

YIELD AND GRAIN QUALITY OF SHIKHAN HYBRID CORN DEPENDING ON SOWING DATES

Bulat G. Akhiyarov^{1✉}, **Rishat R. Abdulvaleev**², **Azat V. Valitov**³, **Luiza M. Akhiyarova**⁴,
Rail R. Alimgafarov⁵

^{1,3,4,5}Bashkir State Agrarian University, Ufa, Russia

²Ufa State Oil Technical University, Ufa, Russia

¹bsau-bulat@rambler.ru

Abstract. The article considers the yield of grain and green mass of corn of the new Shikhan hybrid depending on the sowing dates in the Republic of Bashkortostan. Increasing the quality feed supply for livestock farming remains an urgent problem for the region. The cattle ration has the significant part of corn, both as silage and grain. The purpose of the research was to determine the optimal sowing time for the new Shikhan hybrid with the development of varietal cultivation technology for high-quality silage and corn grain. The experiments were carried out on the territory of the Educational and Scientific Center of the Bashkir State Agrarian University. A new hybrid Shikhan, which was created in the republic together with the All-Russian Research Institute of Corn, Kukuruz Selection Seed-growing Enterprise and Bashkir State Agrarian University, was put to the test. In 2021 the Shikhan hybrid (FAO 170) was included in the State Register of breeding achievements, which necessitated the development of a varietal adapted technology for cultivating the crop. The process of establishing the optimal time for sowing corn of the Shikhan hybrid revealed that the yield of green mass and grain differed significantly. Based on the research results in the Republic of Bashkortostan, we recommend to sow corn of the Shikhan hybrid at a middle early sowing time (May 5), to obtain a high yield of green mass of 31.4 t/ha, grain of 10.34 t/ha and a high content of starch and crude protein.

Key words: corn, grain yield, green mass yield, Shikhan hybrid, sowing dates, starch, protein.

For citation: Akhiyarov B. G., Abdulvaleev R. R., Valitov A. V., Akhiyarova L. M.,

Alimgafarov R. R. Yield and grain quality of Shikhan hybrid corn depending on sowing dates. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 5-11. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_5-11.

Authors:

B. G. Akhiyarov^{1✉}, Candidate of Agricultural Sciences, Associate Professor;

R. R. Abdulvaleev², Doctor of Agricultural Sciences, Professor, <https://orcid.org/0000-0002-6251-7035>;

A. V. Valitov³, Candidate of Agricultural Sciences, Associate Professor;

L. M. Akhiyarova⁴, Candidate of Agricultural Sciences, Senior Researcher;

R. R. Alimgafarov⁵, Candidate of Agricultural Sciences, Associate Professor

^{1,3,4,5}BashSAU, 34 50-letiya Oktyabrya St., Ufa, Russia, 450001

²Ufa State Oil Technical University, 1 Kosmonavtov St., Ufa, Russia, 450064

¹bsau-bulat@rambler.ru

Original article

DOI 10.48012/1817-5457_2025_1_12-18

FUNGICIDES APPLICATION ON SPRING RAPE CROPS AS A FACTOR OF SEED IMPROVEMENT

Tatyana F. Devyatkina^{1✉}, **Sergey S. Chigorin**², **Alexey I. Silaev**³, **Dmitriy V. Bochkarev**³,
Ekaterina O. Glazkova⁵

^{1,2,4,5}N. P. Ogarev Mordovia State University, Saransk, Russia

³Vavilov University, Saratov, Russia

¹z--tatyana--z@mail.ru

Abstract. Producers of spring rape seeds in the south of the Non-Black soil zone often neglect measures related to the use of fungicides, while crop losses due to diseases can be about 35-45 %. At the same time, pathogenic microorganisms from the surface of rape seeds worsen the quality of the products obtained, thereby reducing their market value. The

assessment of the biological effectiveness of the use of fungicides on vegetative plants in order to improve the sowing material of spring rape of the Neman variety was carried out on leached chernozem in the Republic of Mordovia in 2020-2022. The phytosanitary examination of rape seeds obtained from various regions of the republic revealed in the mycobiota of the seed material both necrotrophic pathogens – *Alternaria spp.* from 18 to 57 %, *Phoma ssp.* from 2 to 4 %, and saprophytic microorganisms, the number of which ranged from 11 to 40 % of the total infection of seeds. Treatment of crops with fungicides Kolosal Pro (propiconazole, 300 g/l + tebuconazole, 200 g/l) at a rate of application 0.5 l/ha and Spirit (azoxystrobin, 240 g/l + epoxiconazole, 160 g/l) at a rate of application 0.7 l/ha once during the formation phase of the leaf rosette-transition to stalking crops provided an increase in yield at the level of 0.70 and 0.57 t/ha to the control plot, respectively. Reapplication of the same fungicides in the end-flowering phase of rape increased yields by 0.90 and 0.77 t/ha, respectively. The conducted phytosanitary examination showed that during a single application of the fungicides Kolosal, Kolosal Pro, Spirit, there was a decrease in the infection of spring rape seeds with pathogenic mycophlora, in case of *Alternaria spp.* it reached 95-96 %, *Phoma spp.* and *Fusarium spp.* - up to 99 %. Double treatment of plants with these preparations reduced the fungi colonization of seeds to the level of 98-100 %. The use of the studied fungicides did not significantly affect the development of saprophytic microorganisms, since the main infection of seeds with them does not occur in the field, but during transportation and storage.

Key words: spring rape, seeds, pathogens, fungicides, phytosanitary examination of seeds.

For citation: Devyatkina T. F., Chigorin S. S., Silaev A. I., Bochkarev D. V., Glazkova E. O. Fungicides application on spring rape crops as a factor of seed improvement. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 12-18. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_12-18.

Authors:

T. F. Devyatkina^{1✉}, Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0002-5363-9479>;

S. S. Chigorin, Postgraduate student, <https://orcid.org/0000-0002-8977-9473>;

A. I. Silaev³, Doctor of Agricultural Sciences, Senior Researcher;

D. V. Bochkarev⁴, Doctor of Agricultural Sciences, Associate Professor,

<https://orcid.org/0000-0002-9165-3634>;

E. O. Glazkova⁵, student, <https://orcid.org/0009-0007-0943-5763>

^{1,2,4,5}N. P. Ogarev Mordovia State University, 37 Rossiyskaya St., Yalga village, Saransk, Russia, 430904

³Vavilov University, 4 Prospect Stolypina St., build. 3, Saratov, Russia, 410012

¹z--tatyana--z@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_18-27

PRODUCTIVITY OF SPRING SOFT WHEAT OF THE EXTRA VARIETY DEPENDING ON CULTIVATION TECHNOLOGY ELEMENTS

Oksana V. Demidova✉, **Nikita N. Zezin**

Ural Federal Agrarian Scientific Research Centre of the Ural Branch

of the Russian Academy of Sciences, Yekaterinburg, Russia

okirova90@mail.ru

Abstract. The studies were conducted to investigate the elements of the cultivation technology of spring soft wheat of the Extra variety in the crop rotation system of the Krasnoufimsk Breeding Center (Ural Research Institute of Agriculture – the Ural Federal Agrarian Scientific Research Center of the Ural Branch of the Russian Academy of Sciences) in 2018-2020. The purpose of the research was to improve the components of the spring soft wheat production technology aimed at increasing productivity through the use of growth regulators and various seeding rates. The effect of seeding rates and methods of treatment with plant growth regulators on the yield of spring soft wheat of the Extra variety was studied. When treating seeds with the Rostok preparation, regardless of the seeding rates, the highest number of productive stems was noted - 592-647 pcs/m². The use of Zircon and Larixin preparations in the tillering phase at a rate of 4.5 million viable grains/ha increased the number of productive stems compared to the control plot by 20.5-21.4 %. The best indicators of the

spring soft wheat yield structure were noted with pre-sowing seed treatment with the Rostok preparation and the Zircon preparation during vegetation with a seeding rate of 4.5 million viable grains/ha. The yield increase was obtained due to high indicators of productive stem stand, ear grain content and 1000-grain weight, which made it possible to maximize the genetic potential of the Extra soft spring wheat variety (8.6-9.9 t/ha in 2018). On average for the years of research, by yield volume the options with seed treatment with the Rostok preparation and vegetative plants with the Zircon preparation with a seeding rate of 4.5 million viable grains/ha stood out - 6.37 t/ha and 6.57 t/ha, respectively. The cost of grain production decreased by 13.5-16.9 %, and the level of profitability increased by 29.1-30.9 % and amounted to 86.9-91.2 %.

