P. 61-63.
12. Seed productivity of new varieties of common beans in the conditions of the Southern Trans-Urals / I.A. Subbotin, A.O. Abylkanova, I.N. Porsev, V.V. Polovnikova // Scientific works of Kuban State Agrarian University. - 2018. - № 3 (72). - P. - 335-338.
13. Phytosanitary diagnostics of agroecosystems / V.A. Chulkina, E.Yu. Toropova, G.Ya. Stetsov, A.A. Kirichenko, E.Yu. Marmulev, V.M. Grishin, O.A. Kazakova, M.P. Selyuk, ed. by Professor E.Yu. Toropova. - Barnaul, 2017. - 210 p.

14. Chulkina, V.A. Phytosanitary improvement of crop production in Siberia. IV. Vegetable crops: a textbook / V.A. Chulkina, E.Yu. Toropova, G.Ya. Stetsov [et al.]. - Novosibirsk, 2003. - 314 p.

15. Integrated plant protection: phytosanitary improvement of agroecosystems (terms and definitions): textbook with the stamp of the Ministry of Agriculture of the Russian Federation / V.A. Chulkina, E.Yu. Toropova, G.Ya. Stetsov [et al.]. - M.: Kolos, 2010. - 482 p.

BMP OF SIGNALING PATH IN THE DEVELOPMENT OF SKIN TUMORS

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Key words: *skin, bone morphogenetic proteins, noggin.*

The article presents results of studying the role and identification of molecular mechanisms for involvement of BMP of signaling pathway in the development of skin tumors using transgenic mice, over-expressing BMP antagonist noggin under the control of keratin gene 14 promoter (K14-Noggin). To study the role of BMP in the development of skin tumors, a transgenic (TG) line of mice was created, over-expressing BMP antagonist of noggin under the control of the keratin gene 14 promoter. To carry out the study, we took skin samples from mice in the following periods: 20, 24, 28, 32, 36, 40 days of postnatal ontogenesis (P0 - P40, respectively), as well as at the period of 12-24 weeks. For each time period, 5-7 mice of the experimental and control line were selected. After sampling, skin samples were immediately frozen in liquid nitrogen and enclosed in embedding medium (Tissue-Tek, OST 4583 Compound, Sakura, USA) and then stored at -80 ° C. Experiments on animals were carried out according to protocols approved by the University of Bradford (license PPL 40/2989) and Chuvash State Agricultural Academy. The data suggest that inhibition of BMP of signaling pathways leads to formation of epithelial skin tumors. Maintaining the activity of BMP of signaling pathways in the skin is one of the factors preventing the transformation of epithelial cells into tumor cells. Thus, transgenic expression of noggin actually leads to inhibition of canonical BMP of signaling pathway in the epidermal and hair keratinocytes.

Bibliography:

1. What is the 'true' function of skin? / C.M. Chuong, B.J. Nickoloff, P.M. Elias, L.A. Goldsmith, E. Macher, P.A. Maderson [et al.] // Exp Dermatol. - 2002. - 11:159-87.

2. Mardaryev, A.N. The role of Cbx4 in the healing of skin wounds of mice / A.N. Mardaryev, N.V. Mardaryeva // Scientific-educational environment as the basis for the development of the agro-industrial complex and the social infrastructure of the village. Materials of the international scientific-practical conference dedicated to the 85th anniversary of Chuvash State Agricultural Academy. - Cheboksary: Chuvash State Agricultural Academy, 2016. - P. 305-310.
3. Mardaryev, A.N. The role of Cbx7 in regulation of keratinocyte migration in the healing of skin wounds of mice / A.N. Mardaryev, N.V. Mardaryeva, G.A. Larionov // Vestnik of Chuvash State Agricultural Academy. - 2017. - № 3 (3). - P. 56-62.
4. Mardaryev, A.N. Control of polycombined protein Cbx7 in the proliferation of keratinocytes of mouse skin / A.N. Mardaryev, N.V. Mardaryeva // Biologization of agriculture - the basis of soil fertility reproduction. Materials of the international scientific-practical conference dedicated to the 60th anniversary of the birth of Doctor of Agricultural Sciences, Professor, Academician of RAE Leonid Gennadyevich Shashkarov. - Cheboksary: Chuvash State Agricultural Academy, 2018. - P. 171-178.
5. Millar, S.E. Molecular mechanisms regulating hair follicle development / S.E. Millar // J Invest Dermatol. – 2002. - 118:216-25
6. The structure and development of skin / D. Chu, L.A. Goldsmith [ed.] // Fitzpatrick's Dermatology in General Medicine McGraw-Hill. - New York, 2012. - P. 58-75.
7. Bone morphogenetic protein in melanoma: angel or devil? / M.Y. Hsu, S. Rovinsky, S. Penmatcha, M. Herlyn, D. Muirhead // Cancer Metastasis Rev. – 2005. - 24:251-63
8. Botchkarev, V.A. Bone morphogenetic proteins and their antagonists in skin and hair follicle biology / V.A. Botchkarev // J Invest Dermatol. - 2003. - 120:36-47
9. Local inhibitory action of BMPs and their relationships with activators in feather formation: implications for periodic patterning / H.S. Jung, P.H. Francis West, R.B. Widelitz, T.X. Jiang, S. Ting Berreth, C. Tickle [et al.] // Dev Biol. – 1998. - 196:11-23.
10. Zhang, J. BMP signalling and stem cell regulation / J. Zhang, L. Li // Dev Biol. - 2005. - 284:1- 11
11. The activation level of the TNF family receptor, Edar, determine scuspnumber and tooth number during tooth development / A. Tucker, D. Headon, J. Courtney, P. Overbeek, P. Sharpe // Dev Biol. – 2004. - 268:185-94
12. FVB/N mice: an inbred strain sensitive to the chemical induction of squamous cell carcinomas in the skin / H. Hennings, A. Glick, D. Lowry, L. Krsmanovic, L. Sly, S. Yuspa // Carcinogenesis. – 1993. - 14:2353-8
13. Transgenic studies with a keratin promoter-driven growth hormone transgene: prospects for gene therapy / X. Wang, S. Zinkel, K. Polonsky, E. Fuchs // Proc Natl Acad Sci USA. – 1997. - 94:219-26

CLINICAL DIAGNOSTICS OF DILATED CARDIOMYOPATHY OF DOGS

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Key words: *cardiomyopathy, dogs, symptoms, diagnostics, heart failure.*

The purpose of the study is to assess the frequency of occurrence of clinical parameters of dogs with dilated cardiomyopathy, depending on the functional class of heart failure syndrome. The object of the study was dogs with dilated cardiomyopathy (n = 159) and clinically healthy animals (n = 33), the latter being used as a control group. Research methods: clinical, echocardiographic, electrocardiographic, radiographic, statistical. Dogs with dilated cardiomyopathy, often show a decrease of exercise tolerance, dyspnea, tachypnea (especially during an animal's sleep), diffuse cardiac impulse and its caudal displacement, non-intensive systolic murmur in the projection of the mitral and tricuspid valve, weakening of the first heart tone, low pulse, less often - hyporexia, reduced time for capillary refilling with blood, cough, tachycardia, gallop rhythm, hepatomegaly, ascites, polydipsia, deficient and alternating pulse, rarely - positive venous pulse and overflow of jugular veins with blood, hypothermia, peripheral edema, cyanosis, orthopnea, variegated pulmonary rales. The presence of a significant correlation of the clinical symptoms of dogs with dilated cardiomyopathy with a functional class of heart failure syndrome was established.

Bibliography:

1. Canine dilated cardiomyopathy: a retrospective study of prognostic findings in 367 clinical cases / M.W. Martin, Johnson M.Stafford, G.Strehlau [et al.] // J Small Anim Pract. – 2010. – № 8. – P. 428–436.
2. Occurrence of cardiorespiratory diseases and impact on lifespan in Swedish Irish Wolfhounds: a retrospective questionnaire-based study / L.Orleifson, I.Ljungvall, K.Höglund [et al.] // Acta Vet Scand. – 2017. – № 1. – P. 53.
3. Vollmar, A.C. Long-term Outcome of Irish Wolfhound Dogs with Preclinical Cardiomyopathy, Atrial Fibrillation, or Both Treated with Pimobendan, Benazepril Hydrochloride, or Methyldigoxin Monotherapy / A.C. Vollmar, P.R. Fox // Journal of Veterinary Internal Medicine. – 2016. – № 2. – P. 553–559.
4. Predictors of Sudden Cardiac Death in Doberman Pinschers with Dilated Cardiomyopathy / L.Klüser, P.J.Holler, J.Simak [et al.] // J. Vet. Intern. Med. 2016. – № 3. – P. 722–732.

5. European Society of Veterinary Cardiology screening guidelines for dilated cardiomyopathy in Doberman Pinschers / G.Wess, O.Domenech, J.Dukes-McEwan [et al.] // J. Vet. Cardiol. – 2017. – № 5. - P. 405–415.
6. Diet-associated dilated cardiomyopathy in dogs: what do we know? / L.M.Freeman, J.A.Stern, R.Fries [et al.] // J Am Vet Med Assoc. – 2018. – № 11. – P. 1390–1394.
7. Harmon, M.W. Dilated Cardiomyopathy in Standard Schnauzers: Retrospective Study of 15 Cases / M.W. Harmon, S.B.Leach, K.E. Lamb // J Am Anim Hosp Assoc. – 2017. – № 1. – P. 38–44.
8. Dutton, E. An update on canine cardiomyopathies - is it all in the genes? / E.Dutton, J. López-Alvarez // J Small Anim Pract. – 2018. – № 17. – P. 1 – 10.
9. Heart rate turbulence after ventricular premature beats in healthy Doberman pinschers and those with dilated cardiomyopathy / J.D. Harris, C.J.L.Little, J.M. Dennis, M.W. Patteson //Journal of Veterinary Cardiology. – 2017. – № 5. – P. 421–432.
10. Prognostic indicators for dogs with dilated cardiomyopathy / M. Borgarelli, R.A.Santili, D.Chiavegato [et al.] // J. Vet. Intern. Med. - 2006. – № 1. – P. 104 – 110.

