Original article

CHANGES IN PRODUCTIVITY OF SPRING OAT VARIETIES DEPENDING ON DIFFERENT LEVELS OF MINERAL NUTRITION

Andrey A. Artemjev✉, Alexander P. Eryashev, Galina N. Ibragimova, Evgeny A. Ryabkin

Mordovian Research Institute of Agriculture – Branch of the Federal Agricultural Research Centre of the North-East, Saransk, Russia

artemjevaa@yandex.ru

Abstract. The effective use of mineral fertilizers is becoming a key factor for increasing crop productivity in the modern realities of agriculture. Spring oat, as one of the important grain crops, requires a careful approach to the selection of varieties and agricultural technologies. The studies of the influence of varietal characteristics and various levels of mineral nutrition on the formation of productive characteristics of spring oat were conducted on the basis of Mordovian Research Institute of Agriculture – Branch of the Federal Agricultural Research Centre of the North-East under the conditions of the southern forest–steppe of the Non-Chernozem region in 2022–2023. The variety (standard) Yakov and the variety line 91h18 were compared according to structural indicators of crop yield and biological yield with various applications of mineral nutrition: 1) without fertilizers; 2) application of azofoska ($N_{16}P_{16}K_{16}$) – background; 3) application of additional fertilization N_{60} in the form of ammonium nitrate with the background. The seeding rate for spring oats was about 5 million germinating seeds per hectare. The azofoska was introduced directly under pre-sowing cultivation, nitrogen fertilization was applied during the tillering phase of the studied culture. According to the results of the conducted studies, a positive dynamics of the formation of productive characteristics of the new 91h18 variety line was established in comparison with the Yakov standard on all backgrounds of mineral nutrition, but this variety showed more advantageous indicators of the crop structure of oat plants, the mass of 1000 grains, and biological yield when applying azofoska with subsequent additional nitrogen fertilization in in the amount of 60 kg/ha in the tillering phase. In this case, it forms a productive plant stand (363 pcs/m2) larger by 27.0 %, the grain content of the panicle (62 pcs.) by 55.0 %, the weight of 1000 grains (40 g) by 11.6 %, and the biological yield of grain (8.88 t/ha) by 130.0 % compared to the control of the Yakov variety, which under the same

conditions showed an increase in these parameters only by 11.8; 37.5; 9.4; 80.3 %, respectively.

Key words: oat, variety, azofoska, fertilization, plant height, panicle length, productive stems, number of grains, weight of 1000 seeds, biological yield.

For citation: Artemjev A. A., Eryashev A. P., Ibragimova G. N., Ryabkin E. A. Changes in productivity of spring oat varieties depending on different levels of mineral nutrition. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 5-13. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_5-13.

Original article

STATE OF PRODUCTION, CONSUMPTION AND RESERVES OF GRAIN IN THE WORLD AND IN THE RUSSIAN FEDERATION

Alexander M. Lentochkin

Udmurt State Agricultural University, Izhevsk, Russia

lenalmih@mail.ru

Abstract. Grain is the most important agricultural product, which is given much attention in many countries of the world. The availability of sufficient grain resources allows solving many issues of providing the population with food, different types and groups of farm animals with concentrated feed, a number of branches of the processing industry with raw materials. The purpose of the study is to assess the state of production, use and reserves of grain. The objectives of the study were to determine the state of grain production in the world, in Russia and its constituent entities, as well as to analyze the balance of grain, its income and expenditure items. In the course of the research, methods of systematization, comparison and analysis of statistical data were used. It was established that a paradoxical situation with grain has arisen in the world, caused by economic and political restrictions. Firstly, the growth of crop yields and gross harvests in the world is accompanied by large grain reserves, approaching 900 million tons. Secondly, despite large grain reserves in the world, about 800 million people are undernourished. Thirdly, large volumes of grain reserves restrain the growth of prices for it. A similar situation has developed in the Russian Federation. Here, the growth of crop yields and gross harvests of grain makes it possible to meet all domestic needs, annually export up to 71 million tons and form grain reserves of about 80 million tons annually. Against the background of constant growth in prices for agricultural machinery, fuel, fertilizers, pesticides, etc., large grain reserves slow down the

proportional growth of prices for it. The low price of grain is close to the level of its cost price, which reduces the profitability of farmers, reducing their ability to invest in the further development of grain production. In order not to restrain the development of grain production in the country, it is necessary to increase the volumes of its use. A promising direction for reducing grain reserves is to expand the directions and increase the volumes of its processing.

Key words: sown area, yield, gross harvest, grain resources, grain export, grain import, grain use.

For citation: Lentochkin A. M. State of production, consumption and reserves of grain in the world and in the Russian Federation. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 14-23. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_14-23.

Original article

YIELD AND NUTRITIONAL VALUE OF GRAIN OF SPRING TRITICALE VARIETIES

Allaui I. Hamadi, Tatyana A. Babaytseva✉, Olga V. Esenkulova

Udmurt State Agricultural University, Izhevsk, Russia

taan62@mail.ru

Abstract. Spring triticale is a new grain crop for the Middle Pre-Urals. The purpose of the research was to evaluate the yield and quality of grain varieties of spring triticale in the agroecological conditions of the Middle Pre-Urals. The research was conducted in 2022-2024 at the experimental field of the Udmurt State Agrarian University in accordance with the requirements of the state variety testing Methodology. 10 varieties of spring triticale were included in the experimental scheme. The standard is a Level grade. As a comparison, the spring wheat variety Simbirzit, cultivated in the region for forage purposes, was also included in the experimental scheme. The biochemical and amino acid composition of the grain was determined in the Department of analytical research of the Tatar Research Institute of Agriculture FIC KazanSC of RAS. Weather conditions during the years of research ranged from optimal to severely arid. Under contrasting growing conditions, there was a strong variation in the yield of all varieties of spring triticale. The average yield varied over the years from 0.94 t/ha to 6.77 t/ha. On average, over three years, the highest grain yield was obtained from the Seltso variety (3.51 t/ha), which generated high yields in two out of three years.

Relative to the yields of the Rovnya (3.07 t/ha) and Simbirtsit (3.00 t/ha) standards, the Dobroye and Timur varieties also had the advantage, with yields of 3.36 t/ha and 3.43 t/ha, respectively. The listed varieties were more productive than the Rovnya variety by 9-14%, and the Simbirtsit variety by 12-17%. Grain of spring triticale varieties in terms of protein, ash, and exchange energy calculated for cattle and poultry met the requirements of Class 2 GOST R 53899-2010. The starch content in the grains of spring triticale varieties (57.5-60.2%) exceeded that of the Simbirzite variety by 2.3-5.0% with LSD_{05} = 2.2%. The amount of irreplaceable amino acids in most varieties was at the same level (3.13-3.34%), a significant deviation of the indicator was only in the Botanic 4 and Dobroye varieties (by 0.35-0.36% and 0.31-0.32%, respectively, with LSD_{05} = 0.25%).