Key words: spring soft wheat, Extra variety, yield, weight of 1000 grains, growth regulators, seeding rate, treatment method, economic efficiency.

For citation: Demidova O. V., Zezin N. N. Productivity of spring soft wheat of the Extra variety depending on cultivation technology elements. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 18-27. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_18-27.

Authors:

O. V. Demidova✉, Researcher, <https://orcid.org/0000-0002-9130-5373>;

N. N. Zezin, Doctor of Agricultural Sciences, Corresponding Member of the Russian Academy of Sciences, <https://orcid.org/0000-0002-7208-3904>

Ural Federal Agrarian Scientific Research Centre of the Ural Branch of the Russian Academy of Sciences, 112a Belinsky St., Yekaterinburg, Russia, 620142

okirova90@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_28-37

**CHARACTERISTICS OF FLAX SAMPLES (*LINUM USITATISSIMUM* L.)
FROM VIR COLLECTION STUDIED IN THE SVERDLOVSK REGION**

Anatoliy P. Kolotov^{1✉}, Elizaveta A. Porokhovinova²

¹Ural Research Institute of Agriculture – Branch of the Ural Federal Agrarian Scientific Research Center of the Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia

²Federal Research Center All-Russian Institute of Plant Genetic Resources named after N. I. Vavilov (VIR), Saint-Petersburg, Russia

¹ankolotov@yandex.ru

Abstract. Oil flax is a versatile industrial crop that, unlike spring rape and colza, can provide good yields in drought conditions, which are increasingly observed in the Middle Urals. The aim of the research is to study new flax samples from the VIR collection, to identify promising breeding material with a complex of economically useful traits. The objectives are: to characterize new collection samples in comparison with the standard variety and to assess their opportunities for further breeding work. Field experiments, as well as observations and assessments, were carried out using Methodological guidelines for the study of the flax collection (*Linum usitatissimum* L.) and Methods for conducting field agrotechnical experiments with oil flax. Mathematical processing of experimental data was performed according to B.A. Dospekhov. 25 flax samples from the VIR collection were studied in the conditions of the Middle Urals. Valuable flax genotypes with a growing season of less than 85 days, highly resistant to lodging, with oilseed yield more than 210 g/m², with flax straw yield 350-490 g/m², with seed fat content more than 45 %, and weight of 1000 seeds 6.90-7.30 g were identified. Based on a complex of economically valuable traits, it is recommended to use four collection samples as initial material for the creation of new varieties adapted to the conditions of the Middle Urals for further breeding work: k-8595 (gk-173, origin VIR), k-8841 (AGT 308/10, origin Czech Republic), k-8849 (AGT 510/08, origin Czech Republic), and k-8861 (AGT14C2, origin Czech Republic).

Key words: oil flax, fiber flax, collection sample, seed yield, straw yield, oil content.

For citation: Kolotov A. P., Porokhovinova E. A. Characteristics of flax samples (*Linum usitatissimum* L.) from VIR collection studied in the Sverdlovsk region. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 28-37. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_28-37.

Authors:

A. P. Kolotov^{1✉}, Candidate of Agricultural Sciences, Leading Researcher,
<https://orcid.org/0009-0007-3452-184X>;

E. A. Porokhovina², Doctor of Biological Sciences, Leading Researcher,
<https://orcid.org/0000-0002-8328-9684>

¹Ural Research Institute of Agriculture – Branch of the Ural Federal Agrarian Scientific Research Center of the Ural Branch of the Russian Academy of Sciences, 112a Belinskiy St., Ekaterinburg, Russia, 620142

²Federal Research Center All-Russian Institute of Plant Genetic Resources named after N. I. Vavilov (VIR), 42 Bolshaya Morskaya St., Saint-Petersburg, Russia, 190031

¹ankolotov@yandex.ru

Original article

DOI 10.48012/1817-5457_2025_1_37-48

GRAIN YIELD FORMATION IN SPRING WHEAT VARIETIES OF DIFFERENT RIPENESS GROUPS

Alexander M. Lentochkin

Udmurt State Agricultural University, Izhevsk, Russia

lenalmih@mail.ru

Abstract. High and sustainable yields require the use of adapted varieties in each soil and climate zone. Therefore, our research objective was to evaluate spring wheat varieties of different ripeness groups by yield and its structure. In accordance with this objective, the following tasks were formulated: to determine the comparative yield of varieties; to determine the peculiarity of the formation of the productivity of the ear and its components under different conditions of the vegetation period. The research was conducted during two experiments, each studied 12 varieties of spring wheat of different ripeness groups during the years with contrasting conditions. We used such research methods as field experiment, laboratory research, statistical analysis, comparison, measurement. It has been established that spring wheat varieties of different ripeness groups under favorable conditions of the growing

season are capable of forming grain yields at the level of 2.5–5.5 t/ha. The high productivity potential of later-ripening varieties is not always achieved if their higher requirements are not met. Domestic varieties are able to successfully compete in yield with foreign varieties. The greatest influence on the grain weight of the ear of spring wheat varieties is exerted by the number of grains formed in it: the average value of the correlation coefficient for varieties under favorable conditions (r) was +0.95, under unfavorable conditions – +0.96. The number of productive spikelets in the spike ($r = +0.80$ and $r = +0.85$) and the number of grains in the spike ($r = +0.83$ and $r = +0.77$) also have a positive strong effect on the productivity of the spike. The mass of 1000 grains on average has a smaller, but also positive strong effect on the productivity of the spike ($r = +0.71$ and $r = +0.75$). We did not reveal any significant differences in ripeness groups of spring wheat varieties either in terms of ear productivity and its components or in terms of the influence of components on ear productivity under contrasting conditions of crop formation.

Key words: spring wheat, varieties, ripeness group, yield, number of grains, weight of 1000 grains.

For citation: Lentochkin A. M. Grain yield formation in spring wheat varieties of different ripeness groups. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 37-48. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_37-48.