EXPANSION OF DICROCELIOSIS IN CATTLE AND MARAL POPULATION ON ALTAI TERRITORY

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***Key words:** dicroceliosis, cattle, marals, epizootic situation, extensiveness of invasion.*

Dicroceliosis of animals is widely spread in many countries of the world, including the Russian Federation, and causes significant economic damage resulting from decrease of the quantity and quality of livestock products and the cost of medical and preventive measures. Along with cattle breeding in Altai, maral breeding is also widespread. Altai Territory is a unique natural and climatic region. According to the geomorphological structure, complex of soil, climatic parametres, relief, the territory of the region is subdivided into 4 natural-climatic zones: steppe, forest-steppe, foothill and salair, according to the level of moisture and moisture saturation: moist, slightly arid, arid and very arid. We carried out a retrospective statistical analysis of the epizootic situation on dicroceliosis of cattle and marals in 60 districts of Altai region and the territories of Barnaul city and the city of Belokurikha for the period 2002–2016. In the process of research, it was

revealed that dicroceliosis, as a parasitic system, functioned on the territory of 22 administrative divisions: 21 districts of Altai Territory and the city of Barnaul (which was 35.0%). The extensiveness of cattle infection with this zoonhelminthosis varied from 0.02 to 20.6%. Extensiveness of dicrocelious invasion of marals in this time period ranged from 51.6% to 84.1%. Our studies and data analysis show that the causative agent of dicroceliosis is the most common and is regularly detected in areas belonging to the foothill zone (9 areas). There were few cases of the dicroceliosis invasion recorded in: steppe (5 districts of Altai Territory), Salair (4 districts) and forest-steppe (4 districts) zones.

Bibliography:

1. Abalakhin, B.G. The effect of dicrocelium on composition of intestinal microflora of Romanov sheep / B.G. Abalakhin // Abstracts of the reports of the 2nd All-Union Congress of Parasitologists. - Kiev: Naukova Dumka, 1983.- P.14-15.
2. Abalakhin, B.G. Prevention of an associated disease caused by the parasitism of dicrocelium, bacteria and fungi: collection of scientific papers of MVA / B.G. Abalakhin. - M.: MVA, 1993. -P. 100-102.
3. Abalakhin, Boris Georgievich. Dicroceliosis and sheep mulleriosis in the central region of the Non-black soil zone of the Russian Federation: dissertation of Doctor of Veterinary Sciences: 03.00.19 / B.G. Abalakhin. - Ivanovo, 1996 – 401p.
4. Akbaev, M.Sh. Observations on the epizootology of dicroceliosis of sheep and the biology of its agent in the conditions of Karachay-Cherkess Autonomous Region: collection of scientific papers of MVA / M.Sh. Akbaev. - M.: MVA, 1970. - P. 167-170.
5. Calamel, M. La dicrocoeliose ovine et caprine dans le sud est de la France / M. Calamel // Rev. med. vet. France. – 1976. - Vol.127 (11). - P.1529-1536.
6. Mkrtychyan, Manyu Eduardovna. Trematodoses of cattle on the farms of Udmurt Republic. Epizootology, pathogenesis, control measures: dissertation of Doctor of Veterinary Sciences: 03.02.11 / M.E. Mkrtychyan. - Izhevsk, 2016 - 5 p.
7. Parasitofauna in the gastrointestinal tract of the cervids (Cervidae) in northern Poland / P. Burlínski, P. Janiszewski., A. Kroll, S. Gonkowski // Acta Veterinaria Belgrade. – 2011. – Vol.61. – P. 269–282.
8. Tishkov, M.Yu. Parasitic diseases of marals and wild ungulates, maral and hunting farms in some regions of the Russian Federation / M.Yu. Tishkov, V.I. Mikhailov, O.N. Shmakova // Vestnik of NSAU. - 2018. - № 3. - P. 103-107.
9. Efremova, E.A. Expansion and seasonally-specific peculiarities of infection of marals with helminths of the Strongylata suborder in Altai Republic / E.A.

Efremova, V.A. Marchenko, E.A. Udaltsov // Vestnik of NGAU. - 2018. - № 2. - P. 81-90.

10. Udaloy, Albert Viktorovich. Ground mollusks of the South of Western Siberia: author's abstract of dissertation of Candidate of Biological Sciences: 03.00.08 / A.V. Udaloy. - Tomsk, 2004. - 35 p.

11. Shuklina, Evgenia Vasilievna. Features of epizootiology and the system of therapeutic and preventive measures in case of associative invasion of marals: author's abstract of dissertation of Candidate of Veterinary Sciences: 03.00.19 / E.V. Shuklina. - Barnaul, 2007. - 22 p.

12. Atlas of the Altai Territory. - M.: USSR Committee for Geodesy and Cartography, 1991. - 38 p.

13. Sidorenko, M.N. Geography of the Altai Territory / M.N. Sidorenko. - Barnaul: Altai Book Publishing House, 1974. - 96 p.

INFLUENCE OF COMPLEX CHEMICAL DEHORNING ON SOME PARAMETRES OF BIOCHEMICAL STATUS OF CALVES

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Key words: calves, horn removal, vitamin A, vitamin D, vitamin E, metabolism.

Surgical diseases, in particular injuries caused by horns, are widespread and require considerable effort to reduce them. One of the reasons for their occurrence is the presence in the herd of non-dehorned animals. Therefore, an important task of veterinary specialists is the creation of hornless herds. The aim of the study was to develop a complex chemical method of dehorning (using the Dehornum gel in combination with the "Belavit Solution Injection for Veterinary Medicine" preparation) of calves and determine its effect on biochemical parameters of the organism. For the study, 3 groups of animals were selected from the age of 20 to 40 days with 5 heads in each according to the principle of conditional clinical analogues (of equal weight, breed and age). To study the biochemical status of calves, the basic metabolic parameters were determined using the Euro Laser automatic biochemical analyzer using ready-made reagent kits produced by Vital, Cormay and Rendex. The developed complex chemical method of preventing the growth of horns had a positive effect on parametres of

biochemical status of calves and caused a decrease on the 3rd day of the total protein by 3.45% and albumin by 4.00%, which is 3.32% and 4.56% less, than in case of traditional chemical method. The ratio of total protein and albumin in the study group was 1: 0.74, and in the control 1: 0.73. By the 21st day, all biochemical parameters returned to the pre-surgical level, which suggests that the developed complex method of chemical dehorning significantly reduces the effect of the stress factor on the body and shortens the time for restoration of homeostasis.

Bibliography

1. Belyavsky, V.N. Comparative effectiveness of various ways to prevent stress in calves during dehorning / V.N. Belyavsky, V.P. Gudz // Scientific notes of the educational institution "Vitebsk State Academy of Veterinary Medicine": scientific and practical journal. - Vitebsk, 2008. - V. 44, issue 2, part 2. - P. 9 - 11.
2. Veremey, E. I. Veterinary measures at dairy complexes / E. I. Veremey, V. A. Zhurba, V. M. Rukol. - Minsk: Belarusian agriculture, 2010. - 28 p.
3. Veremey, E.I. Horn are now "not worn" / E. I. Veremey, V. M. Rukol, V. A. Zhurba // Belarusian Agriculture. - 2014. - № 8. - P. 41 - 43.
4. Breeding and diseases of the young: a practical guide / A. I. Yatusевич [et al.]; ed. by A.I. Yatusевич [et al.]; Vitebsk State Academy of Veterinary Medicine. - Vitebsk: VSAVM, 2012. - P. 94 - 103. 816 p. : ill.
5. Additional resources in injury prevention and increasing the productivity of cattle / V. M. Rukol [et al.] // Agrarian Science to Agriculture: VII International Scientific and Practical Conference, February 2–3, 2012: collection of articles: in 3 books / Altai State Agrarian University. - Barnaul: ASAU, 2012. - Vol. 3. - P. 279 - 281.
6. Eliseev, A. N. Methods for forming a hornless herd for dairy complexes / A. N. Eliseev [et al.] // Vestnik of Kursk State Agricultural Academy. - 2013. - № 7. - P. 60 - 66.
7. Rukol, V. M. Clinical status and histological changes in tissues in preventing the horn growth of calves / V. M. Rukol // Questions of regulations in veterinary medicine. - 2012. - № 1. - P. 36 - 39.
8. Rukol, V. M. Methods of preventing the growth of horns in calves in industrial conditions / V. M. Rukol // International Journal of Veterinary Medicine. - 2011. - № 2. - P. 21 - 24.
9. Tarasevich, A.V. The significance of hornless cattle in injury prevention / A.V. Tarasevich, E.I. Veremey // Scientific search for young people of the 21st century: materials of the X International Scientific Conference of Students and Master's Degree students. - Gorki, 2009. - P. 135.

10. An effective means to prevent horn growth of calves - "Antihorn" // Our agriculture. Veterinary and animal breeding. - 2012. - № 7. - P. 25.

EVALUATION OF LINES OF SIMMENTHAL BREED SERVICING BULLS BY PRODUCTIVITY OF THEIR DAUGHTERS

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Key words: *Simmenthal breed, genealogical line, selection, heredity, correlation coefficient, selection, matching, genotype, coefficient of heritability, hereditary capacity.*

This paper gives a characteristic of 10 genealogical lines of Simmenthal breed by a set of breeding traits and an assessment of the hereditary qualities of bulls from 6 widely spread lines by comparing the productivity of daughters and mothers during the first lactation. It was established that the average milk yield of Simmenthal cows of all assessed lines in the first lactation is 2769 kg. The most promising for further breeding work are the lines of Fasadnik 642, Victor 1486 and Krepysh 50. The descendants of the bulls of these lines (n = 609) exceed the average cow milk yield of all baselines by 506 kg. The milk fat content, depending on the line, ranged from 3.81 to 3.99% with an average of 3.90%. The live weight of cows of these lines varied from 480 to 623 kg. The daughters of bulls of Fasadnik line 642 had the largest live weight, exceeding the average live weight of cows of all lines by 108 kg (20.9%). Studies have shown that of all the bulls used in breeding, such bulls as Chubuk 8106, Nadel 289, Volshebnik 58, Zontik 972, Kosmonavt 267 and Zhytomyr 182 improved milk yield of their daughters, milk yield of daughters increased by a significant amount (+ 297-717 kg; $P < 0.05-0.001$). The bulls Buyan 846 (+ 0.06%), Neman 949 (+ 0.08%), Nivelir 724 (+ 0.09%), Chubuk 8106 (+ 0.10%), Burvstnik 751 (+0 , 17%), Nadezhnyi 552 (+ 0.21%) and Volshebnik 58 (+ 0.30%), increased milk fat content, the latter three bulls improved this parametre by a significant amount ($P < 0.01-0.001$). Research has established that the heritability coefficients for Simmenthal cattle in this farm varied from 0.10 to 0.72, proving that the selection of cows for mothers' productivity in case of purely bred breeding is quite possible and real.