Key words: yield, biochemical composition of grain, metabolic energy, irreplaceable amino acids.

For citation: Hamadi A. I., Babaytseva T. A., Esenkulova O. V. Yield and nutritional value of grain of spring triticale varieties. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 23-29. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_23-29.

Original article

THE CONDITION OF PLANTINGS IN THE COURTYARD SPACE DVORYANSKOE GNEZDO IN YEKATERINBURG

Lyudmila I. Atkina, Ekaterina O. Leyman✉

Ural State Forestry Engineering University, Yekaterinburg, Russia

leymaneo@m.usfeu.ru

Abstract. The objective of the study is to analyze the structure of plantings in the courtyard space of the Dvoryanskoe Gnezdo city block. This architectural complex has the status of an architectural monument. It is a truly valuable historical object reflecting plans for the construction of industrial social towns in 1930-1950 inside the city of Sverdlovsk. The courtyard space in its structure and size, with an area of about 4 hectares, is closer to the type of an inner-block park, which is almost impossible for modern residential complexes. To achieve this goal, an inventory of trees and shrubs in the courtyard was carried out with the preparation of a detailed plan, accompanied by a statement, which includes morphological parameters and a score of the sanitary condition of the trees. To assess green space arrangement, the balance of the territory was calculated. The approximate age of the plantings

was estimated based on archival photos of the territory. The share of green spaces is 63.5 %; roads, driveways and footpaths occupy more than 36.0 %. The predominant area is occupied by lawn coverings; it is 50.5 % of the total area, while woody vegetation, including trees and shrubs, makes up about 13.0 %. These parameters satisfy the accepted norms for the distribution of territory by area during the planning and construction of courtyard spaces. Green plantings form a predominantly semi-open type of spatial structure, providing a comfortable environment in the court yard. In total, there are 498 trees, represented by 13 species, and 543 shrubs, represented by 11 species. The prevailing species in this area are balsam poplar (Populus balsamifera L.), maple ash (Acer negundo L.), dwarf apple (Malus baccata L.), cotoneaster (Cotoneaster lucidus Schltdl.), Siberian pea shrub (Caragana arborescens Lam.), lilac (Syringa vulgaris L.) The average score of the sanitary condition of all the plantings represented in the courtyard area is 2.94. This indicates a weakened state of the plants, the need for various kinds of sanitary pruning, thinning and partial rejuvenation of the species composition.

Key words: Uralmash, Dvoryanskoe Gnezdo, sotsgorod, inventory of trees and shrubs, courtyard layout, courtyard garden, condition of plantings, historical layout.

For citation: Atkina L. I., Leyman E. O. The condition of plantings in the courtyard space Dvoryanskoe Gnezdo in Yekaterinburg. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 30-37. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_30-37.

Original article

EKISTICAL FUNCTIONS OF THE ARBORETUM OF THE VORONEZH STATE UNIVERSITY OF FORESTRY AND TECHNOLOGIES

Aleksandr V. Veselov

Morozov VSUFT, Voronezh, Russia

A946283@yandex.com

Abstract. Numerous scientific publications devoted to the arboretum of Voronezh State University of Forestry and Technologies do not analyze its impact on the genesis and development of multi-scale settlement formations. This impact of a greening object on the formation, evolution and restructuring of a settlement unit, its economic profile, social-demographic composition, landscape and planning structure is characterized as ekistical. In

the spatial aspect, the boundaries of this study are taken from the urban area (Voronezh State Agrarian University – Voronezh State University of Forestry and Technologies) to the Voronezh urban agglomeration. The system approach was applied in the work, considering the arboretum as a part of relevant demo-ekistical systems on a multiscale basis in order to identify specific functions inherent to the greening object. A brief historical description of the arboretum of the Voronezh State University of Forestry and Technologies within the district of the city is given. For the arboretum as an object of study, the main ekistical functions are established. Each of its identified functions corresponds to a particular stage of settlement. The arboretum performs a district-forming function for the urban area, a compensation function – for the city, a transit function –for the urban agglomeration. With an increase in the rank and size of the settlement unit under consideration, the topological representation of the arboretum in its planning structure consistently decreases from areal to the point. The obtained results can be used in the development of spatial development concepts (master plans), territorial planning documents, land use and development rules of municipalities of the Voronezh urban agglomeration, as well as rules of beautification and documentation on territory planning of the Voronezh urban district. The data collected on the arboretum may also be useful in restoring its protective zone as a natural monument or in establishing it as a cultural heritage site.

Key words: ekistics, town planning, greening of settlements, arboretum, natural and ecological framework.

For citation: Veselov A. V. Ekistical functions of the arboretum of the Voronezh State University of Forestry and Technologies. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 37-47. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_37-47.

Original article

THE DYNAMICS OF COMPOSITION AND STATE OF THE GREEN SPACES ON THE TERRITORY OF ILYICH AVENUE IN PERVOURALSK

Ekaterina S. Loginovskih, Maria V. Zhukova✉

Ural State Forestry Engineering University, Yekaterinburg, Russia

zhukovamv@m.usfeu.ru

Abstract. Understanding the dynamics of the composition of green spaces is a key factor for the sustainable management of urban landscaping facilities. Taking into account the

species composition and its dynamics provides an opportunity to predict future changes in the ecosystem and develop strategies for the conservation of biodiversity. The aim of this research is the analysis of the dynamics of the state of green spaces on the territory of Ilyich Avenue in Pervouralsk for the period from 2012 to 2022. The study, conducted on the basis of GIS-data and a field survey, examined changes in the planning structure of the avenue and the characteristics of green spaces. During the study, the features of changing the parameters of green spaces were analyzed, including species composition, planting density, age and general condition of trees and shrubs. Special attention was paid to the indicators of the sanitary condition of the plantings over a ten-year period and the identification of the main problems and trends in the landscaping of the avenue before and after reconstruction, and for the future. The results of the study showed that the share of green spaces in the total balance of the territory decreased, despite the expansion of the range of species, which was associated with an increase in the area of the territory. These conclusions emphasize the need to improve the landscaping system, which will increase the environmental sustainability of the urban environment. The practical significance of the results obtained consists in their applicability for making recommendations and developing projects to improve the condition of green spaces, which will contribute to creating a more comfortable appearance of the territory of the landscaped facility. The study also focuses on the importance of a systematic approach to urban landscaping management in growing urban areas.