Author:

A. M. Lentochkin, Doctor of Agricultural Sciences, Professor,

<https://orcid.org/0000-0003-0256-489X>

Udmurt State Agricultural University, 16 Kirova St., Izhevsk, 426033

lenalmih@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_49-57

**IMPACT OF LIMING ON NITROGEN NUTRITION OF AGRICULTURAL CROPS
IN HIGHLY ACIDIC SOD-PODZOLIC SOIL**

Vyacheslav I. Makarov✉, **Sergey I. Kokonov**

Udmurt State Agricultural University, Izhevsk, Russia

makaroffVI@yandex.ru

Abstract. Liming is an important reclamation measure that has a complex effect on soil fertility and crop nutrition. The purpose of the research is to evaluate the effect of liming of highly acidic sod–podzolic light loamy soils on nitrogen nutrition of spring wheat and white mustard. The vegetation experiment was conducted in 2022. The soils in variants B2-B5 were chalked at doses of 8, 16, 24, 32 g/vessel, respectively (analogous to 4, 8, 12, 16 t CaCO₃/ha). During the experiment in 2022-2024 the spring wheat was grown, the white mustard was the postharvest crop. In 2022 the soil in the plot A2 lay complete fallow. The liming of the crop rotation link without rest with a dose of 32 g CaCO₃/vessel increased the vegetative mass of plants by 126 % in the first year of the ameliorant using, in the second year – decreased to 76 %, in the third year – 43 %. On average for the three years of research the bioproductivity in the crop rotation link with complete fallow land was lower by 19.0 %. The relationship between lime doses and the total nitrogen content in plants is non-linear. The use of a half dose of lime (8 g/vessel) reduced the nitrogen content in the biomass of plants in the crop rotation link with complete fallow land (A2) by 0.09 %, and with annual cultivation of spring wheat and white mustard as the postharvest crop (A1) by 0.47 %. With an increase in lime doses from 16 to 32 g/vessel, the enrichment of plant biomass with nitrogen increases. The economic removal of nitrogen by plants has a close direct relationship ($r = 0.89-0.98$) with lime doses. In total, for three years in the crop rotation link without complete fallow land, the specific increase in total nitrogen removal was 13.3 mg N/vessel per 1 g CaCO₃/vessel, in the first year - 54.1 %; in the second – 31.6 %, in the third – 14.3 %. The crop rotation link with complete fallow land had the lower level of specific increase in total nitrogen removal (9.0 mg N per 1 g CaCO₃). There is a non-linear relationship between the nitrate content in plant biomass and lime doses.

Key words: liming of soils, nitrogen nutrition of plants, sod-podzolic soils, soil acidity, nitrogen content in plants, nitrogen removal by plants.

For citation: Makarov V. I., Kokonov S. I. Impact of liming on the nitrogen nutrition of agricultural crops in highly acidic sod-podzolic soil. *The Bulletin of Izhevsk State*

Agricultural Academy. 2025; 1 (81): 49-57. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_49-57.

Authors:

V. I. Makarov[✉], Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0002-2240-700X>;

S. I. Kokonov, Doctor of Agricultural Sciences, Professor, <https://orcid.org/0000-0001-7201-3909>

Udmurt State Agricultural University, 16 Kirova St., Izhevsk, 426033

makaroffVI@yandex.ru

Original article

DOI 10.48012/1817-5457_2025_1_57-64

**IMPACT OF CHEMICALIZATION AGENTS ON PHOTOSYNTHETIC
ACTIVITY AND YIELD OF CORN TOP MASS**

Timur V. Khnykin¹, **Alexander P. Eryashev**^{2✉}

¹N. P. Ogarev Mordovia State University, Saransk, Russia

²Mordovian Research Institute of Agriculture – Branch of the Federal Agricultural Research Centre of the North-East, Saransk, Russia

²eryashev_alex@mail.ru

Abstract. The article considers the results of studies on leached chernozems in the Mordovian Research Institute of Agriculture in the Republic of Mordovia. The studies examined the changes in photosynthetic activity and yield of top corn mass after the use of mineral fertilizers for the planned grain yield of 6.2 t/ha (background) and with the application of liquid complex fertilizers Megamix-Profi, Megamix-Azot and growth regulator Albit in the phase of 3-4; 3-4 + 5-6 and 5-6 leaves. On average for 2021-2023, the studies revealed that spraying corn with additional agrochemicals in the phase of 3-4 + 5-6 leaves and at the time of formation of 5-6 leaves did not contribute to an increase in photosynthetic potential (1.57

and 1.62 million $m^2 \times \text{day/ha}$) relative to the phase of 3-4 leaves (1.59 million $m^2 \times \text{day/ha}$). It was maximum compared to the control plot (1.44 million $m^2 \times \text{day/ha}$) with the introduction of mineral fertilizers for the planned grain yield of 6.2 t/ha and with the application of Megamix-Profi (1.67 and 1.64 t/ha), although the studied preparations did not increase it compared to the background. According to the particular differences, this indicator exceeded in case of application solid mineral fertilizers, with liquid complex fertilizers and growth regulator by 19.4 – 6.9 %, compared with the natural background (1.44 million $m^2 \times \text{day/ha}$), whereas in this case the latter did not contribute to its increase (only by 3.0 – 0.6 %), comparing with the option with the use of mineral fertilizers (1.67 million $m^2 \times \text{day/ha}$). The dates of the use of new preparations did not affect the yield of the land weight (26.79–27.69 t/ha). It was maximum in the variant with fertilizers application followed by spraying corn with Albit, where the excess over the control plot (21.54 t/ha) was 40.2 %, and comparing with the background (28.62 t/ha) – 5.5 %. In the variant described above this indicator had an advantage in particular differences with double use (31.52 t/ha) and in the phase of 5-6 leaves (30.17 t/ha), the increases were 46.3 and 40.14; 10.1 and 5.4 %, respectively.

Key words: mineral fertilizers, Megamix, Albit, corn, photosynthetic potential, yield of top mass.

For citation: Khnykin T. V., Yeryashev A. P. Impact of chemicalization agents on photosynthetic activity and yield of corn top mass. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 57-64. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_57-64.

Authors:

T. V. Khnykin¹, Postgraduate student;

A. P. Yeryashev^{2✉}, Doctor of Agricultural Sciences, Professor

¹Ogarev Mordovia State University, 37 Rossiyskaya St., Yalga village, Saransk, Russia, 430904

²Mordovian Research Institute of Agriculture – Branch of the Federal Agricultural Research Centre of the North-East, 5 Michurin St., Yalga village, Saransk, Russia, 430904

²yeryashev_alex@mail.ru

**COENOPOPULATION ANALYSIS OF COMMON JUNIPER
(JUNIPERUS COMMUNIS L.) ON THE SOUTHERN BORDER
OF THE RANGE IN THE CHUVASH REPUBLIC**

Alexey N. Avtonomov^{1✉}, Alexander V. Dimitriev², Andrey A. Mironov³

¹Moscow Polytechnic University (Cheboksary Institute), Cheboksary, Russia

^{2,3}I. N. Ulyanov Chuvash State University, Cheboksary, Russia

¹420533@mail.ru

Abstract. The article presents the results of the study of the population indices of the common juniper (*Juniperus communis* L.) at the southern border of the range in the Chuvash Republic. The research results showed that the population density for plots 1 – 3 was only from 5 to 12 specimens per 1 ha, while the density of common juniper was 1350 specimens in four study plots and 2290 specimens in five study plots. For common juniper, as a typical boreal species located on the southern border of the range within the territory of the Chuvash Republic, temperatures below the usual average temperatures and a large amount of precipitation in the summer of 2022 contributed to the good formation of galberries, therefore, first-year berries (green) predominate on the plants, their number is greater by 2-3.5 times than second- or third-year berries (black-blue). Large by weight (0.25 mg) ripe berries (2-3 years) are noted only in humid areas, which, apparently, is due to less destroyed substrate and more favorable soil conditions. The average maximum size of the juniper cluster is 7.14 m², the average is 4.8 m², the minimum is 2.5 m². The lowest juniper population density (5 pcs./ha) is noted in hill areas (facies 1 and 2). High population density and vegetative growth of clumps in low areas (facies 4 and 5) contribute to a good soil-protective effect. Observations of the processes of self-restoration and changes in the age structure of coenopopulations and their fragments in areas with various ecological conditions and with active recreation made it possible to propose measures to preserve their resistance to environmental factors.

Key words: common juniper, population, density, abundance, age structure, regeneration.

For citation: Avtonomov A. N., Dimitriev A. V., Mironov A. A. Coenopopulation analysis of common juniper (*Juniperus communis* L.) on the southern border of the range in the Chuvash Republic. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 65-71. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_65-71.