Bibliography:

1. Shchepkin, M.M. From observations and thoughts of a breeder / M.M. Shchepkin. - M.: Selkhozgiz, 1947.-P. 5-61.
2. Vitt, V.O. From the history of Russian horse breeding / V.O. Vitt. - M.: Selkhozgiz, 1952. - 359 p.

3. Eisner, F.F. Breeding by lines in cattle breeding / F.F. Eisner // Animal breeding. - 1960.- № 5. - P. 5-8.
4. Kolyshkina, N.S. Selection of dairy and meat cattle / N.S. Kolyshkin. - M.: Kolos, 1970. - 288 p.
5. Kravchenko, N.A. Breeding of farm animals / N.A. Kravchenko, M.: Kolos, 1973.- 486 p.
6. Milk production / N.G. Dmitriev, V.I. Mosiyko, S.S. Braga, L.K. Ernst [et al.]. - M.: Agropromizdat, 1985. - 336 p.
7. Eisner, F.F. Theory and practice of breeding in cattle breeding / F.F. Eisner - Kiev: Urozhai, 1981. - 192 p.
8. Kravchenko, N.A. Breeding selection by line breeding / N.A. Kravchenko. - M.: Selkhozgiz, 1954.- 242 p.
9. Kolyshkina, N.S. Selection work for high fat content dairy lines / N.S. Kolyshkin // Animal breeding. - 1961. - № 11.- P. 12-14.
10. Karelin, V.N. Improvement of cattle breed by method of breeding by lines / V.N. Karelin. - Minsk, 1962.- 443 p.
11. Plokhinsky, N.A. Guidelines on biometrics for livestock specialists / N.A. Plokhinsky. - M.: Kolos, 1969.- 256 p.
12. Bolgov, A.E. Using Ayrshire cattle to improve dairy breeds / A.E. Bolgov, E.P. Karmanova. - M.: Rosagropromizdat, 1989. - 302 p.
13. Nikoro, Z.S. On some cases of negative genetic correlation between parent and offspring in cattle / Z.S. Nikoro // Genetic principles of selection of farm animals. - Publishing house of Siberian Branch of the USSR Academy of Sciences, 1965.- P.182-203.
14. Theoretical bases of animal breeding / Z.S. Nikoro, G.A. Stakan [et al.]. - M.: Kolos, 1968. - 430 p.
15. Merkurieva, E.K. Genetic bases of breeding in cattle breeding / E.K. Merkurieva - M.: Kolos, 1977. - 239 p.

PECULIARITIES OF CHAMPION COW USAGE FOR MAKING HERDS OF INTENSIVE MILK TYPE

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Key words: *milk productivity, champion cow, lactation, fat, milk yield, first-calf heifer, abundant milk yield.*

It is established that the milk productivity of cows increases with the growth of the organism of the studied animals. The largest milk yield was obtained from cows of IV lactation, milk yield is almost at the same level from V to VII lactation

and is 6085-6053 kg. The live weight of cows increases to the seventh lactation, reaching a live weight of 612 kg. As for crossbred cows, in case of milk yield increase in I lactation the service period becomes longer and the economic use period and lifetime productivity decrease. First calf heifers are more sensitive to intense milking, because they are still at the developmental stage. Therefore, it is necessary to carry out milking of heifers, taking into account the development of the organism. Milking of first-calf heifers should be planned for receiving milk yield of 5.0–6.0 thousand kg of milk, conducting a preparatory period for obtaining high yields later. Training should be intensive, but without overstrain of cows. Intensive milking of first-calf heifers helps to obtain high milk productivity from cows, which is confirmed by a high correlation dependence between the milk yield in the first lactation and on average during all lactations $r = 0.571 \pm 0.082$. As for the group of cows ($n = 47$), the highest fat content in milk turned out to be in the record highest lactation. This indicates a combination of high genetic potential both in milk yield and in fat content in milk. The obtained data suggests that simultaneous selection by milk yield and milk fat content is quite possible.

Bibliography:

1. Prudov, A.I. The usage of Holstein breed for intensification of dairy cattle / A.I. Prudov, I.M. Dunin. - M.: Niva of Russia, 1992. - 191 p.
2. Prudov, A.I. Selection of the Red-Spotted breed of dairy cattle / A.I. Prudov, A.I. Baltsanov. - M.: Kolos, 1994. - 187 p.
3. New population of Red-Spotted dairy cattle / I.M. Dunin, N.V. Dugushkin, V.I. Erofeev, A.P. Velmatov. - M.: All-Russian Research Institute of Breeding., 1998. - 279 p.
4. Bogdanov, E.A. Basics of selection / E.A. Bogdanov. - M.: State technical publishing house, 1923. - 215 p.
5. Ivanov, M.F. Creating new breeds / M.F. Ivanov // Works of All-Union Academy of Agricultural sciences named after Lenin. - M., 1936. - Issue 9. - P. 36-42.
6. Kravchenko, N.A. Breeding of farm animals / O.N. Kravchenko. - M.: Kolos, 1963. - 212 p.
7. Ernst, L.K. Modern methods for improving dairy cattle / L.K. Ernst, V.A. Chemm - M.: Kolos, 1973. - 375 p.
8. Kalmykov, A.N. Improving the efficiency of selection of purely bred dairy cattle: author's abstract of dissertation of Doctor of Agriculture / A.N. Kalmykov. - Moscow, 1991. - 44 p.

9. Velmatov, A.P. Productivity and quality of milk of Red-Spotted cows of different origin / A.P. Velmatov, O.D. Andreev, A.A. Velmatov // Chief livestock specialist. - 2012. - № 4. - P. 32-37.
10. Vostrilov, A.V. Features of Holsteinized Red-Spotted cattle / A.V. Vostrilov, E.S. Zharinov // Dairy and meat cattle. - 2007. - № 1. - P. 6-7.
11. Katmakov, P.S. Creation of new highly productive types and populations of dairy cattle / P.S. Katmakov, E.I. Anisimova. - Ulyanovsk: USAA, 2010. - 242 p.
12. Katmakov, P.S. Creating a new type of Red-Spotted cattle in the Volga region / P.S. Katmakov, V.P. Gavrilenko // Zootechny. - 1993. - № 11. - P. 5-6.
13. Karamaev, S.V. Influence of reproductive ability on productive longevity of Holsteinized cows in case of different housing conditions / S.V. Karamaev, Kh.Z. Valitov // Education, science, practice: innovation aspect. Materials of the international scientific-practical conference dedicated to the memory of Professor A.F. Blinokhvatov. - Penza, 2008. - P. 465-468.
14. Karamaev, S.V. Milk productivity of Holsteinized Black-Spotted cows in case of different housing conditions / S.V. Karamaev, E.A. Kitaev, N.A. Soboleva // Dairy and meat cattle. - 2010. - № 8. - P. 14-16.
15. Economic efficiency of productive qualities of animals of different genotypes / Ye.A. Anisimova, E.R. Gosteva, A.S. Barargaliev, E.A. Aleshina // Zootechny. - 2015. - № 5. - P. 14-17.
16. Effect of conformation traits on longevity of cows of Slovak Simmental breed / V. Canji, P. Strapak, E. Strapakova, P. Juhas // Slovak journal of animal science. – 2008. – Vol.41, № 2. – P. 83-90.

ADAPTATION FEATURES OF YOUNG CATTLE OF MANDOLONG BREED IN THE CONDITIONS OF SAMARA REGION

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Key words: *breed, bull-calves, colostrum, blood, immunity, resistance, adaptation.*

Mandolong breed was first brought to the territory of Russia in the Samara region from Australia in December 2010, so there is no data of its adaptation abilities, natural resistance, biological and productive features in the climatic and feed conditions of the Middle Volga region. The object of the research was the

bull-calves of Mandolong breed in comparison with analogues of Kalmyk breed of Russian selection. Research results showed that Mandolong breed is very plastic, animals adapt well to new environmental conditions, showing high vitality and productive qualities. Colostrum of cows of both breeds was characterized by a high immune status. Mandolong breed was inferior to Kalmyk one in content of globulin fraction of proteins by 1.8%, immunoglobulins - by 24.7 g / l (25.0%). After drinking colostrum, the parametres of morphological and biochemical composition of blood serum significantly increase. Mandolong breed exceeded the analogues of Kalmyk breed in terms of the content of erythrocytes by 6.9%, total blood protein - by 6.1%, albumin fraction - by 11.6%, globulin fraction - by 1.8%. The bull-calves had high parametres of humoral immunity of the organism. At the age of 18 months mandolongs were inferior by bactericidal activity of blood serum to Kalmyk breed by 4.9%, by lysozyme activity of blood serum - by 3.4%, remaining within the limits of physiologically normal state. Compared to Kalmyk breed, bull-calves of Mandolong breed are larger, taller, wider, with a more intensive growth rate, able to reach body weight of 489.5 kg at the age of 12 months, corresponding to the category of "Extra", and live weight of 649.5 kg at the age of 18 months - category of "Super".