Key words: green spaces, urban planting, landscaping system, sanitary state of plantings, planning structure.

For citation: Loginovskikh E. S., Zhukova M. V. The dynamics of composition and state of the green spaces on the territory of Ilyich Avenue in Pervouralsk. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 47-54. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_47-54.

Original article

HISTORICAL LANDSCAPE IN A MODERN CONTEXT: ASSESSMENT OF PLANTINGS AND PLANNING OF THE OLDENBURGSKY PALACE COMPLEX IN THE VORONEZH REGION

Alina V. Manukovskaya✉, Elena N. Tikhonova

Morozov VSUFT, Voronezh, Russia

manykovskayaav@yandex.ru

Abstract. The article presents the results of a comprehensive study of the territory of the Historical and Cultural Center the Oldenburgsky Palace Complex, an autonomous cultural institution of the Voronezh Region. Based on a detailed inventory of tree plantations growing in the park area of the Oldenburgsky Palace Complex, an analysis of the current state of tree plantations and their distribution by condition categories was carried out to identify the most viable species demonstrating high growth rates and resistance to negative environmental factors, as well as vulnerable species requiring the most careful care. Particular attention is paid to the analysis of the problems of preserving the historical integrity of the landscape in the context of active recreational use of the territory. The issues of balance between preserving the authentic appearance of the park and the need to adapt it to modern requirements for a comfortable visit are considered. The basis for preserving the visual perception of the park space is its historical appearance, while taking into account modern requirements for visitors comfort and environmental sustainability of the territory. The implementation of these measures will preserve the unique character of the landscape as an important component of the cultural heritage of the region. The developed recommendations include a set of measures for the sanitary maintenance of plantings, restoration of historical landscape compositions, optimization of recreational impact and development of tourism infrastructure. The results of the study have significant practical value and can be used in developing concepts for the preservation and development of other estate parks and complexes of historical and cultural value in Russia.

Key words: palace complex, park area, tree plantings, assessment, preservation, historical landscape.

For citation: Manukovskaya A. V., Tikhonova E. N. Historical landscape in a modern context: assessment of plantings and planning of the Oldenburgsky Palace Complex in the Voronezh Region. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 54-64. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_54-64.

Original article

METHODOLOGY FOR DETERMINING THE VOLUME OF FELLED WOOD WITHIN THE BOUNDARIES OF DESIGNATED CUTTING AREAS

Yuliya I. Perepechina✉, Sergey S. Strelkov, Svetlana Yu. Tsirikhova

FSBEI HE «Bryansk State Technological University of Engineering», Bryansk, Russia
y-perepechina@mail.ru

Abstract. The aim of the research is the study and analysis of the application of the methodology set out in Decree of the Government of the Russian Federation dated December 29, 2018 No. 1730 "On Approval of the Specifics of Compensation for Damage Caused to Forests and Natural Objects As a Result of Violations of Forest Legislation" and Decree of the Government of the Russian Federation dated December 18, 2019 No. 2164 "Amendments to Appendix No. 4...", used to determine the amount of compensation for damage and the volume of felled wood within the boundaries of the designated cutting area. The study identifies the main problems and shortcomings in methodology implementation, as well as proposes ways and mechanisms to solve them. To conduct the study, a forest site of 1.2 ha was selected where the forest user carried out continuous logging of ripe and overgrown forest plantations. The inventory of felled trees was based on the stump diameter and the species. For calculations, the length on the stump was converted to a length of 1.3 m according to the table by A. M. Mezhibovsky. The volume of illegally felled timber was calculated according to the Sorting and Commodity Tables for forests in the central and southern regions of the European part of the RSFSR. Research results: the absolute and relative errors of the volume calculated by the stump diameter (in the bark) according to the height class I from the declared volume are 185 m3 and 87 %, respectively, which exceeds the permissible error by 77 %; the absolute and relative errors of the volume calculated in realizable wood according to the height class I with the conversion of the D stump to D 1.3 m for the entire logging area from the declared value are + 17 m3 and +7 %, respectively; calculated in realizable wood according to the height class II from the declared value are –4 m3 and –2 %, respectively.

Key words: cutting area, volume of felled wood, taxes for calculating the amount of damage, inventory by stumps, payment rates.

For citation: Perepechina Yu. I., Strelkov S. S., Tsirikhova S. Yu. Methodology for determining the volume of felled wood within the boundaries of designated cutting areas. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 64-71. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_64-71.

Original article

FEATURES OF THE STANDS FORMATION AFTER THE IMPROVEMENT THINNINGS IN THE ARCTIC ZONE

Darya N. Torbik, Elena A. Surina✉

Northern Research Institute of Forestry, Arkhangelsk, Russia

mari.savina.krsu@bk.ru

Abstract. The article is devoted to the topic of sustainable forest management in the long term, based on the analysis of the dynamics and development of forest ecosystems, the identification of patterns in the reforestation process and the factors that influence it after various forestry activities. The article presents the results of research conducted on trial areas in bilberry pine and spruce forests of the Arkhangelsk region after thinnings of different ages. The dynamics of the under growth reforestation of pre- and post-generation, the impact of logging on the conditions of formation of forest communities by the example of forests of the Arkhangelsk region were studied. The main indicators for the beginning of thinning at any age are: transition of stands from slow to intensive growth, an increase in the stand density and canopy closure in mixed stands, the adverse effect of hard woods on conifers. Thinning has had a positive effect not only on the growth of the forest stand, but also on the development of ground cover and undergrowth, on species diversity, abundance. Timely and high-quality improvement thinning is not aimed at the production of liquid wood, but the formation of stands of the desired composition and the best quality.

Key words: forest, Arctic zone, reforestation, undergrowth, improvement thinnings.

For citation: Torbik D. N., Surina E. A. Features of the stands formation after the improvement thinnings in the Arctic zone. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 72-79. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_72-79.