Authors:

A. N. Avtonomov^{1✉}, Doctor of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0002-9138-9853>;

A. V. Dimitriev², Candidate of Biological Sciences, Associate Professor, <https://orcid.org/0000-0002-3573-5088>;

A. A. Mironov³, Candidate of Geographical Sciences, Associate Professor, <https://orcid.org/0000-0002-9195-6221>

¹Moscow Polytechnic University (Cheboksary Institute), 54 Karla Marksa St., Cheboksary, Russia, 428000

^{2,3}I. N. Ulyanov Chuvash State University, 15 Moskovskiy prospect St., Cheboksary, Russia, 428015

¹420533@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_72-81

INDICATORS OF SOIL GAS EXCHANGE IN UFA PARKS AND GREEN ZONES

Regina R. Baiturina[✉], **Lenara R. Salimyanova**

BashSAU, Ufa, Russia

aspirant_bsau@mail.ru

Abstract. Currently the role of soil cover on greenhouse gases has not been sufficiently studied and the data on them are contradictory. To fully understand the processes being studied, it is necessary to pay more attention to the factors influencing greenhouse gases contents. The purpose of the research is the reconnaissance determination of carbon fluxes on

the soil surface in the plantings of the green zone of Ufa. The research was carried out in urban park areas, coniferous and deciduous stands, and landscape clearings were taken as samples. Greenhouse gas emissions were monitored by applying the exposure camera method using a Li-Cor 7810 gas analyzer. The measurements at the selected sites were carried out during the daytime at the beginning of the growing season (April) and during the growing season (August). The emission of carbon flux on the soil surface in a broad-leaved forest before the beginning of the growing season (March) reaches $493.2 \text{ gC/m}^2\text{day}^{-1}$. In an uncovered by forest area (clearing), the carbon flux on the soil surface does not exceed $471.8 \text{ gC/m}^2\text{day}^{-1}$. Despite the measurement period before the growing season of trees, shrubs and herbaceous plants, carbon flows in absolute terms on forest soils exceed unforested areas, since tree, shrub and herbaceous plant species differ in root depth and spatial distribution. At the end of the growing season (August), the emission of carbon flux on the soil surface decreases to $636.9 \text{ gC/m}^2\text{day}^{-1}$. The obtained results can be used to evaluate the indicators of factors affecting the quality and condition of soil. Undoubtedly, soil gas exchange measurements are an important method of studying the processes occurring in soil and affecting its condition.

Key words: soil, climate, greenhouse gases, gas exchange, carbon dioxide and methane emissions, gas analyzer LI-COR 7810.

For citation: Baiturina R. R., Salimyanova L. R. Indicators of soil gas exchange in Ufa parks and green zones. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 72-81. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_72-81.

Authors:

R. R. Baiturina✉, Candidate of Biological Sciences, Associate Professor, <https://orcid.org/0000-0002-8156-2165>;

L. R. Salimyanova, Postgraduate student, <https://orcid.org/0000-0003-4683-7060>

BashSAU, 34 50-letiyaOktyabrya St., Ufa, Russia, 450001

aspirant_bsau@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_82-88

EFFECT OF SELECTIVE FELLINGS ON UNDERGROWTH ACCUMULATION IN BIRCH AND PINE FORESTS

Gennady A. Godovalov^{1✉}, Irina V. Bezdenezhnykh², Natalia M. Iteshina³, Lev E. Kuznetsov⁴, Alexander V. Lyubchik⁵

^{1,2,4,5}Ural State Forest Engineering University, Yekaterinburg, Russia

³Udmurt State Agricultural University, Izhevsk, Russia

¹godovalov1952@mail.ru

Abstract. Based on fifteen sample plots of pine and birch plantations, subjected to production selective fellings, their silvicultural efficiency was established in the South Ural forest steppe wood region. The study was carried out on the territory of the Bagaryak forest range of the Kaslinsky Forestry in the Chelyabinsk region. The study showed that selection fellings did not create conditions for the increasing of coniferous undergrowth in the secondary birch forests of the mixed grasses and linden pine stands as well as the grasses and broad-leaved grasses pine stands. After the conducting fellings the undergrowth is either absent or dominated by aspen. The pine undergrowth also disappears or its share in the undergrowth structure is very small. The density and occurrence of Scotch pine undergrowth after selective fellings is quite significant in pine plantations. However, the storage of pine undergrowth in the first years after felling does not always guarantee its growing into the upper tier or the formation of the second tier. The reason is that the pine undergrowth is light demanding. The data obtained indicate the need to replace selective fellings with combined selective fellings. At the same time, in the areas with the absence of pine undergrowth after selective fellings the two stage strip fellings are performed with the pine forest creation and carrying out fire fighting measures. After selective fellings in pine plantations the two stage gradual fellings are carried out if there is pine undergrowth. The latter is preserved during logging operations, and in the absence of pine undergrowth, forest crops are created on the cleared strips.

Key words: fellings of mature and over-mature stands, selective fellings, combined selective fellings, undergrowth.

For citation: Godovalov G. A., Bezdenezhnykh I. V., Iteshina N. M., Kuznetsov L. E., Lyubchik A. V. Effect of selective fellings on undergrowth accumulation in birch and pine

forests. *The Bulletin of Izhevsk State Agricultural Academy*.2025; 1 (81): 82-88. (In Russ.).

https://doi.org/10.48012/1817-5457_2025_1_82-88.

Authors:

G. A. Godovalov^{1✉}, Candidate of Agricultural Sciences, Associate Professor,
<https://orcid.org/0000-0002-2309-2302>;

I. V. Bezdenezhnykh², Candidate of Agricultural Sciences,
<https://orcid.org/0009-0003-6806-8968>;

N. M. Iteshina³, Candidate of Agricultural Sciences, Associate Professor,
<https://orcid.org/0000-0002-2003-2005>;

L. E. Kuznetsov⁴, Postgraduate student, <https://orcid.org/0000-0001-7547-7055>;

A. V. Lyubchik⁵, Master's degree student

^{1,2,4,5}Ural State Forestry Engineering University, 37 Siberian Tract St., Ekaterinburg, Russia,
620100

³Udmurt State Agricultural University, 16 Kirov St., Izhevsk, Russia, 426033

¹godovalov1952@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_89-95

SPECIES DIVERSITY AND ABOVEGROUND PHYTOMASS OF LIVING SOIL COVER IN PLANTATIONS ON DREDGED DUMPS

Alexander I. Petrov¹, **Veronika S. Kotova**², **Regina A. Osipenko**³,
Semyon A. Medvedev⁴, **Sergey V. Zalesov**^{5✉}

^{1,3,4,5}Ural State Forestry Engineering University, Yekaterinburg, Russia

²Ural Forestry Engineering College of USFEU, Yekaterinburg, Russia

⁵zalesovsv@m.usfeu.ru

Abstract. The paper studies the species diversity and aboveground phytomass of living soil cover in artificial and natural 18-25 year old plantations formed on dredged dumps in the

Mid-Ural taiga forest region on the basis of materials from seven test areas. It has been established that under the canopy of the indicated plantings there are 39 species of living soil cover belonging to 13 families. Furthermore, 15 species are of the forest meadow phytocenosis, 8 species are of the forest phytocenosis, 10 species are of the meadow one, and 6 species are of synanthropic one. The aboveground phytomass of species of living ground cover in the natural plantings varies from 74.3 to 138.8 kg/ha, with variations in the artificial plantings from 66.5 kg/ha in a completely dry condition. Moreover, the aboveground phytomass of the ground vegetation is dominated by species of the Bluegrass and Aster families. Indicators of species composition and aboveground phytomass depend on the taxation indicators of stands. Since the substrate of the dredge dumps does not contain chemical elements harmful to humans and animals, the living ground cover can serve as a source for harvesting feed and medicinal raw materials, as well as for developing beekeeping.

Key words: disturbed lands, dredged dumps, reclamation, living soil cover, species diversity, aboveground phytomass.