Bibliography:

1. Levakhin, V.I. Adaptation and meat productivity of bulls of various breeds / V.I. Levakhin, M.M. Poberukhin, B.A. Sarkenov // Zootechny. - 2014. - №6. - P. 23-25.
2. Kayumov, F.G. Meat cattle breeding: domestic breeds and types, breeding, organization of herd reproduction: monograph / F.G. Kayumov. - M.: Vestnik of RAA, 2014. - 216 p.
3. Meat cattle breeding in our country, new breeds and types created in recent years / F.G. Kayumov, A.V. Kudasheva, K.M. Dzhulamanov, S. D. Tyulebaev // Zootechny. - 2014. - №8. - P. 18-19.
4. Kayumov, F.G. Kalmyk cattle and ways to improve it: monograph / F.G. Kayumov, V.E. Barinov, N.V. Madzhiev. - Orenburg: OOO Agency Press, 2015. - 158 p.
5. Levakhin, V.I. Adaptation abilities and productivity of purely bred and crossbred bull-calves with application of different breeding technologies / V.I. Levakhin, B.A. Sarkenov, M.M. Poberukhin // Dairy and meat cattle. - 2015. - №4. - P. 5-8.
6. Batanov, S.D. Meat productivity of purely bred and crossbred bull calves / S.D. Batanov, L.V. Korepanova // Zootechny. - 2011. - №6. -P. 17-18.
7. Karamaev, S.V. Efficiency of Mandolong breed use for beef production of young cattle / S.V. Karamaev, Kh.S. Mataru, A.S. Karamaeva // Global Science and innovation: materials of the V international Scientific Conference, Chicago, June 24-25th, 2015. – Publishing office Accent Graphics communications – Chicago – USA, 2015. – P. 11-18.

8. Mandolong breed of livestock - for the first time in Russia: monograph / S.V. Karamaev, Kh.S. Mataru, Kh.Z. Valitov, A.S. Karamaeva. - Kinel: Publishing department of SSAA, 2017. - 185 p.
9. Morin, D.E. Effects of quality, quantity, and timing of colostrums feeding and addition of a dried colostrums supplement on immunoglobulin Gi absorption in Holstein bull calves / D.E. Morin, G.C. McCoy, W.L. Hurley // J. Dairy Sci. - 1997. – 80(4). – P. 747-753.
10. Quigley, J.D. Passive immunity in newborn calves / J.D. Quigley. – 2010. – URL:<http://www.weds.ca> .
11. Georgiev, I.P. Differences in chemical composition between cow colostrums and milk / I.P. Georgiev // Bulg. J. Veter. Med. – 2008. – 11(1). – S. 3-12.
12. Fox, A. Scientific and medical research related to bovine colostrums. Its relationship and use in the treatment of disease in humans / A. Fox, A. Kleinsmith. - Selected publishers abstracts, 2010. - URL:<http://www.immunetree.com>
13. Akers, R.M. Lactation and the mammary gland / R.M. Akers. - Iowa State Press, Blackwell Publishing Company, 2002. – 278 p.
14. Akers, R.M. Major advances associated with hormone and growth factor regulation of mammary growth and lactation in dairy cows / R.M. Akers // J. Dairy Sci., 2006. – 89(4). – P. 1222-1234.
15. Influence of breed, parity and food intake on chemical composition of first colostrum in cow / S. Zarcu, H. Cemescu, C. Mircu, C. Tulcan, A. Morvay, S. Baul, D. Popovici // Anim. Sci. Biotechn. - 2010. – 43(1). – P. 154-157.

USAGE OF L-CARNOSINE FOR IMPROVEMENT OF BOAR SPERM QUALITY

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Key words: *boars, L-carnosine, feeding, sperm quality, insemination.*

The introduction of biologically active substance of L-carnosine, which consists of the amino acid residues such as histidine and beta-alanine, into the ration of service boars was studied in this research. This medication is known in medicine as a remedy with antioxidant properties, which neutralizes free radicals, toxins, modulates the immune system, has a neuroprotective effect. The study was conducted on service boars for the first time, L-carnosine doses of 500 and 1000 mg per day were used. Research has established a positive effect of giving L-carnosine to animals, especially at a dose of 1000 mg. At the same time, due to the

effect of the medication, boars' tolerance increases, which affects the sexual reflex links. At the same time there is no change in the hormonal status and the content of enzyme level. Possessing a strong antioxidant effect, the medication reduces the content of pathological forms of sperm in semen of boars, increases their survival and fertilizing ability by 3.4-11.7%. Thus, the usage of a biologically active additive of L-carnosine in the ration of service boars is very appropriate.

Bibliography:

1. Dzhamaaldinov, A.Ch. The influence of apple pectin on service boars / A.Ch. Dzhamaaldinov // Veterinary medicine. - 2005. - № 8. - P. 41-42.
2. Burmistrova, L.A. Bee royal jelly - natural biostimulant // Collection of scientific papers of the Belgorod Agricultural Academy. - Belgorod: BAA, 2008. - P. 107-111.
3. The effect of royal jelly on the reproductive ability of boars / A.G. Narizhny, N.S. Gneusheva, G.V. Eskin, L.Yu. Luzhnykh // Modern directions of scientific and technological progress in beekeeping: a collection of scientific papers of the international conference State Scientific Institution Scientific Research Institute of Apiculture. - Rybnoe, 2007. - P. 242-247.
4. Androgenic properties of the pink Radiola / V.V. Komar, Ya.K. Grishchuk, S.M. Kit [et al.] // Pharmaceutical Journal. - 1981. - Volume 54. -P. 49-52.
5. Dzhamaaldinov, A.Ch. Usage of phytogenic medication to increase the potency of boars / A.Ch. Dzhamaaldinov, A.G. Narizhny // Pig breeding. - 2004. - № 2. - P. 20-23.
6. Narizhny, A.G. Parametres of boar semen and productivity of sows in case of application of dihydroquercetin / A.G. Narizhny, A.G. Anisimov, A.T. Mysik // Zootechny. - 2013. - № 9. - P. 29-31.
7. Narizhny, A.G. Improvement of reproductive qualities of boars when biologically active substances are introduced into their rations / A.G. Narizhny, A.G. Anisimov, A.Ch. Dzhamaaldinov // Vestnik of Ulyanovsk State Agricultural Academy. - 2015.- № 1 (29). - P. 77-80.
8. Yunusova, O. Yu. Increased reproductive function of boars when giving to them L-carnosine / O.Yu. Yunusov // Perm Agrarian Vestnik. - 2017. - № 3 (19). - P. 151-154.
9. Severin, S.E. The discovery of carnosine and azertin. Some of their properties / S.E. Severin // Biochemistry. - 1992. - Volume 57. - P. 1285-1292.
10. Boldyrev, A.A. Carnosine and protection of tissues from oxidative stress / A.A. Boldyrev. - M.: MSU Publishing House Dialog, 1999. - 362 p.

11. Yarygina, E.G. Oxidative stress and its correction with carnosine / E.G. Yarygina, V.D. Prokopyeva, N.A. Bokhan // Success of modern natural science. - 2015. - № 4. - P. 106-113.
12. Ablayev, N.R. Carnosine and its biomedical value / N.R. Albayev // Laboratory medicine of Kazakh National Medical University. - 2016. - № 1 (16). - P. 4 -8
13. Merkurieva, E.K. Biometrics in breeding and genetics of farm animals / E.K. Merkurieva. - M.: Kolos, 1970. - 424 p.
14. Plokhinsky, N.A. Biometrics / N.A. Plokhinsky. - 2nd ed. - M: Moscow State University Publishing House, 1970. - 368 p.

THE CONNECTION BETWEEN THE LEVEL OF MILK PRODUCTIVITY OF RED GORBATOV COWS AND THEIR PRODUCTIVE LONGEVITY

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Key words: cows, productive longevity, milk productivity.

The studies were conducted on the basis of the breeding farm of OAO "Ababkovskoe" of Nizhny Novgorod region. The aim of the work was to study the connection between milk productivity of cows of the red Gorbatov breed in terms of the first and highest lactations and parametres of their productive longevity. The breed has a tendency to a prolongation of productive life in case of an increase of milk yield during the first lactation. The maximum values of all parametres were observed in case of first-calf heifers' productivity of 5000-6000 kg of milk, they lactated 4.80 lactations. Milk yield for the first lactation has a slight positive relationship with lifelong productivity ($r = 0.30$) and lifespan ($r = 0.17$). Milk yield per 1 day of life is closely related to the productivity of cows during the first lactation ($r = 0.49$). Cows with the highest lactation productivity of 5000-6000 kg of milk - 5.52 lactation had the greatest economic use, however, the difference to the average for the herd was not significant. A further increase of productivity leads to a decrease of productive life of cows. In general, there is an average positive relationship between milk yield during the highest lactation and life span ($r = 0.48$). The yield during the highest lactation has a great influence on life-long milk yield, the influence force was 22.47% ($F > F_{st}$). In the conditions of preservation of the gene pool of red Gorbatov breed, the recommended milk yield of first-calf heifers should be 4000-5000 kg of milk. The growth of milk production in subsequent lactation contributes to prolongation of the period of economic use of cows and increase of other productive paramtres. In the course of the research,

the insignificant influence of the “milk flow rate” factor on the studied parameters was noted. Cows of red Gorbatov breed with milk flow rates of 1.1-1.5 kg / min were the best.

Bibliography:

1. Adzhibekov, K.K. Evaluation of red-motley cows for calving longevity in different categories of breeding farms / K.K. Adzhibekov, V.K. Adzhibekov // Zootechny. - 2018. - № 2. - P. 22-23.
2. Fedoseeva, N.A. Ways to increase productive longevity of cows / N.A. Fedoseeva, A.P. Golikova, N.I. Ivanova et al. - M.: publishing house Sputnik. - 2015. - 113 p.
3. Eremin, S.P. Milk productivity and longevity of brown Swiss cow breed / S.P. Eremin, O.V. Rudenko, A.P. Eremin // Izvestiya of Orenburg State Agrarian University. - 2018. - № 2 (70). - P. 227-230.
4. Kazantseva, E.S. Productive longevity of Black-Spotted cows / E.S. Kazantseva // Milk-economic vestnik. - 2018. - № 2 (30). - P. 36-43.
5. Rudenko, O.V. Productive longevity of red Gorbatov cattle in the conditions of preservation of the gene pool: guidelines / O.V. Rudenko, G.D. Komarova. - Nizhny Novgorod: Dyatlovy Gory Publishing House, 2017. - 44 p. ISBN 978-5-90522-780-6.
6. Volkova, V.V. Genetic characteristics of Red Gorbatov and Suksun cattle breeds by microsatellite markers / V.V. Volkova, T.E. Deniskova, O.S. Romanenkova et al. // Dairy and meat cattle breeding. - 2017. - № 6. - P. 6-8.
7. Eremin, S.P. The development of obstetric and gynecological diseases in case of disorders of metabolic processes of cows / S.P. Eremin, T.S. Bezrukova, I.V. Yashin // Issues of regulations in veterinary medicine. - 2014. - № 3. - P. 61-64.
8. Ovchinnikova, L. Influence of milking on productive longevity of cows / L. Ovchinnikova // Dairy and meat cattle breeding. - 2007. - № 8. - P. 21-22.
9. Kryuchkova, N.N. / Duration of economic use of Black-Spotted cows of different levels of milk production / N.N. Kryuchkova, I.M. Starodumov // Zootechny. - 2008. - № 2. - P. 16.
10. Zhbanov, V.P. The effect of the intensity of first-calf heifers on their lifelong productivity and longevity / V.P. Zhbanov // Agrarian vestnik of the Upper Volga. - 2015. - № 1 (10). - P. 30-34.
11. Rudishina, N.M. Productive longevity of Black-Spotted cows depending on the age of the first insemination and the level of milk yield during the first lactation / N.M. Rudishina, I.V. Shtyreva // Vestnik of Kazan SAU. - 2016. - № 4 (42). - P. 39-43.
12. Yumaguzin, I.F. Influence of the intensity of first-calf heifers' milking on the productive longevity of Holstein cows / I.F. Yumaguzin // Vestnik of Kurgan State Agricultural Academy. - 2017. - № 4 (24). - P. 74-75.
13. The influence of genotypic and paratypical factors on the productive longevity of Black-Spotted cows / V.K. Pestis, S.I., Korshun, N.N. Klimov, L.A. Tanana // Reports of the National Academy of Sciences of Belarus. - 2016. - № 4. - V. 60. - P. 120-126.