Original article

EFFICIENCY OF ARTIFICIAL REFORESTATION IN THE ISSYK-KUL FORESTRY OF THE REPUBLIC OF KYRGYZSTAN

Nurstan M. Chyngozhoev[1], Sergey V. Zalesov[2]✉

[1]P. A. Ghan Scientific and Production Center for Forest Research of the National Academy of Sciences
of the Kyrgyz Republic, Bishkek, Kyrgyzstan
[2]Ural State Forestry Engineering University, Yekaterinburg, Russia
[2]zalesovsv@m.usfeu.ru

Abstract. Closer attention to artificial reforestation is necessary because of low forest cover in the Kyrgyz Republic. It is known that forest cover largely minimizes such negative phenomena as mudflows, floods, soil erosion, determines the water content of rivers and the conversion of surface runoff into subsurface runoff. The purpose of the work is to analyze the effectiveness of artificial reforestation in the Issyk-Kul Forestry and develop proposals for its improvement. The analysis was carried out using forest crops grown on the territory of the Issyk-Kul Forestry for the period from 1989 to 2012. It was found that during the specified period 2,477.84 hectares of forest crops with 17 tree and shrub species were afforested on the territory of the state forest fund alone. At the same time, during the period from 1989 to 1999, forest crops of larch and oleaster were written off, and from 2000 to 2012 – fir, oak, ash, maple, elm, pear, walnut, apple tree and oleaster. The latter indicates the impact of climate change on the preservation of forest crops. Of the 2,477.84 hectares of forest crops created in the forest fund, 8.2 % are characterized by a good condition and 34.4 % by a satisfactory condition. At the same time, 1,007.85 hectares (40.7 %) were lost or written off, which indicates the low efficiency of forestry production. Climate aridization leads to a decrease in the survival rate and preservation of forest crops, which necessitates improving the technology of their planting and scientifically based selection of tree and shrub species taking into account forest growing conditions.

Key words: the Republic of Kyrgyzstan, reforestation, forest crops, preservation, condition.

For citation: Chyngozhoev N. M., Zalesov S. V. Efficiency of artificial reforestation in the Issyk-Kul Forestry of the Republic of Kyrgyzstan. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 79-87. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_79-87.

Original article

COMPARATIVE ANALYSIS OF WINTER HARDINESS OF BEE COLONIES BETWEEN THE CENTRAL RUSSIAN BEE BREED AND SOUTHERN BREEDS UNDER NATURAL AND CLIMATIC CONDITIONS OF THE UDMURT REPUBLIC

Svetlana L. Vorobyeva✉, Vladislav V. Ravilov, Vitaly M. Yudin, Anastasia S. Tronina
Udmurt State Agricultural University, Izhevsk, Russia
vorobievasveta@mail.ru

Abstract. The honeybees management in winter is one of the important periods of the annual cycle for ensuring the vital activity of bee colonies, since the maximum number of bees death occurs during this time. Depending on the technology of keeping and the breed composition, honeybees tolerate the winter period differently in specific climatic conditions. In this regard, the purpose of the research is to study the winter hardiness of bee colonies of different breeds kept in the territory of the Udmurt Republic. Field studies of winter hardiness were carried out in the farm enterprise OOO Shafis in the Uvinsky District of the Udmurt Republic in the period 2022-2025. The following indicators were studied during the research: the safety of bee colonies, the vigour of bee colonies in the autumn and spring, the amount of feed used including per a bee row of a colony. Three experimental groups were formed for the research: the control group – the Central Russian breed, experimental group 1 – the Carnica breed and experimental group 2 – the Buckfast breed. The safety of bee colonies in the control group was 96.7 %, in experimental group 1 the indicator was 86.6 % for the entire study period, in experimental group 2 – 90.0 %. The percentage of overwintered bees in families in the control group was 69.5 %, which is higher than in experimental groups 1 and 2 by 7.9 % and 8.1 %, respectively. The average feed consumption per a bee row for the entire study period was 2.37 kg, i.e. the minimum feed consumption rate in winter was recorded in the group of bee colonies of the Central Russian breed. The maximum rate was determined in the group of bee colonies of the Carnica breed – 2.70 kg; the difference was reliable with a probability of $P \geq 0.95$.

Key words: honeybees, wintering, winter hardiness, breed, Central Russian breed, Buckfast, Carnica.

For citation: Vorobyeva S. L., Ravilov V. V., Yudin V. M., Tronina A. S. Comparative analysis of winter hardiness of bee colonies between the Central Russian bee breed and southern breeds under the natural and climatic conditions of the Udmurt Republic. The

Bulletin of Izhevsk State Agricultural Academy.2025; 3 (83): 88-95. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_88-95.

Original article

PROGNOSTIC CRITERIA IN THE DIAGNOSIS OF LATENT MASTITIS

Anastasiya N. Ilyina✉, Liliya F. Khamitova

Udmurt State Agricultural University, Izhevsk, Russia

anastasiyailina499@gmail.com

Abstract. The most common disease of cattle in agricultural enterprises is mastitis, with a different clinical picture and course of the disease. With a confirmed diagnosis of mastitis, the company incurs huge losses both in terms of treatment costs and the loss of possible profits. Among all the manifestations of mastitis, the situation is particularly acute with the subclinical form of mastitis. This type has no clinical signs. In turn, the latent form is the starting point for the manifestation of clinical forms of mastitis. In this regard, it is extremely important to identify in advance the subclinical form of mastitis in general all over the dairy livestock. The health of the dairy herd, production losses, and profits depend on the effectiveness of diagnostic methods of subclinical mastitis. The aim of the study was to determine the effectiveness of diagnostic approaches in subclinical mastitis. The evaluation of diagnostic approaches was carried out by comparing the results of diagnostic research methods. For this purpose, an express diagnostic method using a Kenotest solution, thermal imaging, and Somatos-mini and Clover-2 milk analyzers were selected. The results of the analysis showed that with the manifestation of the subclinical form of mastitis, the qualitative indicators remained within the normative values, however the changes in indicators of level of somatic cells and in clinical blood analysis were observed. When comparing the diagnostic methods of subclinical mastitis, we can say that the use of the thermal imaging method has shown a high diagnostic ability in agricultural enterprises.

Key words: cows, mammary gland, mastitis, somatic cells.

For citation: Ilyina A. N., Khamitova L. F. Prognostic criteria in the diagnosis of latent mastitis. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 95-101. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_95-101.