For citation: Petrov A. I., Kotova V. S., Osipenko R. A., Medvedev S. A., Zalesov S. V. Species diversity and aboveground phytomass of living soil cover in plantations on dredged dumps. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 89-95. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_89-95.

Authors:

A. I. Petrov¹, Postgraduate student, <https://orcid.org/0000-0002-2409-481x>;

V. S. Kotova², College student, <https://orcid.org/0000-0001-7342-5577>;

R. A. Osipenko³, Candidate of Agricultural Sciences, <https://orcid.org/0000-00033359-3079>;

S. A. Medvedev⁴, Master's student;

S. V. Zalesov^{5✉}, Doctor of Agricultural Sciences, Professor,

<https://orcid.org/0000-0003-3779-410x>

^{1,3,4,5}Ural State Forest Engineering University, 37 Sibirskiy trakt St., Yekaterinburg, Russia, 620100

²Ural Forestry Engineering College of USFEU, 35 Sibirskiy trakt St., Yekaterinburg, Russia, 620100

⁵zalesovsv@m.usfeu.ru

SCALE OF FIRE DANGER CLASSES ACCORDING TO WEATHER CONDITIONS FOR THE SVERDLOVSK REGION

Ilya M. Sekerin¹, Gennady A. Godovalov², Andrey M. Yeritsov³, Sergey V. Zalesov^{4✉},
Alexey A. Krektunov⁵

^{1,2,3,4}Ural State Forest Engineering University, Yekaterinburg, Russia

⁵Ural Institute of State Fire Service of EMERCOM of Russia, Yekaterinburg, Russia,

⁴zalesovsv@m.usfeu.ru

Abstract. The purpose of the work is to clarify the fire danger scale used in the Sverdlovsk region to improve the work of departments and services engaged in forest protection. While performing the tasks, materials specific for the fire danger of the forest fund of the Sverdlovsk region and adjacent regions were used. The analysis of fire danger scales according to the weather conditions has established that they do not fully comply with the specified requirements. The result is that the efficiency of forest fire protection reduces. In order to eliminate this disadvantage the values of the complex fire hazard indicator according to the V.G. Nesterov scale and the recommendations of scientists from Leningrad Research Institute of Forestry in terms of soil cover moisture and forest litter were determined for each fire for the period from 2012 to 2022. It has been established that the fire season in the Sverdlovsk region is characterized by significant heterogeneity. The latter necessitates the development of two fire danger scales according to weather conditions. The most objective indicator for fire danger class calculation according to weather conditions is the indicator of soil cover moisture. On the base of this indicator the scales of fire danger according to weather conditions have been developed and proposed for production in the Sverdlovsk region for two time periods: from April to May and from June to October.

Key words: Sverdlovsk region, fire danger class, fire danger scales, complex indicator of fire danger according to weather conditions.

For citation: Sekerin I. M., Godovalov G. A., Yeritsov A. M., Zalesov S. V., Krektunov A. A. Scale of fire danger classes according to weather conditions for the Sverdlovsk region. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 96-101. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_96-101.

Authors:

I. M. Sekerin¹, Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0003-3493-4322>;

G. A. Godovalov², Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0002-2303-2302>;

A. M. Yeritsov³, Candidate of Agricultural Sciences, <https://orcid.org/0000-0002-2756-5349>;

S. V. Zalesov⁴, Doctor of Agricultural Sciences, Professor, <https://orcid.org/0000-0003-3779-410x>;

A. A. Krektunov⁵, Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0003-2160-3305>

^{1,2,3,4}Ural State Forest Engineering University, Yekaterinburg, Russia

⁵Ural Institute of State Fire Service of EMERCOM of Russia, 22 Mira St., Yekaterinburg, Russia, 620062

⁴zalesovsv@m.usfeu.ru

Original article

DOI 10.48012/1817-5457_2025_1_102-107

IMPACT OF BIOLOGICALLY ACTIVE SUBSTANCES ON QUALITY OF COMMON SPRUCE SEEDLINGS DURING OUTDOOR CULTIVATION

Olga N. Tyukavina^{1✉}, **Nadezhda A. Demina**², **Danyal Kh. Fayzulin**³

¹Northern (Arctic) Federal University named after M. V. Lomonosov, Arkhangelsk, Russia

^{1,2,3}Northern Research Institute of Forestry, Arkhangelsk, Russia

¹o.tukavina@narfu.ru

Abstract. The demand for planting material is increasing. The use of biologically active substances allows increasing the yield of seedlings resistant to extreme factors and shortening the period of their cultivation. At the same time, it is necessary to take into account the quality of the planting material, which determines its survival and preservation in the forest area. The aim of the research is to assess the effect of biologically active substances Zircon and Epin-Extra on the quality of two-year-old seedlings of common spruce. Seedlings were grown in the North Taiga forest area on experimental beds near the city of Arkhangelsk in compliance with standard agricultural technology. At the experimental sites, unlike the control ones, seedlings were treated with biologically active substances, combining them with top dressing during the period of maximum plant demand for nutrients. With the effective implementation of all agrotechnical techniques, the use of biologically active preparations Epin-Extra and Zircon contributed to the better growth of spruce seedlings in the second year of development in height and root collar diameter. The height of seedlings increased by 36-47 %, the root collar diameter – by 18-23 %. Foliar treatment of spruce seedlings with Epin-Extra and Zircon preparations led to an overgrowth of the root system regardless of the growing conditions. The length of the main root significantly increased by 12-16 %; the total length of the lateral roots significantly increased by 16-34 %. According to the ratio of the mass of thin roots to the mass of the aboveground part, spruce seedlings are characterized by high quality. According to the Dixon index, the quality of seedlings increased as a result of treatment with growth stimulants.

Key words: common spruce, seedling quality, Zircon, Epin-Extra, height, root collar diameter, length of the main root, total length of the lateral roots, weight of the aboveground part of the seedling, Dixon index.

For citation: Tyukavina O. N., Demina N. A., Fayzulin D. K. Impact of biologically active substances on quality of common spruce seedlings during outdoor cultivation. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 102-107. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_102-107.

Authors:

O. N. Tyukavina^{1✉}, Doctor of Agricultural Sciences, Associate Professor, Leading Researcher, <https://orcid.org/0000-0003-4024-6833>;

N. A. Demina², Candidate of Agricultural Sciences, Associate Professor, Senior Researcher, <https://orcid.org/0000-0001-5626-1523>;

D. K. Fayzulin³, Junior Researcher

¹Northern (Arctic) Federal University named after M. V. Lomonosov, 17 Naberezhnaya Severnoy Dviny St., Arkhangelsk, Russia, 163002

^{1,2,3}Northern Research Institute of Forestry, 13 Nikitova St., Arkhangelsk, Russia, 163062

¹o.tukavina@narfu.ru

Original article

DOI 10.48012/1817-5457_2025_1_108-114

ASSESSMENT OF GROWTH IN BROILER CHICKENS WITH DIFFERENT CAGE BATTERY DENSITIES

Tatyana N. Astrakhantseva, Anton A. Astrakhantsev[✉], **Alexander I. Lyubimov**

Udmurt State Agricultural University, Izhevsk, Russia

antonzif@list.ru

Abstract. An innovative approach for increasing the yield of poultry per unit of production area is to plan the cage density of broilers. This technological parameter is of particular importance when broilers are kept in cages and slaughtering done in stages. The aim of the study was to evaluate the indicators characterizing the growth and development of broiler chickens by sex with different cage battery densities using gradual slaughtering. The study was conducted at Udmurt Poultry Farm in the Udmurt Republic. The study focused on broiler chickens of the crossing Ross 308, which were raised in 4-tier Avimax sliding cage batteries. Four groups of birds were formed, with a cage density of day-old chicks in cages of 26.9, 27.5, 28.0 and 28.5 heads/m². The groups were collected taking into account the sex of the chickens, placing them in cages in a ratio of 1:1. The period of poultry raising was 41 days with the first slaughter stage at 32 days of age. The live weight of chickens and roosters in the groups at the age of 32 days had no significant differences. The live weight of the remaining roosters and chickens in the groups at the age of 41 days did not have a significant difference, and its values were in the range of 3005 – 3112 and 2754 – 2804 g, respectively. An increase in the poultry cage density from 26.9 to 28.5 heads/m² did not have a significant negative effect

on the live weight and growth rate of broiler chickens during 32 and 41 days of raising. An increase in the poultry cage density from 26.9 to 28.5 heads/m² did not have a significant negative effect on the live weight and growth rate of broiler roosters during 32 days of raising. When rearing roosters after the first stage of slaughter up to 41 days, a slight decrease in their live weight and growth rate was detected in the group with cage density of 28.5 heads/m².