14. Kazakov, D.S. Influence of milk productivity of first-calf heifers on their productive longevity / D.S. Kazakov, S.G. Belokurov // Current issues of the development of science and technology: a collection of articles of the international scientific-practical conference of young scientists. Karavaevo: Kostroma State Agricultural Academy. - 2017. - P. 84-88.

15. Babik, N.P. Connection between milk yield of female ancestors and productive longevity of cows / N.P. Babik, E.I. Fedorovich, V.V. Fedorovich // Scientific notes of the educational institution Vitebsk State Academy of Veterinary Medicine. - 2018. - № 1. - V. 54. - P.89-93.

16. The Unified State Information System of Accounting for Research, Development and Technological Civilian [Electronic resource] <https://esu.citis.ru/ikrbs/SAHNPSQFD6GYEM41VXAEPGVN> (access date 15.01.2019)

MILK PRODUCTIVITY AND UDDER MORPHO-FUNCTIONAL FEATURES OF BESTUZHEV BREED HEIFERS AND THEIR CROSS BREEDS WITH RED DANISH BREED

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Key words: *breed, Bestuzhev breed, Red Danish breed, blood flow, first-calf heifers, milk productivity, morphofunctional udder parametres (girth, length and width of udder; length and thickness of dugs, milk flow rate and udder index).*

The article presents results of the inflow of red Danish breed blood and its effect on milk productivity of cross-bred heifers. Red Danish breed is one of the world's best dairy breeds. Cows of this breed are characterized by high milk production, and they are distinguished by their adaptability to industrial technologies. As a result of this infusion, in cross-bred heifers, compared with their purely bred Bestuzhev peers, have increase of milk yield (by 20.57%) and fat content (by 0.23%) and protein content in milk (by 0.07%). In addition, morphofunctional signs of their udder are improved. In particular, girth (by 2.26%), length (by 6.07%) and width (by 7.87%) of udder, as well as length (by 1.49%) and thickness (by 0.5 and 0.9%) of dugs, cross-bred heifers are more consistent with the requirements for cow machine milking. Cross-breed first-calf heifers have greater udder index (by 1.63%) and milk flow rate (1.26%). Consequently, the inflow of red Danish blood to Bestuzhev animals had a positive effect on both milk production and morphofunctional udder parametres of hybrid

first-calf heifers, which is extremely important in the conditions of industrial milk production. This method of crossing is advisable to use in selection work with Bestuzhev breed.

Bibliography:

1. Krasota, V.F. Bestuzhev cattle / V.F. Krasota, V.T. Lobanov, V.A. Babushkina - M.: Selkhozgiz, 1952.- 192 p.
2. Klyushkin, K.I. Bestuzhev breed of cattle / K.I. Klyushkin, V.N. Kochetkov, A.A. Tolmanov. - Ulyanovsk: Volga publishing house, 1976. - 144 p.
3. Annual publication on breeding work in dairy cattle breeding on farms of the Russian Federation - 2014. - M.: Publishing house of FSBSI All-Russian Research Institute of Breeding, 2015. - 254 p.
4. Tolmanov, A.A. Bestuzhev breed: evolution, progress, preservation of the gene pool / A.A. Tolmanov, P.S. Katmakov, V.P. Gavrilenko. - Ulyanovsk, 2000. - 239 p.
5. Genetic markers in dairy cattle breeding / P.S. Katmakov, V.P. Gavrilenko, A.V. Bushov, N.I. Stenkin. - Ulyanovsk: "Printing House", 2010. - 84 p.
6. Vsyakikh, A.S. Imported cattle in the USSR: breeding and use / A.S. Vsyakikh, M.S. Kurinsky. - M.: Kolos, 1976. - P. 185 - 199.
7. Dmitriev, N.G. Breeds of livestock in the countries of the world: reference book / N.G. Dmitriev. - L.: "Kolos" (Leningrad branch), 1978. - P. 177 - 179.
8. Soldatov, A.P. Animal Breeds of Russia: Catalogue / A.P. Soldatov. - M.: "Astrel Publishing house; "AST Publishing House", 2013. - P.15 - 16.
9. Dunin, I.M. Dictionary – reference book / I.M. Dunin, A.G. Dankvert. - M.: Publishing house of FSBSI All-Russian Research Institute of Breeding, 2013. - 26 p.
10. Velitok, I.G. Technology of cow milking / I.G. Velitok. - M., "Kolos", 1975. - 256 p.
11. Medvedev, N.G. Breed and age characteristics of the biochemical and morphological composition of blood of experimental animals / N.G. Medvedev // Scientific works of Ulyanovsk Agricultural Institute. - Ulyanovsk, 1978. - Volume 14. - P. 61-65.
12. Catalogue of Bestuzhev breed bulls / N.I. Stenkin, Z.A. Ainatulov, A.Ya. Khakimov, M.A. Sapparova. - Ulyanovsk, 2010. - 32 p.
13. Catalogue of servicing bulls. - Bykovo: OAO "Head Center for Reproduction of Farm Animals", 2014, 2015. - 35 p.
14. Garkavy, F.L. Cow breeding and machine milking / F.L. Garkavy - M.: Kolos, 1974. - 160 p.

THE EFFECT OF NATURAL MINERAL ADDITIVES ON MORPHO-BIOCHEMICAL STATUS OF BLOOD AND PRODUCTIVITY OF YOUNG PIGS IN THE AREA WITH INCREASED CONTENT OF RADIOCESIUM

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Key words: *young pigs for fattening, natural mineral additives, zeolite, slaughter and meat qualities, life weight gains, toxic substances, blood.*

The work is devoted to a comparative analysis of the effect of using the ecominerals of Bryansk region deposits in diets of young pigs for fattening contained in the zone with high radiocesium contamination on the dynamics of their growth, meat productivity, slaughter quality and morpho-biochemical status of blood. The effect of reducing the toxicological load on the body was also under consideration. It was established that giving rations which include tripoli (smectite and zeolite-containing) diets to young pigs allowed them to increase their live weight by 8.75% and by 6.90%, and average daily gains by 15.95% and 12.24%, respectively. Slaughter yield increased in pigs, which received smectite tripoli in the feed mixture by 3.97%, and zeolite-containing tripoli by 4.31%. Meat yield in carcasses significantly increased by 17.5% and by 12.4% ($P \leq 0.01$). The feeding of sorbing additives significantly influenced the decrease in the level of lead in muscle tissue by 3.5 times, in kidneys by 1.6 times, in spleen by 2.5 times, in lungs by 1.7 to 2 times and in heart by 1.8 times. The concentration of copper ($P \leq 0.001$) is 1.6-2.0 times less in liver and kidneys. It has been reliably established ($P \leq 0.05 \dots 0.01$) that there is a decrease in the level of manganese and cobalt in the muscle tissue and kidneys of animals of the experimental groups. The number of leukocytes of animals of the second and third groups is less than in the control group - by 6.26 and 4.72%. The results of the biochemical analysis of blood serum indicate ($P \pm 0.01-0.001$) an increase in the content of total protein, calcium by 14.1% and phosphorus by 11.3%.

Bibliography

1. Kabanov V.D. Intensive pork production V.D. Kabanov. - M.: 2003. - 400 p.
2. Kokarev, V.L. Improvement of mineral nutrition of farm animals / V.L. Kokarev, A. Guryanov // Zootechny. -2004. - №7. - P.12-16.