Original article

THE EFFECT OF THE DRUG IMUNOFAN ON THE BIOCHEMICAL STATUS OF BLOOD IN CALVES WITH NONSPECIFIC DIARRHEA

Nadezhda Yu. Kalyazina

National Research Mordovia State University, Saransk, Russia

nata35349@mail.ru

Abstract. The aim of the study was to compare the effect of the drug Imunofan on the biochemical status of blood in calves with nonspecific diarrhea compared with the traditional treatment regimen for this pathology based on oral rehydration, dieting and the use of medications. The experiment was conducted on the basis of the Farm of Parvatkin A.V. in Sabaevo, the Kochkurovsky district, RM in 2025. The experiment was carried out on the calves of early age from birth to 10-14 days with a diagnosis of nonspecific diarrhea, of which two experimental groups were formed according to the principle of analogues of 10 heads in each group. The control group included healthy calves of similar age. The calves of experimental group 1 were treated with the following therapy (classical treatment regimen): oral dehydration with Kalfdrink electrolyte at a dose of 4 liters /head + 100 ml of 40 % glucose for 10 days; drinking chamomile decoction at a dose of 100 ml / head, 20-30 minutes before feeding, 4 times a day for 7 days; drinking the complex antibacterial drug Ciproventer at a dose of 1 sachet / head. (10 g/head), for 5 days. To restore the beneficial intestinal microflora, the calves were given Vetelact at a dose of 5 ml / head. for 20 days. The calves of experimental group 2 in addition to the above-described treatment regimen were intramuscularly injected with Imunofan at a dose of 1 ml / head, once a day, 3 times every other day. Blood samples for biochemical analysis were taken from calves on the 5th, 15th, and 20th days of the experiment in the morning (before feeding), from the jugular vein into vacuum blood collection systems Vacuette with clot coagulation activator. Laboratory tests were carried out on biochemical analyzers Stat Fax 1904+, URIT 800 Vet at the Mordovian Republican Station for the Control of Animal Diseases. The use of the classical treatment regimen for nonspecific diarrhea in calves with additional intramuscular administration of the immunomodulator Imunofan improved their clinical condition, made it possible to relieve symptoms of diarrhea faster (on the 2nd day) compared to the calves with the classical treatment regimen for this pathology, in which the normalization of the indicators was a day later, which was confirmed by the normalization of indicators of a biochemical blood test.

Key words: calves, nonspecific diarrhea, Imunofan, biochemical blood test.

For citation: Kalyazina N. Yu. The effect of the drug Imunofan on the biochemical status of blood in calves with nonspecific diarrhea. The Bulletin of Izhevsk State Agricultural Academy.2025; 3 (83): 101-107. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_101-107.

Original article

GROWTH AND DEVELOPMENT CHARACTERISTICS OF REPLACEMENT HEIFERS WHILE USING PROBIOTIC YEAST IN THE DIETS OF THE MILK PERIOD

Elena M. Kislyakova✉, Denis S. Trefilov

Udmurt State Agricultural University, Izhevsk, Russia

mullan@inbox.ru

Abstract. The milk period is one of the important periods in the life of a calf. The diet has a great impact on the development of forestomaches. The use of feed additives has a positive effect on the formation of the gastrointestinal tract. The introduction of probiotics into the diet improves the functioning of the rumen microflora. Their use in feeding young animals provides an opportunity to change easily from milk feed to plant one. The objective of the work is to study the effectiveness of different schemes for using Kluver Pro probiotic yeast in feeding young calves. The studies were conducted at the JSC Put Ilyicha, Zavyalovsky District, Udmurt Republic. To conduct the experiment, three groups of calves were formed, 10 heads each, using the pair-analogue method. The experimental groups were given a probiotic Kluver Pro in addition to the main diet at a rate of 4 g /hd /day for 120 days for the first experimental group and 5 g /hd /day for 60 days, and in the remaining 60 days at a rate of 6 g /hd /day for the second experimental group. The use of Kluver Pro in feeding calves during the milk period of rearing had a positive effect on the dynamics of live weight. At the age of 6 months of, the live weight of heifers receiving the probiotic Kluver Pro according to the scheme with increasing dosage was 192.9 kg, which is more by 5.1 % than in the control group and more by 1.2 % than the live weight of heifers in the first experimental group. Body measurements also showed a positive effect of the probiotic. At the age of three months, the following parameters: height at withers (98.7 cm), height at sacrum (100.9 cm), oblique body length (81.4 cm), chest depth (22.4 cm), girth behind shoulder blades

(98.7 cm) were higher in heifers of the second experimental group by 2-8 % than in the control group. Body constitution indices showed that heifers receiving the probiotic were more compact.

Key words: probiotic yeast, Kluver Pro, replacement heifers, milk period, live weight, live weight gain, body measurements, body constitution indices.

For citation: Kislyakova E. M., Trefilov D. S. Growth and development characteristics of replacement heifers while using probiotic yeast in the diets of the milk period. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 108-114. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_108-114.

Original article

THE MORPHOLOGY OF SOFT PALATE IN DOGS PREDISPOSED TO THE BRACHYCEPHALIC SYNDROME

Dmitriy A. Ostroukhov[1]✉, Yuriy G. Vasiliev[2], Dmitriy S. Berestov[3], Liliya F. Khamitova[4]

[1,3,4]Udmurt State Agricultural University, Izhevsk, Russia

[2]Izhevsk State Medical Academy, Izhevsk, Russia

[1]dimasssostroukhov@gmail.com

Abstract. The aim of the study is to establish patterns and differences in the histological organization of the soft palate wall in dogs of different breed types (dolichocephalic, mesocephalic and brachycephalic) in order to identify breed morphological markers for the formation of respiratory disorders. The study included 10 dogs (2 dolichocephalic, 3 mesocephalic, 5 brachycephalic breeds) aged 2-6 years, euthanized for veterinary reasons, without signs of significant systemic and infectious diseases. Classification of breeds by skull type was carried out based on morphometric measurements of the ratio of the length of the cranial and facial sections of the skull using a caliper. A full clinical examination, assessment of the animals' condition, pulse oximetry and thermometry measurements were carried out before collecting the material. Samples of the soft palate were taken in the area of the palatopharyngeal arch with the inclusion of all layers of the organ; the process of dehydration and embedding in paraffin was carried out using standard histological methods. The soft palate in all examined breeds was characterized by a similar basic structure, however, in brachycephalic breeds, pronounced morphological differences were observed: decreased density and heterogeneity of muscle fiber distribution, epithelial hyperplasia with an increase

in the height of epithelial papillae, a significant increase in the number and expansion of the excretory ducts of the salivary glands. Signs of chronic interstitial edema, perivascular infiltration with mononuclear cells and vascular congestion were noted. Histological analysis established the presence of zones of sclerosis and fibrosis of the muscle layer in brachycephalic dogs with the replacement of muscle tissue with connective tissue structures, which was rarely observed in animals of other groups. Morphological changes in the soft palate were found in all examined animals of brachycephalic breeds including French bulldogs and pugdogs. The histological examination revealed signs of organ wall fibrosis, dystrophic changes in the muscular apparatus, chronic inflammatory reactions, pathological changes in the salivary glands. Expansion of the excretory ducts of the glands with an increase in their relative volume, atrophy of skeletal muscles with replacement by connective tissue, the development of chronic inflammation are key factors contributing to structural changes in the soft palate in brachycephalic dog breeds and the formation of a predisposition to the development of brachycephalic obstructive airway syndrome.