Key words: broiler chickens, growth, development, raising period, cage density.

For citation: Astrakhantseva T. N., Astrakhantsev A. A., Lyubimov A. I. Assessment of growth in broiler chickens with different cage battery densities. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 108-114. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_108-114.

Authors:

T. N. Astrakhantseva, Postgraduate student;

A. A. Astrakhantsev[✉], Candidate of Agricultural Sciences, Assistant Professor,
<https://orcid.org/0009-0003-4252-2464>;

A. I. Lyubimov, Doctor of Agricultural Sciences, Professor, <https://orcid.org/0000-0002-4573-2980>;

Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069
antonzif@list.ru

Original article

DOI 10.48012/1817-5457_2025_1_114-122

EVALUATION OF THE BREEDING CHARACTERISTICS IN VYATKA HORSES ON FARMS IN THE UDMURT REPUBLIC

Natalia F. Belousova^{1✉}, **Svetlana P. Bass**², **Aleksander I. Lyubimov**³

¹All-Russian Research Institute of Horse Breeding, Divovo, Russia

^{2,3}Udmurt State Agricultural University, Izhevsk, Russia

¹natfb@yandex.ru

Abstract. The Udmurt Republic is currently the leading breeding region for the valuable domestic Vyatka horse breed. An important indicator of the breed's condition is the analysis of the main breeding characteristics, which include origin, typicality, measurements, body conformation and quality of offspring in commercial horse breeding. The purpose of the research is to monitor the breeding characteristics of horses of the Vyatka breed in the Udmurt Republic. The research objectives are: to conduct a comparative analysis of the assessment of the external indicators and performance of horses of the Vyatka breed in the context of farms of the Udmurt Republic and to compare them with the breed standard. The study focused on 113 heads of Vyatka horses aged two years and older. The documents of the primary breeding registration and the results of the quality evaluation were the study material. According to the research results in the Udmurt Republic, eight largest farms of various forms of ownership with at least 4 mares and 1 breeding stallion were allocated to separate analyzed groups. The measurements of Vyatka stallions generally correspond to the breed standard, and the measurements of mares slightly exceed the standard. Considering that the stabilizing selection is used in the Vyatka horses breeding by measurements, these results are considered acceptable in breeding work with this breed. When assessing the origin, most of the Vyatka horses in the republic (52.2 %) were rated at 8 points. The largest part of modern Vyatka horses (64.6 %) is represented by a pronounced breed type with a score of 8-10 points. Most Vyatka horses (30.1 %) were rated 8 points for the body conformation, 41 % of the horses were rated 5 points for their working qualities.

Key words: Vyatka horse breed, selection, quality valuation, conformation, measurements and indices, working qualities.

For citation: Belousova N. F., Bass S. P., Lyubimov A. I. Evaluation of the breeding characteristics in Vyatka horses on farms in the Udmurt Republic. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 114-122. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_114-122.

Authors:

N. F. Belousova^{1✉}, Candidate of Agricultural Sciences, Senior Researcher of Breeding Department, <https://orcid.org/0000-0003-0515-0123>;

S. P. Bass², Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0003-3979-1279>;

A. I. Lyubimov³, Doctor of Agricultural Sciences, Professor,

<https://orcid.org/0000-0002-4573-2980>

¹All-Russian Research Institute of Horse Breeding, 20 Divovo, Russia, 391105

^{2,3}Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069

¹natfb@yandex.ru

Original article

DOI 10.48012/1817-5457_2025_1_122-129

CAUSES OF PSE SYNDROME DEVELOPMENT IN PORK AND METHODS TO IMPROVE ITS FUNCTIONAL AND TECHNOLOGICAL CHARACTERISTICS

Marina I. Vasilyeva✉, **Roman R. Laptev**, **Yulia V. Isupova**

Udmurt State Agricultural University, Izhevsk, Russia

marinaroshya@gmail.ru

Abstract. Consumer interests for chilled semi-finished products are rapidly growing; they stand out among emulsified meat products due to their high-quality composition, meeting the criteria of the healthy eating philosophy. Setting high requirements for the quality of meat for processing and production of semi-finished products, technologists report frequent cases of pork with PSE syndrome. In this regard, the purpose was defined - to evaluate the functional and technological properties of meat of fattening pigs and to develop a technology for the production of semi-finished products from PSE pork. The studies for assessment the nature of enzymatic degradation of pork tissue were carried out in the leading meat processing plant of the Udmurt Republic, the selection of natural structure-forming agents for abnormal raw meat in the technology of semi-finished products was conducted in the Laboratory of Livestock Products Processing in the Udmurt State Agricultural University in 2023-2024. The longissimus dorsi muscle of pork, previously injected with aqueous solutions of functionally active substances, was used as raw material in the production of portioned semi-finished products: a solution of table salt (0.1 %) was introduced into test sample No.1; a solution of arabinogalactan (0.9 %) was introduced into test sample No.2, and a composition consisting

of solutions of table salt (0.1 %) and arabinogalactan (0.9 %) was introduced into test sample No.3. High water-binding capacity to the meat weight – 38.9 % and to the total moisture – 57.0 % were achieved in test sample No.3 treated with table salt and arabinogalactan; the indicators exceeded similar values of test samples No.1 and No.2 by 1.4-5.7 % and 0.2-5.3 %, respectively. Based on the results of the tasting evaluation, test sample No.3 scored the maximum number of points: the semi-finished product, brought to culinary readiness, had an attractive color and rich taste, juicy and tender texture.

Key words: hybrid young stock, slaughter yield, meatiness coefficient, active acidity, pork, PSE, injection, semi-finished products, salt, arabinogalactan, water-retention capacity.

For citation: Vasilyeva M. I., Laptev R. R., Isupova Yu. V. Causes of PSE syndrome development in pork and methods to improve its functional and technological characteristics. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 122-129. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_122-129.

Authors:

M. I. Vasilyeva[✉], Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0002-1778-9808>;

R. R. Laptev, Postgraduate student;

Yu. V. Isupova, Candidate of Agricultural Sciences, Associate Professor, <https://orcid.org/0000-0003-3753-3188>

Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069
marinaroshya@gmail.com

Original article

DOI 10.48012/1817-5457_2025_1_130-135

APPLICATION OF ANTICLOS BIOPREPARATION IN COW FEEDING RATIONS

Oksana A. Krasnova[✉], **Marat R. Fakhriyev**

Udmurt State Agricultural University, Izhevsk, Russia

Abstract. The scientific experiment was conducted in the farm of D. I. Ponomarev in the Zavyalovsky district of the Udmurt Republic. The aim of the research was to study the effect of the AntiClos biopreparation on milk productivity, the quality of milk from first lactation cows and the resistance of the animal body during the period of milk capacity increasing. The study focused on two groups of first lactation cows of the Black-and-White Holstein breed (control and experimental), with 15 heads in each group, taking into account body weight, productivity and state of health. The basic diet was used in the feeding ration of the control group, and the AntiClos feed supplement was added to the basic diet in the experimental group. The feed supplement was used once a day during morning feeding in a mixture with concentrated feeds at the rate of 50 g/head per day, starting from the 1st day after calving. The duration of the experiment was 100 days. The use of the AntiClos complex feed additive, which was aimed at preventing clostridiosis, had the most positive effect on increasing the milk productivity of cows in the experimental group by 7.06 % during the period of increasing the milk yield, contributed to an increase in the amount of milk fat and protein by 8.4 % and 7.8 %, respectively. An increase in the amount of lactose, ash, nonfat milk solids, and the mass fraction of dry matter in the milk of the experimental group was revealed. The experimental animals have an increase in humoral immunity, which is very important in the first three months of lactation: an increase in the bactericidal activity of blood serum in experimental animals compared with the control group was 9.34 %; serum lysozyme activity in experimental animals increased by 3.37 times when compared to the control group. The use of AntiClos biopreparation in the diet of animals had an impact on important biochemical parameters: total protein, alkaline phosphatase.