3. Kononenko, S.L. Natural feed additive in animal rations / S.I. Kononenko, Z.V. Pekhatsieva, N.A. Yurina // Vestnik of Agrarian Science of the House .- 2017.-V.1. - №37.- P. 76-84.
4. Faritov, T.A. Feed and feed additives for animals / T. A. Faritov.- M .: “Lan”, 2014. - P. 236–238.
5. Mysik, A.T. Features of the standardized pig feeding system in OOO Tsar-Myaso of Bryansk region / A.T. Mysik, R.V. Nekrasov, M.G. Chabaev, E.A. Makhaev, M.B. Badyrkhanov, I.M. Magomedaliev // Zootechny. - 2016. - №9. - P.14-16.
6. Lavrentyev, A.Yu. On the issue of the use of zeolite-containing Tripoli / A.Yu. Lavrentyev, F.P. Petryankin, M.A. Lavrentyeva // Fundamental and applied problems of increasing the productivity of farm animals in the changed conditions of the economic system and ecology / Ulyanovsk State Agricultural Academy - Ulyanovsk, 2005; V. 1. -P. 54-59.
7. Podolnikov, M.V. The content of trace elements in the tissues and organs of young pigs for fattening. / M.V.Podolnikov, L.N. Gamko, V.E. Podolnikov // Current problems of intensive development of animal husbandry: a collection of scientific works .- Gorki: Publishing House of the BSAA, 2012.- Issue 15, Part 1.- P. 180-185
8. Semenova, Yu.V. Productivity and product quality of fattened pigs when using nanostructured silica-containing feed additives in their rations / Yu.V. Semenova // Agrarian science and education at the present stage of development: experience, problems and solutions. Materials of International Scientific Practical conference. V. III. Ulyanovsk, 2016. - P.69-73.
9. Ulitko, V.E. Siliceous marl (zeolite) in rations of farm animals and poultry / V.E. Ulitko, L.A. Pykhtina, A.L. Ignatova, V.V. Kozlov // In the digest: Catalogue of scientific developments and innovative projects. - Ulyanovsk, 2015. - P. 34.
10. Ulitko, V.E. Chelate structures of biogenic elements when growing young pigs / V.E. Ulitko, A.V. Bushev // In the digest: Catalogue of scientific developments and innovative projects. Ulyanovsk, 2015. - P. 36.
11. Chernogradskaya, N.M. Natural zeolites of Yakutia in the ration of piglets at weaning and fattening periods / Chernogradskaya N.M. // Zootechny. - 2005. - №9. - P. 13-14.
12. Shadrin, A.M. The use of natural zeolites for prevention of feed stress of animals and birds / A.M. Shadrin, V.A. Sinitsyn // Veterinary and feeding. -2008; - №3. -P. 35
13. Shlenkina, T.M. Effective use of various mineral supplements in the rations of pigs / Shlenkina T.M., Vasina S.B., Lyubin N.A. // Collection of scientific papers of the XIV International Scientific and Practical Conference on Pig Production:

**CHANGE OF LIVE WEIGHT AND MORPHO-BIOCHEMICAL
PARAMETRES OF SOWS' BLOOD WHEN GIVING TO THEM
NATURAL SORBENT IN ZONES WITH DIFFERENT ECOLOGICAL
STRESS**

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Key words: feed mixture, exchange energy, sows, mineral additive, live weight, blood.

The environmental situation in Bryansk region after the accident at Chernobyl nuclear power plant remains tense. High content of heavy metals, nitrates and other ecotoxicants, which reduce the realization of the genetic potential of growth and development of animals, is found in soil, water, and feed. We studied the effect of marl at a dose of 2% of the dry matter of the diet on morpho-biochemical parameters of blood, the dynamics of live weight of sows (Landras breed older than two years) during the last 30 days of pregnancy. In the zone with a contamination density with radionuclides of 5-10 Ku / km² (zone I), the absolute increase of sows of the experimental group was 8.85% more ($P \leq 0.01$), and in the zone with a density of 15-40 cu / km² (zone II) by 8.94% ($P \leq 0.05$). It was established that the enrichment of the feed mixture with marl gave them an advantage in transformation of the diet nutrients, activation of assimilation processes, reduction of the toxic effect. It has been reliably established that, under the action of marl, erythropoietis became more active, so the blood hemoglobin content in the first zone increased by 12.9%, in the second zone it increased by 16.9%, and the concentration of red blood cells increased in the first zone by 13.9% and in the second zone - by 11.3% compared with the control analogues. The biochemical analysis of the blood serum of sows fed with marl included in the main ration undoubtedly proves the fact of improving such parametres as: total protein - by more than 6.0% in the first and by 7.5% in the second zone; the calcium content increased by 16.7 -27% and phosphorus in both zones - by 27%. In order to improve the physiological status of pregnant sows kept in areas with different

environmental stress and increase the growth rate to achieve suitable body weight by the time of farrowing and preparing for further lactation, full realization of the genetic potential of reproductive qualities, we recommend to include marl in the feed mixture at a dose of 2 % of dry matter of the ration.

Bibliography

1. Ushakova, L.M. Duration of the suckling period and its influence on further reproductive function of sows / L.M. Ushakova, A.V. Filatov // Pig breeding, 2018. №4 P. 19-21.
2. Konopelko, Yu.V. Intensification of pig reproduction technology / Yu.V. Konopelko // Industrial and Breeding Pig Production, 2005. No. 1 P. 44-45.
3. Surai, P.F. Piglet weaning and pre-start feeding: From theory to practice / P.F. Surai, T.I. Photina. Feeds and feeding, 2014. №1. p. 2-10.
4. Krapivina, E.V. Resistance of post-vaccinated pigs against pasteurellosis in conditions of increased ¹³⁷Cr in soil / E.V. Krapivina, L.N. Gamko, V.P. Ivanov // Agricultural Biotechnology: Materials of International Scientific and Practical Conferences .- Gorki, 1998.- P. 300-302.
5. Gamko, L.N. Effect of zeolite additives on productivity of young pigs / L.N. Gamko, T.L. Talyzina, V.M. Rybnikova // Theses of the reports of the interuniversity scientific-practical conference. – Velikie Luki, 1994.- P. 82-83.
6. Kononenko, S.L. Natural feed additive in animal rations / S.I. Kononenko, Z.V. Pekhatsieva, N.A. Yurina // Vestnik of Agrarian Science of the House .- 2017.-V.1. № 37.- p. 76-84.
7. Podyablonsky, S.M. The effect of giving zeolites on blood composition and metabolism of pigs / S.M. Podyablonsky // Scientific Technical Bulletin of Siberian Research and Design and Technological Institute of Livestock.- Novosibirsk, 1990.- №2.- P. 14-17.
8. Gamko, L.N. The possibilities of reducing the concentration of heavy metals in the organs and tissues of young pigs for fattening / L.N. Gamko, M.B. Badyrkhanov // International Scientific Practical Conference. Agrarian Science to agricultural production of Siberia, Kazakhstan, Mongolia, Belarus and Bulgaria. October 4-6, 2017.V.1.-P.334-335.
9. Bazylev, M.V. Efficiency of production of pork on an industrial basis due to pigs' feeding intensification / M.V. Bazylov, V.V. Bukas, Ve. A. Levkin // Current problems of intensive development of animal husbandry: Collection of scientific works.- zssue 15. –Part 1. – Gorki, 2012 – P. 38-44.
10. Katic, M. Clinoptilolite effect on cell media and the consequent effects on tumor cells in vitro [Text] / M. Katic, B. Bosnjak, K. Gall-Troselj, I. Dikic, K. Pavelik // Front. Biosci. – 2006. - № 11 – P. 1722-1732.

11. Koknaroglu, H. Animal science application of robust tests: effect of zeolite and initial weight on fattening performance of cattle / Koknaroglu H., Turan C., Toker M.T. // Animal science papers and rep. / Polish acad. of sciences, Inst. of genetics and animal breeding. -Jastrzebiec, 2008; Vol. 26, N 2-P. 107-116.
12. Ulitko, V.E. Siliceous marl (zeolite) in rations of farm animals and poultry / V.E. Ulitko, L.A. Pykhtina, A.L. Ignatova, V.V. Kozlov // In the digest: Catalogue of scientific developments and innovative projects. Ulyanovsk, 2015. - P. 34.
13. Chernogradskaya, N.M. The use of non-traditional feed additives to increase the productivity of animals in Yakutia / Chernogradskaya N.M. // Zootechny. - 2004. - №11. -P. 17–18.
14. Kornienko, A.V. The use of sorbent additives Coretron and Biokoretron with pre- and probiotic properties in the diets of sows and their effect on the change in live weight during the pregnant and suckling periods / A.V. Kornienko, V.E. Ulitko, E.V. Savina // Materials of the International Scientific and Practical Conference "Fundamental and applied problems of increasing animal productivity and the competitiveness of animal products in the current economic conditions of the agroindustrial complex of the Russian Federation", / Ulyanovsk, Volume 1. - Ulyanovsk State Agricultural Academy named after P.A. Stolypin, 2015. - P. 33-36.
15. Sezin, Yu.A. Opportunities to provide livestock industries of Bryansk region with natural minerals of local origin / Yu.A. Sezin // Intensity and competitiveness of livestock industries. Materials of International scientific and practical Conference April 21-22, 2016. - Kokino: FSBEI HE Bryansk State Agrarian University, 2016. - P. 144-147.

APPLICATION OF “BAIKAL EM 1” PROBIOTIC PRODUCT IN COW RATIONS AND ITS INFLUENCE ON DIGESTION, REPRODUCTIVE ABILITY AND MILK PRODUCTIVITY

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***Key words:** cow, ration, product “Baikal EM 1”, interlactation and lactation period, digestibility, reproduction, profitability.*

The utility of Baikal EM 1 probiotic additive in rations of dry and lactating cows of Black-Spotted breed was studied and scientifically substantiated. This is a

cultural fluid containing 3 types of lactic acid bacteria (Lactobacillus plantarum, Lactobacillus casei, Streptococcus lactis); yeast fungi (Saccharomyces boulardii) and photosynthetic bacteria (brown-red algae. The effect of 50 and 75 ml introduction into the ration of the probiotic product on enzymatic process intensity in the rumen in terms of pH change of ruminal fluid, the number of formed VFAs - as a parameter of the conversion of carbohydrate ration substances, cellulolytic activity of bacteria was studied in the experimental studies conducted on three similar groups of cows (20 heads in each). The digestibility of nutrients with different doses of probiotic supplements was determined. The effect of such feeding of cows on their reproductive ability, milk production, chemical composition of milk and feed conversion was found out. It is proved that the most pronounced effect on improving reproductive function, increasing milk production, level of enzymatic processes in the rumen, the digestibility and use of nutrients has a probiotic at a dose of 50 ml / head per day. This significantly increases the formation of VFA in the rumen, the activity of bacteria destroying cellulose, the digestibility of all nutrients, which undoubtedly leads to improved reproductive function, increased milk production, the content of fat mass fraction in milk and improves other parameters which specify its quality. Economic calculations have established that for 1 ruble of additional costs associated with purchase and use of "Baikal EM 1" probiotic at a dose of 50 ml / head per day received 4.73 rubles of profits, and the level of profitability of milk production rises to 23.99%, against 16.24% in the control group.