Key words: histology of the soft palate, brachycephalic dog breeds, epithelium, salivary glands, muscle tissue.

For citation: Ostroukhov D. A., Vasiliev Yu. G., Berestov D. S., Khamitova L. F. The morphology of soft palate in dogs predisposed to the brachycephalic syndrome. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3(83): 114-121. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_114-121.

Original article

INCREASING THE THERMAL STABILITY OF RAW MILK AT THE STAGE OF ITS PRODUCTION

Olga S. Utkina

Udmurt State Agricultural University, Izhevsk, Russia

utkinaolga1982@yandex.ru

Abstract. A certain group of dairy products require highly heat-resistant milk including canned milk and baby food. It is necessary for enterprises producing these products for their effective management to know how the composition and properties of milk affect its thermal stability and how the thermal stability of milk depends on the conditions of its production. The purpose of the research is to analyze the dependence of the thermal stability of milk supplied

to milk processing enterprises of the Udmurt Republic on its composition and properties and to identify the ways of improving its thermal stability. The analysis of milk quality was carried out according to the data of laboratories of milk processing enterprises. The thermal stability of milk supplied to the processing enterprises of the republic yearly averaged 2.1 according to alcohol test. There was mainly milk of the thermal stability group II (95.4 %). The mass fraction of protein (r = -0.16), lactose (r = -0.10), nonfat milk solids (r = -0.11) and density (r = -0.28) had a negative correlation with the group of thermal stability of milk. Acidity (r = 0.18), somatic cell count (r = 0.13), and bacterial contamination of milk (r = 0.03) had a positive correlation with the heat resistance group. Enterprises that produce milk with low thermal stability are small farms that use tethered system of livestock keeping and stationary milking units for milking cows. Among the suppliers with high thermal stability of milk, there are farms that keep cows in modern livestock facilities, providing the free-stall housing of cows and their milking in milking parlors. To increase the thermal stability of milk, producers need to improve its quality in terms of the mass fraction of protein, nonfat milk solids and sanitary measurements.

Key words: thermal stability of milk, group of thermal stability according to the alcohol test, ultrapasteurization, mass fraction of protein, mass fraction of nonfat milk solids , density, acidity, QMAFAnM, somatic cells, season of the year, milk production conditions, salt stabilizers to increase the thermal stability of milk.

For citation: Utkina O. S. Increasing the thermal stability of raw milk at the stage of its production. The Bulletin of Izhevsk State Agricultural Academy.2025; 3 (83): 121-128. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_121-128.

Original article

EFFICIENCY EVALUATION OF USING REAGENTS KITS FOR OBTAINING SOLUTIONS OF CHELATE COMPLEX COMPOUNDS USED AS A FEED ADDITIVE

Alexander V. Shishkin[1], Andrey N. Kulikov[2]✉, Yuriy G. Krysenko[3], Marina S. Kulikova[4]

[1]Udmurt Scientific Research Institute of Agriculture, Udmurt Federal Research Center - Ural Branch of the Russian Academy of Sciences, Izhevsk, Russia

[2,3,4]Udmurt State Agricultural University, Izhevsk, Russia

[2]andrey.kulikov.1991@bk.ru

Abstract. The article presents the results of a study of a feed additive based on chelate complex compounds of metals and microelements. It is a kit of reagents that are preliminarily added to water intended for animals drinking. In this case, solutions of chelate complex compounds of metals and microelements are formed. Each kit allows obtaining several chelate complex compounds of one microelement with different compositions and is designed for a certain number of animals. The reagent kits are very compact and lightweight. The efficiency of using solutions of chelate complex compounds obtained with these kits and solutions of inorganic salts was compared. In this case, the dosage by the content of microelements was the same. To reduce the effect of physiological antagonism, a fractional-periodic scheme of introducing compounds of different microelements (Fe, Co, Mn, Cu, Zn) was used. The study was carried out on 3 groups of calves (10 heads each) that initially experienced a deficiency of microelements. The first group received solutions of chelated complex compounds of microelements prepared from reagent kits for 30 days, the second group received solutions of inorganic salts according to the same scheme. The third group of calves was a control one. The animals of the 1st and 2nd groups showed a reliable increase in the content of Cu, Co, Zn, Mn, and Fe in the blood compared to group 3. At the same time, by the end of the study, the content of Cu, Zn, Mn, and Fe in the blood of calves of the 1st group was significantly higher than in the 2nd. The content of total protein in the blood of calves of the experimental groups also increased. This increase was significantly higher in the 1st group than in the 2nd group. The increase in body weight in the 1st group was the highest, and clinical manifestations of microelement deficiency disappeared earlier. Thus, the use of the new feed additive proved to be more effective compared to the use of solutions of inorganic salts.

Key words: feed additive, microelements, chelate complex compounds, calves.

For citation: Shishkin A. V., Kulikov A. N., Krysenko Yu. G., Kulikova M. S. Efficiency evaluation of using reagent kits for obtaining solutions of chelate complex compounds used as a feed additive. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 129-135. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_129-135.

Original article

IMPROVING TECHNOLOGIES IN DIGITAL LOGISTICS OF THE AGRO-INDUSTRIAL COMPLEX: FROM SECURITY ASSURANCE TO MODERN MANAGEMENT METHODS

Rufiya R. Gadlgareeva[1]✉, Tatyana S. Kopysova[2], Anastasia G. Kudryashova[3], Nina F. Svintsova[4]

[1,4]Udmurt State University, Izhevsk, Russia

[2]Udmurt State Agricultural University, Izhevsk, Russia

[3]OOO Yacompaniya, Izhevsk, Russia

[1]grr09@yandex.ru

Abstract. The agro-industrial complex in Russia faces the necessity of fundamental transformation of logistics processes. The research relevance is determined by increasing requirements for the quality of agricultural products, significant losses of agricultural products (up to 30 %), low efficiency of traditional logistics models, and the emergence of new technological opportunities. The aim of the research is to analyze the current state of the architecture of integrated digital logistics systems (IDLS) in the agro-industrial complex and to develop innovative directions for its modernization considering modern technological achievements. The methodological basis of the research is a systematic approach to the analysis and design of IDLS. A complex of complementary methods was applied, including analysis of functional capabilities of existing systems, experimental evaluation of indicators, and simulation modeling. A phased approach to innovation implementation with short-term, medium-term, and long-term stages has been developed. It has been established that the modern architecture of IDLS has a five-level structure with a number of shortcomings. Innovative directions for modernization have been developed: the use of next-generation computing technologies, distributed learning with data privacy preservation, microelectronic systems for local analytics, and an intelligent self-adjusting system structure. Full-scale implementation of the proposed innovations can provide a reduction in logistics costs by 30-40 %, a reduction in product losses by 20-25 %, and an increase in forecasting accuracy to 90-95 %.