Key words: Black-and-White breed, cows, AntiClos biopreparation, increasing milking capacity, milk productivity, milk quality, natural resistance, total protein, alkaline phosphatase.

For citation: Krasnova O. A., Fahriev M. R. Application of AntiClos biopreparation in cow feeding rations. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 130-135. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_130-135.

Authors:

O. A. Krasnova, Doctor of Agricultural Sciences, Associate Professor,

<https://orcid.org/0000-0002-0304-512X>;

M. R. Fahriev, Postgraduate student

Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069

krasnova-969@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_136-148

**ASSESSING THE POTENTIAL OF AUTONOMOUS ENERGY COMPLEXES
BASED ON SOLAR AND WIND ENERGY CO-UTILIZATION
IN THE VOLGOGRAD REGION**

Sergei V. Anikeev✉, **Sergey I. Bogdanov**, **Igor O. Konnov**

Volgograd SAU, Volgograd, Russia

anikeevvlg@yandex.ru

Abstract. The depletion of fossil fuel reserves and the growing environmental challenges are driving the development of renewable energy sources. For Russia, where over 50 % of remote territories rely on diesel generators, the adoption of hybrid energy systems is critically important for reducing costs, enhancing energy independence, and potentially lowering the initial product costs, thereby accelerating the development of areas disconnected from centralized power grids. The aim of this study is to assess the potential of autonomous energy complexes based on renewable wind and solar energy sources, determine their seasonal dynamics, and evaluate their efficiency in the Volgograd region. Using NASA data about hourly wind speed and solar radiation measurements over 12 years – the specific power of the air flow and the average hourly solar radiation were calculated for 34 districts in the region. Additionally, an analysis of energy generation distribution was conducted, categorizing it into: no generation, operation of only wind/solar installations, and simultaneous generation from both sources. The research results have revealed that, on average across the region, the maximum simultaneous generation from both sources occurs in summer, reaching 48.3 %,

while the minimum is observed in winter at 24.7 %. The system downtime varies from 4.1 % to 4.7 %, peaking in the autumn. The annual average time of simultaneous operation from both energy sources is 36.1 %, with solar energy dominating in the summer months and wind energy prevailing in winter. Ultimately, the average total downtime of the hybrid system amounts to 3.7–4.3 days per season, which can be compensated for through backup systems. This confirms the feasibility of using such systems for powering small enterprises and agricultural complexes, provided they are integrated with energy storage or other supplementary sources.

Key words: renewable energy sources, renewable energy resources, renewable energy potential, wind energy, solar energy.

For citation: Anikeev S. V., Bogdanov S. I., Konnov I. O. Assessing the potential of autonomous energy complexes based on solar and wind energy co-utilization in the Volgograd Region. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 136-148. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_136-148.

Authors:

S. V. Anikeev[✉], Postgraduate student, <https://orcid.org/0009-0005-1297-7980>;

S. I. Bogdanov, Candidate of Technical Sciences, Associate Professor,
<https://orcid.org/0000-0002-3111-2895>;

I. O. Konnov, Postgraduate student, <https://orcid.org/0009-0002-1129-3286>
Volgograd SAU, 26 Universitetskiy prospect St., Volgograd, Russia, 400002
anikeevvlg@yandex.ru

Original article

DOI 10.48012/1817-5457_2025_1_148-155

IMPACT OF THE INLET PIPE DIAMETER ON THE TECHNOLOGICAL AND ENERGY PERFORMANCE OF THE DKR-1 GRAIN CRUSHER

Sergey Yu. Bulatov^{1✉}, **Vladimir N. Nechaev**², **Alexander G. Sergeev**³,
Anatoly E. Shamin⁴, **Alexey E. Shlykov**⁵

^{1,2,4,5}Nizhny Novgorod State University of Engineering and Economics, Knyaginino, Russia

Abstract. In agricultural organizations with livestock in small quantity, the preparation of compound feed is carried out on feed aggregates of low productivity, which include hammer crushers with a fan. One of their main disadvantages is low productivity due to the additional energy costs of moving the airflow. In our opinion, the main thing in crushers with a fan is to find the optimal operating mode, in which the aerodynamic parameters of the fan will correspond to the potential of the crusher sieve. It is hypothesized that it is possible to align the grain supply using an ejector in order to evenly load the sieve by selecting the optimal diameter of the inlet connection pipe of the crusher. The paper considers an urgent issue of assessing the effect of the diameter of the inlet pipe of the DKR-1 grain hammer crusher on its performance and energy consumption. The studies of the DKR-1 crusher were carried out as part of a feed preparation line. Curved blades were additionally installed to study the effect of aerodynamic characteristics on the rotor. The results of conducted experiments have determined that with a sieve hole diameter of 6 mm and a hose diameter less than 70 mm, the crusher collapses, which leads to a sharp decrease in its productivity. Additional experiments with blades mounted on the rotor with a diameter of 420 mm showed that the productivity of the crusher was limited by the diameter of the hose with a diameter of less than 70 mm. When examining the diameters of the suction hoses, the optimal diameter 100 mm was determined for the crusher DKR-1, which allowed to increase the productivity of the crusher to 1650 kg/h. The grading analysis of the crushed grain obtained on sieves with a hole diameter of 8 and 10 mm shows that the feed meets the requirements of National State Standards. When grinding on a sieve with 8 mm holes, the number of whole grains is 2.00 %, 10 mm – 3.54 %.

Key words: pipe diameter, grain, blades, hammer crusher, productivity, whole grains, specific energy consumption.

For citation: Bulatov S. Yu., Nechaev V. N., Sergeev A. G., Shamin A. E., Shlykov A. E. Impact of the inlet pipe diameter on the technological and energy performance of the DKR-1 grain crusher. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 148-155. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_148-155.