Bibliography:

1. Belookov, A.A. The effect of microbiological products EM-Kurung and Baikal EM1 on milk productivity of cows and survivability of calves / A.A. Belookov, O.V. Plis // Izvestiya of Orenburg State Agrarian University. - 2010. - Volume 1, No. 25-1. - P. 51–53.
2. Ovsyannikov, A.I. Fundamentals of experimental work in animal breeding / A.I. Ovsyannikov. - M.: Kolos, 1976.- 304 p.
3. Standards and rations for feeding of farm animals: a reference book / A.P. Kalashnikov [et al.]; ed.by A.P. Kalashnikov, V.I. Fisinin, V.V. Shcheglov, N.I. Kleimenov. - 3rd edition revised and upgraded. - Moscow, 2003. - 456 p.
4. Kirilov, M.P. The system of cow feeding with a productivity of 4500-6000 kg of milk per year: recommendations / M.P. Kirilova, V.A. Krokhina, Yu.P. Duksin. - Dubrovitsy, 1992. - 117 p.
5. Kuznetsov, A.S. The influence of feeding and housing factors on quality parameters of cow milk / A.S. Kuznetsov, S.G. Kuznetsov // Zootechny. - 2010. - № 10. - P. 6-9.
6. Malikova, M.G. Innovative technologies of feed production and use / M.G. Malikova, Kh.M. Safin, M.T. Sabitov. - Ufa: Mir Pechati, 2017. - 304 p.
7. The management system of agro-industrial production in the Republic of Bashkortostan / ed. by U.G. Gusmanov [et al.]. - Ufa: Academy of Sciences of the Republic of Bashkortostan, Gilem, 2012.- 528 p.

8. Markham R., A steam distillation apparatus suitable for micro-Kjeldahl analyses. *Biochem. J.* 36.1942, 790–791p.
9. Kaplan, V.A. Method for determining the cellulolytic activity of the rumen contents / V.A. Kaplan, Mosolova E. S. // *Vestnik of Agricultural Science (Ukr. Acad. of Agricultural sciences)*. - 1962. - № 10.- P.27-30.

EFFICIENCY OF HIGH-PROTEIN FEED USAGE IN COMBINATION WITH NATURAL MINERALS IN RATIONS OF YOUNG PIGS

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Key words: *weaned piglets, mixed feed, dried milk whey, smectite tripoli, digestibility, crude fat, crude fiber.*

The problem of giving high-protein feed in combined feeds and inclusion of natural mineral supplements is currently important. The lack of protein does not only reduce the productivity of young pigs and the quality of products, but also leads to an extremely high overrun of feed, the rise in meat price. Therefore, the article provides research materials on the effect of giving mixed feeds to pigs, which include high-protein feed and natural mineral supplement such as smectite Tripoli, as well as their impact on productivity and digestibility of nutrients. It was established that the mixed feed with addition of smectite Tripoli at a dose of 2.0% had a positive effect on the increase of average daily gain during the test period, which was 3.54% more than in the control. The digestibility of organic matter was greater in this group by 1.73, crude fat by 4.74%, and crude fiber by 3.6% compared with young pigs in the control group. More efficient use of nutrients has led to increased productivity. Analysis of morpho-biochemical blood parameters showed that the content of hemoglobin in the third experimental group (which received 4% of dry whey and 2% of smectitic tripilla) exceeded the control group by 0.63%. The content of calcium and phosphorus in blood significantly exceeded calcium content in the experimental group by 27.9% ($P \leq 0.05$), in case of application of 1.5% of smectite Tripoli. It should be noted that the introduction of high-protein feed and smectite Tripoli in the combined feed at the doses of 1.5 and 2.0% contribute to improvement of biochemical processes, including protein and mineral metabolism.

Bibliography:

1. Kuznetsov, S.G. Biological criteria for supply state of animals with minerals / S.G. Kuznetsov // *Agricultural Biology*. - 1991. - №2. - P.16-34.
2. Belkin, B.L. Use of zeolites from Khotynetsky deposit of Oryol region in feed for pigs / E.L. Belkin, R.I. Tormasov // *Materials of the scientific-practical conference devoted to the 190th anniversary of veterinary education in Russia and the 100th anniversary of veterinary science*. - SPb., 1998. - 4.1. - P.32-33.
3. Gamko, L.N. Marl and protein-vitamin-mineral concentrate in the rations of young pigs / L.N. Gamko, P.N. Shkurmanov // *Vestnik of Orel SAU*, 2012. - №5. - P. 130-132.
4. Talyzina, T.L. Biological aspects of mineral metabolism of young pigs in case of application of natural zeolite / T.L. Talyzina, N.F. Bashirova // *Vestnik of Orel SAU*. - 2012. - № 5. - P. - 130-132.
5. Ryzhkov, V.A. The effect of giving an appropriate dose of sapropel on growth and development of young pigs / V.A. Ryzhkov, T.A. Krasnoshchekova, E.V. Ryzhkov, S.A. Sogorin // *Zootechny*. - 2014. - № 9. – P. 16-17.
6. Ulitko, V.E. The effectiveness of application of vitamin-mineral medication "Carcesel" in rations of sows / V.E. Ulitko, A.V. Kornieko // *Vstnik of Ulyanovsk State Agricultural Academy*. - 2013. - № 2. - P.83-87.
7. Podolnikov, V.E. Recommendations on the use of tripoli of Bryansk deposits in rations of farm animals / V.E. Podolnikov, L.N. Gamko, Yu.A. Sezin, I.I. Sidorov. - Bryansk: Publishing House of Bryansk State Agrarian University, 2018. - 54 p.
8. Golushko V.M. Meet the Tripoli, feed adsorbent. / V.M. Golushko, A.I. Kozinets, M.A. Nadarinskaya, A.V. Golushko // *Belarusian agriculture*. - 2013. - №9 (136). - P. 19-22.
9. Slabitsky, A.I. The effect of zeolite on some aspects of protein metabolism of pigs / A.I. Slabitsky, V.O. Panchuk, N.E. Sogor // *Scientific and Technical Bulletin*. - Ukrainian Scientific Research Institute of Physiology and Biochemistry animals. - Lvov. - 1985. - Vol. 7 (1). - P.30-32.
10. Usage of natural minerals for pigs' feed / N.I. Yarovan, R.I. Tormosov, T.V. Smagina et alt. // *Scientific problems of livestock production and improvement of its quality. Digest of scientific works*. - Bryansk: Publishing house of Bryansk State Agricultural Academy. - 2007. - P. 378-384.
11. Shkurmanov, P.I. The influence of mineral supplements and protein-vitamin mineral concentrate on productivity and morphological parameters of blood of young animals // P.I. Shkurmanov // *Scientific problems of livestock production and improvement of its quality. Materials of XXVII scientific practical conference of post graduates and students*. Publishing house of Bryansk State Agricultural Academy, 2011. - P. 84-86.

12. Goodband, R.H. An evaluation of barley in starter diets for swine / R.H. Goodband, R.H. Hines // J. Anim Sc., 1988. – 66, 12:3086 -3013.
13. Bandareva, M.S. Digestibility and assimilation of feed protein with the use of enzyme supplements Beevirazim – 400 / M.S. Bandareva // Current problems of intensive development of animal husbandry Collection of scientific Works. - Issue 15. - Part 1. – Gorki, 2012. – PP168-173, №13.
14. Kalachnyuk, G.I. Physiological, biochemical and practical justification of giving zeolites to animals / G.I. Kalachnyuk // Vestnik of agricultural science. - 1990. - № 3. - P. 50-64.
15. Chabaev, M.G. Magnesium feed for pigs / M.G. Chabaev, V.N. Vinogradov, V.P. Nadeev // Compound feeds.- 2011. - №1. - P. 63.

RUMEN DIGESTION AND PRODUCTIVITY OF CALVES IN CASE OF APPLICATION OF SORBING - PROBIOTIC ADDITIVE BIOPINULAR

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***Key words:** sorbing - probiotic additive Biopinular, calves, productivity, ruminal digestion, volatile fatty acids (VFA).*

The article presents results of experimental studies on breeding of young cattle of Black-Spotted breed from birth to 6 months in case of application of a sorbing - probiotic additive Biopinular in the ration. It was found on three groups of calves of the dairy period that the use of Biopinular additive in the amount of 0.5% (group II) and 1.0% (group III) of the dry matter of their diet contributes to a deeper fermentation of the feed mass in the process of ruminal digestion, which is seen in an increase of active acidity (pH), cellulolytic activity of bacteria, the content of VFA as the final product of fermentation of carbohydrates. It also enhances the ammonia-binding function of the microflora, which led to a higher energy and protein content and greater intensity of live weight increase, which is proved by larger average daily (by 8.83 and 23.70%, respectively) and relative (by 1.63 and 3.86%) gain and lower costs (by 0.44 and 0.64) of energetic feed unit per gain unit.

Bibliography:

1. Ulitko, V.E. Problems of new types of cows' feeding and their solutions / V.E. Ulitko // Zootechny. - 2014. - №8. - P.2-5.
2. Ulitko, V.E. Innovative approaches to solving problematic issues of feeding farm animals / V.E. Ulitko // Vestnik of Ulyanovsk State Agricultural Academy. - 2014. - №4 (28). - P. 136-147.