Key words: digital logistics, agro-industrial complex, integrated systems, quantum computing, distributed learning, digital twins, data privacy, self-organization, product traceability, energy efficiency.

For citation: Gadlgareeva R. R., Kopysova T. S., Kudryashova A. G., Svintsova N. F. Improving technologies in digital logistics of the agro-industrial complex: from security assurance to modern management methods. The Bulletin of Izhevsk State Agricultural

Academy. 2025; 3 (83): 136-143. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_136-143.

Original article

JUSTIFICATION OF THE PARAMETERS OF THE SEEDING AUGER FOR A CARROT SEED DRILL

Ivan A. Deryushev✉, Alexey G. Ivanov, Alexandr V. Kostin, Mariya A. Savelieva

Udmurt State Agricultural University, Izhevsk, Russia

deryshev_ivan@mail.ru

Abstract. Sowing carrot seeds involves placing seeds at a certain depth in the soil at a given planting step. To solve the problems, it is necessary to increase the degree of mechanization, which leads to even sowing at the right time, within agrotechnical terms and with minimal costs. An important condition is compliance with the seeding rate and planting requirements, which contributes to the optimal density of plants in the future. This is ensured by the seeding unit of the drill. This problem is especially relevant when sowing seeds of small-seeded crops, which include carrots. The paper focuses on the uniformity of seed dosing by the seeding unit when sowing carrots. For this purpose, a two-stage dosing system is proposed, consisting of a reel and auger dispenser. This system is implemented in the design of the seeding unit developed by the authors' team. It has a simple and compact design containing a seed hopper, in the lower part of which a dosing reel is located. After the reel unit, the seeds are evenly fed into the auger dispenser, which moves them to the unloading window in the body. Then the seeds go through the seed pipe to the coulters. There is also an outlet window in the body, from which the seeds are fed into the seed pipe. The substantiation of the parameters of the profile and the dimensions of the inter-turn space of the auger, ensuring the regular placement of one seed in the turn, is given. The number of auger turns n_{turns} = 10 was selected, and the relationship between the speed of the machine-tractor unit of 4 km/h and the rotational speed of the auger n_3 = 168.5 rpm was substantiated.

Key words: small-seeded crops, carrots, seeds, sowing device, auger, rotation frequency.

For citation: Deryushev I. A., Ivanov A. G., Kostin A. V., Savelieva M. A. Justification of the parameters of the seeding auger for a carrot seed drill. The Bulletin of Izhevsk State

Agricultural Academy. 2025; 3 (83): 144-150. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_144-150.

Original article

NUMERICAL MODEL OF MELTING OF THE POWDER COMPOSITION B4C-BN UNDER THE CONDITIONS OF SHORT-PULSE LASER PROCESSING

Alexey G. Ipatov[1]✉, Evgeniy V. Kharanzhevsky[2]

[1]Udmurt State Agricultural University, Izhevsk, Russia

[2]Udmurt State University, Izhevsk, Russia

[1]Ipatow.al@yandex.ru

Abstract. The development of modern technological processes for applying functional coatings is associated with the need to test the process of structure formation under modeling conditions. The issues of mathematical modeling are widely used in modern mechanical engineering production and allow with a high degree of probability to predict the modes, properties and characteristics of the created objects. This study proposes a mathematical model of melting of a thin ceramic layer based on a carbonitride powder composition on the surface of a steel substrate. The numerical model provides an opportunity to consider in a wide range the processes of consolidation of powder particles with each other and the formation of stable adhesive bonds due to remelting with a metal substrate. The developed model is a special case of selective laser melting in powder media and the temperature, porosity, specific enthalpy are taken as the main dependent variables. Computer calculations of the model of melting of a single track of B_4C-BN ceramic mixture powder on a steel surface were conducted. The analysis of non-stationary thermal fields, porosity fields, shape and size of the melted track was carried out. Based on the analysis of non-stationary thermal fields, porosity fields, the energy and kinematic modes were obtained ensuring the formation of a stable ceramic layer with a penetration depth of up to 30 μm and an active mixing zone of 5-15 μm, a powder layer thickness of h_0 = 30 μm. Laser processing parameters: effective laser beam diameter D_b = 30 μm, laser generation frequency ν = 20 kHz, average laser power P_{cp} = 35 W, pulse duration τ_{imp} = 100 ns, laser processing speed v = 0.1 m/s.

Key words: powder medium, particle consolidation, mathematical model of selective laser melting, thermophysical processes, convective mixing.

For citation: Ipatov A. G., Kharanzhevsky E. V. Numerical model of melting of the powder composition B_4C-BN under the conditions of short-pulse laser processing. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 151-156. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_151-156.

Original article

PARAMETERS OF 10/0.4 KV POWER TRANSFORMERS FOR A COMPUTER MODEL OF RURAL ELECTRICAL NETWORK IN MATLAB SIMULINK

Alexander A. Lansberg

Federal Scientific Agroengineering Center VIM, Moscow, Russia

lansbergaa@vk.com

Abstract. Computer simulation is one of the most reliable ways to study the load and emergency modes of operation of transformers. The most functional modeling tool is the MATLAB Simulink software package. Most works do not provide information on the justification of the electrical parameters of computer models of 10/0.4 kV power transformers and the assessment of their reliability. The purpose of the study is to substantiate the parameters of computer models of 10/0.4 kV power transformers in MATLAB Simulink and evaluate their reliability. The electrical parameters for the most commonly used 10/0.4 kV power transformers of rural electric networks were determined using literary sources. These are transformers of the ONAN design with rated voltages of 10/0.4 kV and power from 63 kVA to 630 kVA with a circuit and a winding connection group Y/Yn-0. The reliability of the calculated parameters was assessed by comparing the no-load and short-circuit losses obtained from the simulation results with the tabular ones, as well as by modeling the modes of stable short circuits at the output of the 0.4 kV transformer and comparing the values of the emergency mode currents with those calculated using the symmetric component method. It has been found that in computer simulation of emergency modes at the output of a 0.4 kV transformer, the values of the single-phase short circuit current calculated by the method of symmetrical components differ by no more than 1 % compared with the simulation results, and for two-phase and three-phase short circuits – by no more than 4 %. At the same time, the no-load and short-circuit losses obtained during the simulation differ from the reference values by no more than 1 %. The results of the study indicate that the calculated parameters of 10/0.4

kV power transformers can be used to simulate their operating modes in the MATLAB Simulink software package.

Key words: computer simulation, computer model of a power transformer, short circuit, no-load losses, short-circuit losses.

For citation: Lansberg A. A. Parameters of 10/0.4 kV power transformers for a computer model of rural electrical network in MATLAB Simulink. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 156-165. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_156-165.

Original article

COMPARATIVE ANALYSIS OF THE EFFICIENCY OF THE TKR 7S-6 TURBOCHARGER WITH MODIFIED BEARING MATINGS UNDER EMERGENCY OPERATING CONDITIONS

Alexandr V. Malinin, Alexey G. Ipatov✉, Vladimir F. Pervushin

Udmurt State Agricultural University, Izhevsk,

Ipatow.al@yandex.ru

Abstract. The paper presents the results of bench tests of ICE turbochargers with different states of bearing matings. The object of research is the TKR 7S-6 turbocharger with a modified bearing mating. Comparisons are made with a similar turbocharger with a standard bearing mating. The modification of the bearing mating consists in forming a thin antifriction coating based on boron carbide on the surface of the turbocharger rotor shaft. Comparative tests were carried out in the laboratory with emergency operating conditions – the absence of lubrication in the bearing mating. To implement bench tests, a bench was designed and a research methodology was developed. The designed testing bench allows spinning the turbocharger rotor shaft up to 100,000 rpm on exposure to the compressed air. The tests were carried out in the ‘start-stop’ mode (test cycle). The efficiency of the bearing mating was estimated by the number of test cycles performed and the rotor shaft run-out time. The results of the studies confirm our assumptions about the increase in the performance of the bearing mating of the ICE turbocharger after modification with a ceramic antifriction coating, in particular, an increase in the run-down time is observed in comparison with the standard bearing mating. The TKR 7S-6 turbocharger with a standard bearing mating was destroyed by

seizure of the rubbing surfaces after 5 test cycles. A similar turbocharger with a modified bearing mating demonstrated the performance of the bearing mating during 500 test cycles.

Key words: ICE turbocharger, bearing mating, antifriction coating, run-down time, emergency operating conditions.

For citation: Malinin A. V., Ipatov A. G., Pervushin V. F. Comparative analysis of the efficiency of the TKR 7S-6 turbocharger with modified bearing matings under emergency operating conditions. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 166-171. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_166-171.

Original article

IMPROVING THE EFFICIENCY OF THE PLOWING MACHINE AND TRACTOR UNIT

Elena S. Polikutina, Sergey V. Shchitov, Zoya F. Krivutsa✉, Victoria A. Shchitova

Far Eastern SAU, Blagoveshchensk, Russia

zfk20091@mail.ru

Abstract. The process of preparing the soil for sowing is the main stage for a good harvest. In recent years, the subsoil tillage has become the most widespread method of preparation as it is the least energy-consuming, which is especially important for reducing the cost of cultivated crops. In the Amur Region, soybean is the main cultivated crop, and the late dates for its harvesting do not allow preparing the soil for sowing in the fall. In this regard, disc tools capable of more efficient soil preparation are widely used for this operation, which is especially important since the agrotechnological timing of spring field work is limited. At the same time, the subsoil tillage creates the prerequisites for the formation of a ‘plow sole’, and this leads to a violation of the water-air balance of the soil, which further affects the growth and development of crops. This is especially typical in those regions where the permafrost base already makes it difficult to remove excess moisture to the lower layers of the soil horizon. Therefore, to improve the water-air balance, it is necessary to use such method of soil preparation as plowing. When performing this operation, there is a deviation of the plowing machine and tractor unit from the trajectory of rectilinear movement due to the occurrence of additional forces that cause the appearance of a turning moment affecting the controlled front wheels of the energy device. To reduce this phenomenon, it is proposed to use the corrector-

stabilizer during work with a mounted plow, which allows stabilizing the trajectory of the plowing machine and tractor unit.

Key words: plowing, energy device, trajectory of movement, machine and tractor unit.

For citation: Polikutina E. S., Shchitov S. V., Krivutsa Z. F., Shchitova V. A. Improving the efficiency of the plowing machine and tractor unit. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 171-178. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_171-178.

Original article

THE EFFECT OF LOW-INTENSITY LASER IRRADIATION ON SHEEP PRODUCTIVITY AND HEALTH

Elena I. Rubtsova✉, Mikhail A. Afanasyev, Irina A. Bogolyubova, Svetlana I. Lyubaya, Lyubov F. Maslova

Stavropol SAU, Stavropol, Russia

elen.68@bk.ru

Abstract. The article presents the research results of the effects of low-intensity laser irradiation (LILI) on the growth, development, and immune status of young sheep. The purpose of the work was to analyze the effects of LILI on the productivity and resistance of young sheep, including the mechanisms of action and optimal radiation parameters. The methodology included a retrospective analysis of scientific publications (2013–2023) and an experimental part conducted at the All-Russian Research Institute of Sheep Breeding. The experiment involved 107 ewes and their offspring, divided into control and experimental groups with LILI application (wavelength 808 nm, power 150 mW). Lambs in the experimental groups showed a significant increase in live weight (by 2.4–4.4 %, $p<0.01$) and average daily gains (by 3.2–4.9 %, $p<0.05$) compared to the control group. LILI activated cellular metabolism through mitochondrial stimulation, enhanced antioxidant defense (increase in SOD activity by 15 %), and modulated inflammatory processes (reduction in IL-1β by 20 %). Histological analysis revealed a 12–15 % increase in the cortical area of the thymus, correlating with improved immune parameters. Optimal irradiation parameters were identified as follows: wavelength 630–900 nm (red and near-infrared ranges), power 5–500 mW, and dose 1–10 J/cm². The greatest effect was achieved through combined treatment of ewes during gestation and lambs in the first months of life. The study confirms the economic

efficiency of the technology: a 10–14 day reduction in the fattening period and a 12–15 % decrease in meat production costs. The results are of practical significance for meat sheep farming, particularly in intensive production systems. Further research will focus on evaluating long-term effects of LILI and adapting the methodology for different sheep breeds.

Key words: low-intensity laser irradiation, photobiomodulation, sheep farming, productivity, immune response, disease prevention, veterinary medicine.

For citation: Rubtsova E. I., Afanasyev M. A., Bogolyubova I. A., Lyubaya S. I., Maslova L. F. The effect of low-intensity laser irradiation on sheep productivity and health. The Bulletin of Izhevsk State Agricultural Academy. 2025; 3 (83): 179-186. (In Russ.). https://doi.org/10.48012/1817-5457_2025_3_179-186.