3. Morozova, L.A. Hematological parameters and microbiocenosis of the gastrointestinal tract of calves when giving them Laktur feed additive / L.A. Morozova, I.N. Mikolaichik, E.V. Dostovalov // Vestnik of Kurgan State Agricultural Academy named after T.S. Maltsev. - 2015. - Volume 3, Number 1. - P. 76-82.
4. Hematological parameters and formation of microbiocenosis of the gastrointestinal tract of calves in case application of probiotics / Ye.A. Miklash, L.S. Kiptsevich, M.A. Kavrus [et al.] // Izvestiya of the National Academy of Sciences of Belarus. A series of agricultural sciences. - 2004. - № 3. - P. 46–50.
5. Egorov, I. Use of probiotics in feeding of farm animals / I. Egorov, P. Pankov // Combined feeds. - 2006. - № 1. - P. 208.
6. Levakhin, V. Probiotic Lactobifadol in feeding of young animals / V. Levakhin, V. Shvindt, T. Timofeeva // Dairy and meat cattle breeding. - 2006. - № 7. - P. 23–25.
7. Papunidi, K.Kh. Effect of probiotics on the microflora of the gastrointestinal tract of newborn calves / K.Kh. Papunidi, G.Sh. Zakirova // Veterinary doctor. - № 4. - 2006. - P. 29–30.
8. Mikolaichik, I.N. The effectiveness of modern yeast probiotics in correcting calf nutrition / I.N. Mikolaichik, L.A. Morozova, E.S. Stupin // Dairy and meat cattle. - 2017. - №5. - P. 23-26.
9. Efficiency of giving a new probiotic based on spore-forming bacteria to calves of the dairy period / R.V. Nekrasov, M.G. Chabaev, A.A. Zelenchenkova, V.A. Savushkin, V.I. Glagolev // Agrarian science. - 2016. - №2. - P.24-27.
10. Khaziakhmetov, F.S. The results of application of probiotics Vitafort in rations of young farm animals / F.S. Khaziakhmetov, A.F. Khabirov, R.Kh. Avzalov // Izvestiya of Orenburg State Agrarian University. - 2016. - №3 (59). - P. 140-143.
11. Standards and rations for feeding of farm animals: a reference book / A.P. Kalashnikov [et al.]. - 3rd ed., revised and upgraded. - M., 2003. - 456 p.
12. Ovsyannikov, A.I. Fundamentals of experimental work in animal breeding / A.I. Ovsyannikov. - M.: Kolos, 1976. - 304 p.
13. Study of digestion of the ruminants: teaching guidelines / Institute of Physiology, Biochemistry and Nutrition of agricultural animals; [Comp.by N.V. Kurilov, N.A. Sevastyanova, V.N. Korshunov et al.]. - Borovsk: All-Russian Research Institute of Animal Physiology, Biochemistry and Nutrition, 1979. - 140 p.
14. Plokhinsky, N.A. Biometrics / N.A. Plokhinsky. - 2nd ed. - M.: Publishing House of Moscow State University, 1970. - 367 p.

BIOLOGICAL PRINCIPLES OF ENERGY EFFICIENCY OF MILK PRODUCTION

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Key words: *standard metabolism, nutrition activity, energy consumption dynamics, productivity*

In contrast to organizational and technological, biological factors are significantly less used in assessing the energy efficiency of food production. The article presents three ways of energy consumption - for "intracellular respiration" - primary metabolism, for products taken out of the body - milk, and for heat exchange with the environment. The primary use of exchange energy in the processes of milk formation and adaptive protective reactions are one of the main conditions for formation of high energy efficiency of productive animals. Exchange processes are the leading system for dynamics of food activity and development of productive qualities. Behavior is one of the elements of adaptation of exchange processes to the environment. Identical physical form of heat for all reactions of its formation, additivity (compaction) from microjoule for a cell to megajoule for an organism, without changing its properties, makes it a universal and most accurate channel for regulation and specification of food activity, adaptation and animal productivity. The ratio of heat absorbed by the body to a change in its temperature (kJ / kg.degr.) and (or) intracellular respiration are the most probable factors of "satiety" and "hunger" states. Highly productive animals spend of 8.1 - 8.6 MJ of gross feed energy on production of one MJ of milk nutritional value, low-productive 9.4 - 9.8 MJ or 14 -16% more.

Bibliography:

1. Grachev, I.I. About reflex regulation of lactation / I.I. Grachev // Journal of General Biology. - 1949. - Volume 10, No. 4. - P.303.
2. Baryshnikov, I.A. On the first regulation of the motor function of the mammary gland / I.A. Baryshnikov, M.G. Zaks, I.N. Zotova // Journal of General Biology. - 1976. - №3. - P.342.
3. Schmidt - Nielsen, K. Size of animals: why is it so important? : monograph / K. Schmidt - Nielsen. - M.: Mir, 1987. - 260 p.
4. Prosser, L. Comparative physiology of animals / L. Prosser, F. Brown. - M.: Mir, 1967. - 729 p.
5. Plokhinsky, N.A. Regression. Exponential functions / N.A. Plokhinsky // Biometrics / Plokhinsky, N.A. - M.: Moscow University, 1970.- P. 210 - 273.

6. Dunin, I.M. Selection technological aspects of development of dairy cattle in Russia / I.M. Dunin, Kh.A. Amerkhanov // Zootechny. - 2017. - №6. - P.2-8.
7. Bogolyubov, N.V. Assessment of the metabolic status of bulls in cas of application of energy - vitamin - mineral complex in the ration / N.V. Bogolyubov, R.L. Rakov // Zootechny. - 2017. - №5. - P.2-4.
8. Prigozhin, I. Order from chaos. A new dialogue of man with nature / I. Prigozhin, I. Stengers. - M.: Nauka, 1986. - 431 p.
9. Biological resources and limitations in dairy cattle improvement / G.G. Cherepanov, I.K. Medvedev, Z.N. Manar, B.D. Kalnitsky // Agricultural Biology. - №4. - 2001. - P. 3 - 23.
10. Glazko, V.I. Introduction to DNA technology / V.I. Glazko, I.M. Dunin. - M., 2001. - 579 p.
11. Dezhatkina, S.V. Experience of using marl in dairy cattle breeding / S.V. Dezhatkina, N.A. Lyubin // Vestnik of Ulyanovsk State Agricultural Academy. - 2016. - № 3. - P. 101-107.

MULTIPLE FETATION OF ROMANOVSKAYA SHEEP BREED AS A FACTOR OF MUTTON PRODUCTION INCREASE

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Key words: *Romanovskaya breed, ewe, reproduction, type of birth, amount of lambs, survivability, live weight, mutton*

Sheep farming in our country has long been practised. At present, the main products for which sheep are bred are lamb. However, the level of mutton production is still quite low. At the end of the last century, all sheep farms received income from the sale of not only lamb, but also wool and sheepskins. Sheep breeding is considered an economically profitable industry in case of simultaneous production of wool and mutton, as the total income from these types of production can cover the considerable expenses for construction and mechanization of farms, for sheep housing and feeding. The intensification of sheep farming in areas of intensive farming is directly linked to the improvement of sheep breeds raised here.

In recent years, new types of sheep have been improved and bred in the zone. One of the promising areas is pelt-meat direction, which is represented by Romanovskaya sheep. This direction has existed for a long time, and not only in our country, but also in a number of countries in the Northern Europe. Sheep of the pelt-meat direction are distinguished by high fecundity, providing a greater yield of meat, as well as wool. In this regard, the purpose of these studies was to study the multiple fetation of Romanovskaya sheep breed and the productivity of their litter of various types of birth in the conditions of a farm enterprise in Krasnodar Territory. The characteristic of the original population of the Romanovskaya breed is given. The weight growth of experimental young animals was determined: at birth, at weaning, and at the age of 8 months; amount of lambs and livestock survivability; calculation of the efficiency of growing young Romanovskaya breed sheep of various types of birth was made. Our research has shown that the groups of ewes who had triplets - 149.9%, four lambs - 141.6% and the groups of twins - 86.6% had the highest profitability. At the same time, the profitability of the group of ewes with one lamb was 9.0%. Thus, as a result of the research, the ewes with two, three and four lambs were the most effective.

Bibliography:

1. Abylkasymov, D.A. The state and problems of the development of Romanovskaya sheep breed in Tver region / D.A. Abylkasymov, V.I. Khodov, N.P. Sudarev // Zootechny. - 2017. - № 1. - P. 29-30.
2. Continuous reproduction of sheep of Romanovskaya breed / L.N. Grigoryan, S.A. Khatataev, N.N. Makarova, M.A. Chelidze, N.G. Stepanova // Zootechny. - 2018. - № 2. - P. 31-32.
3. Dvalishvili, V.G. Meat-pelt type of Romanovskaya sheep breed / V.G. Dvalishvili, N. Aziz // Zootechny. - 2012. - № 5. - P. 30-31.
4. Belik, N.I. Correlation of some economically useful traits in sheep / N.I. Belik, A.G. Martirosyan // Zootechny. - 2002. - № 4. - P. 9-10.
5. Ovcharov, M. How to restore a sheep of Romanovskaya breed / M. Ovcharov // Chief Zootechnician. - 2010. - № 1. - P. 29-31.
6. Lakota, E.A. Economic efficiency of double-breed and three-breed cross-breeding of Stavropol sheep of the Volga region population / E.A. Lakota // Vestnik of Ulyanovsk State Agricultural Academy. - 2017. - №3 (39). - P. 132-136.
7. Kravchenko, N.I. Increase of sheep multifetation / N.I. Kravchenko // Sheep, goats, wool business. - 2015. - №1. - P. 13-14.
8. Kravchenko, N.I. Doing sheep farming is profitable. The basis of profitability is the multifetation of ewes and intensive lamb rearing / N.I. Kravchenko // Animal breeding of Russia. - 2014. - №6. - P.7-9.
9. Shevkhuzhev, A.F. Meat productivity of young Karachai sheep / A.F. Shevkhuzhev, D.R. Smakuev, A.I. Ponomareva // Izvestiya of St. Petersburg State Agrarian University. - 2017. - № 4. - P. 102-107.
10. Shaydullin, I.N. The state of Russian sheep farming and the ways to bring it out of the crisis / I.N. Shaydullin // Chief Zootechnician. - 2006. - № 9. - P. 63-66.

11. Mekhanikov, A.A. New approaches in breeding of repairing young Romanovskaya sheep / A.A. Mekhanikov, M.V. Mekhanikova, V.A. Mekhanikov // Chief Zootechnician. - 2016. - № 3. - P. 62-66.
12. Dvalishvili, V.G. Cross-breeding efficiency of Romanovskaya breed ewes with a quarter-blooded Argali Romanovskiy tup / V.G. Dvalishvili, I.S. Vinogradov // Chief zootechnician. - 2014. - № 8. - P. 43-48.
13. Kravchenko, N.I. Intensification of sheep reproduction is the basis for increasing the profitability of the industry / N.I. Kravchenko // Sheep, goats, wool business. - 2018. - № 2. - P.8-10
14. Kostylev, M.N. Efficiency of interline crosses of Romanovskaya sheep / M.N. Kostylev, M.S. Barysheva // Vladimirsky farmer. -2017. - № 4 (82). - P. 31-32.
15. Genetic characteristics of argali hybrids and sheep of Romanovskaya breed on the basis of full-genome SNP analysis / A.V. Dotsev, T.E. Deniskova, V.A. Bagirov, K. Vimmers, Kh. Raier, G. Brem, N.A. Zinoviev // Current biotechnology. - 2017. - № 2 (21). - P. 157-160.