Authors:

S. Y. Bulatov^{1✉}, Doctor of Technical Sciences, Associate Professor,

<https://orcid.org/0000-0001-9099-0447>;

V. N. Nechaev², Candidate of Technical Sciences, Associate Professor,

<https://orcid.org/0000-0002-7566-6013>;

A. G. Sergeev³, Candidate of Technical Sciences, <https://orcid.org/0000-0003-0466-9003>;

A. E. Shamin⁴, Doctor of Economics, Professor, <https://orcid.org/0000-0002-2382-274X>;

A. E. Shlykov⁵, Senior Lecturer, <https://orcid.org/0000-0001-9002-2665>

^{1,2,4,5}Nizhny Novgorod State University of Engineering and Economics, 22 Oktyabrskaya St., Knyaginino, Russia, 606340

³DOZA-AGRO, 20 Shosse Zhirkombinata, Nizhny Novgorod, Russia, 603028

¹bulatov_sergey_urevich@mail.ru

Original article

DOI 10.48012/1817-5457_2025_1_155-162

DYNAMICS OF TUBER MOVEMENT ALONG THE WORKING ORGANS OF THE DISC WASTE CLEANER

Alexey G. Ivanov[✉], **Alexander V. Kostin**, **Fanis R. Arslanov**, **Alexander A. Lomaev**,
Konstantin L. Vorontsov

Udmurt State Agricultural University, Izhevsk, Russia

ivalgen@inbox.ru

Abstract. Potato cultivation is a complex multi-stage process, its essential part is the post-harvesting treatment of potatoes before storing them. The post-harvesting includes the receiving a thrashed heap, its distribution, and cleaning from soil and plant impurities, removal of substandard tubers, calibration into size fractions and placement of marketable potatoes in storage bins. The study focuses on the separation of soil impurities from the heap. A disc waste cleaner developed by the author's team is proposed for this purpose. It has a simple and compact structure containing a frame and three shafts with discs placed on shafts with gaps sufficient to sift soil through them. The description of the operating principle of the machine

is presented. To substantiate the parameters of the machine, a mathematical model of the dynamics of the movement of a spherical tuber along the ends of the disks was developed. The model is based on the laws of theoretical mechanics, in particular on the equations of natural dynamics. An approach to obtaining differential equations of tuber motion is shown. A method for solving a differential equation is described. It has been found by calculation that stable rolling of tubers along the ends of the discs upward is possible from an initial angle of $\varphi_0 = 60 \dots 65^\circ$, and the separation of tubers occurs at an angle of 149° . The axial distance between the shafts of the waste cleaner should be chosen from just the right conditions, so the discs partially fit into the space between the discs of the neighboring shaft ($a_{w1} < 0,5(d_1 + d_2)$, $a_{w2} < 0,5(d_2 + d_3)$).

Key words: thrashed heap, impurities, waste cleaner, drive, disc shaft, rotation, dynamic equations, rolling friction.

For citation: Ivanov A. G., Kostin A. V., Arslanov F. R., Lomaev A. A., Vorontsov K. L. Dynamics of tuber movement along the working organs of the disc waste cleaner. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 155-162. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_155-162.

Authors:

A. G. Ivanov[✉], Candidate of Technical Sciences, Associate Professor,
<https://orcid.org/0000-0001-7111-7642>;

A. V. Kostin, Candidate of Technical Sciences, Associate Professor,
<https://orcid.org/0000-0002-0589-3448>;

F. R. Arslanov, Candidate of Technical Sciences, Associate Professor;

A. A. Lomaev, Postgraduate student;

K. L. Vorontsov, Postgraduate student

Udmurt State Agricultural University, 9 Studencheskaya St., Izhevsk, Russia, 426069

ivalgen@inbox.ru

Original article

DOI 10.48012/1817-5457_2025_1_162-167

THE WEAR-FREE EFFECT IN TRIBOCONNECTIONS DOPED WITH BISMUTH

Alexey G. Ipatov^{1✉}, Evgeny V. Kharanzhevsky²

¹Udmurt State Agricultural University, Izhevsk, Russia

²Udmurt State University, Izhevsk, Russia

¹Ipatow.al@yandex.ru

Abstract. The paper is devoted to the analysis of the wear-free effect under conditions of plastic deformation of contacting surfaces subjected to surface alloying with metallic bismuth. Alloying of the steel surface with bismuth is implemented using an innovative technology of short-pulse laser remelting of the surface layer. Tribological studies were performed in the conjunction with aluminum alloy AZh-1. The analysis of tribological indicators was performed under various kinematic and dynamic loads, in the boundary friction mode using modern laboratory and research equipment. Under boundary lubrication conditions, the bismuth-alloyed steel surface paired with the analyzed alloy AZh-1 is characterized by a consistently low value of the friction coefficient. Over the entire range of kinematic and dynamic loads, the friction coefficient varies in the range from 0.04 to 0.08. Under conditions of high alternating loads, the aluminum alloy has high fatigue strength, which prevents the surface from premature failure. Tribological and optical studies have revealed that the contacting surfaces have effective running-in, without traces of mechanical and molecular interaction. The absence of mechanical and molecular wear in the contact zone determines the wear-free effect, which is confirmed by the analysis of the wear of the contacting bodies - zero wear is observed throughout the wear tests. At the same time, the temperature background in the contact zone does not exceed 55°C. The reduced temperature in the contact zone characterizes low friction work and the absence of surface destruction. Optical analysis and 3D profilometry of friction surfaces have revealed that the running-in of surfaces occurs not due to wear of the microgeometry of the surfaces, but plastic deformation and favorable redistribution of the material volume over the surface section in the direction of the main movement. The process of plastic deformation absorbs the main energy from friction and thereby reduces the temperature background of friction of the contacting bodies. This

phenomenon opens a new page in understanding the wear-free effect, and the research results have high scientific and practical potential.

Key words: bismuth doping, wearlessness, short-pulse laser processing, friction, aluminum alloy.

For citation: Ipatov A. G., Kharanzhevsky E. V. The wear-free effect in triboconnections doped with bismuth. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 162-167. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_162-167.

Authors:

A. G. Ipatov^{1✉}, Candidate of Technical Sciences, Associate Professor,
<https://orcid.org/0000-0003-2637-4214>;

E. V. Kharanzhevsky², Doctor of Technical Sciences, Professor,
<https://orcid.org/0000-0002-1525-2169>

¹Udmurt State Agricultural University, 9 Studencheskaya St., Izhevsk, Russia, 426069

²Udmurt State University, 1 Universitetskaya St., build. 1, Izhevsk, Russia, 426034

¹Ipatow.al@yandex.ru

Original article

DOI 10.48012/1817-5457_2025_1_168-174

DIRECTION FOR IMPORT SUBSTITUTION OF THE PRIMERA DMC 9000 SEEDER COULTER

Vladimir F. Pervushin[✉], **Mikhail R. Kudrin**, **Alexey I. Ipatov**, **Marat Z. Salimzyanov**, **Sergey N. Shmykov**

Udmurt State Agricultural University, Izhevsk, Russia
pervushin54@mail.ru

Abstract. The causes and wear patterns of the hoe coulters on the PrimeraDMC9000 seeder have been studied and analyzed in order to replace them for reducing price and cost while maintaining their operational life. It is established that the resource of one seeder under

the conditions of the Udmurt Republic, depending on the degree of wear of the coulters, ranges from 3,000 to 4,500 hectares, and the resource of one coulter ranges from 62.5 to 94.0 hectares. The paper offers two options for replacing coulters when they reach their maximum operating time: by manufacturing a new coulter from rolled sheets by laser cutting; by restoring the original coulter, which has reached its operational life, by milling and soldering a carbide blade. Field tests and studies of coulters were carried out in the village of Bolshaya Gurez-Pudga, Vavozhsky district, Udmurt Republic, on loamy soils and simultaneously in the village of Nechkino, Sarapulsky district (Russkaya Niva) on sandy loam soils in the planting season of the spring-summer 2024. Grain crops (wheat, barley, oats etc.) were sown on a tractor unit consisting of a wheeled tractor of drawbar category 4 and 5 + PrimeraDMC 9000 seeder. During the sowing season, on-the-farm researches were conducted on a batch of coulters made of rolled steel with welded thickenings (sideplates). The total operating time of the seeder was 450 hectares. Taking into account the number of coulters installed on one seeder, the average operating time per coulter was 9.4 ha. Studies of the wear pattern and degree of the coulters have shown that the end working surface and the toe of the coulter, which takes on a rounded shape, are subjected to heavy wear. The research of the manufactured coulters in order to study their wear patterns and operating life will continue in 2025.

Key words: seeder, hoe coulter, operational life, operating time, soldering.

For citation: Pervushin V. F., Kudrin M. R., Ipatov A. G., Salimzyanov M. Z., Shmykov S. N. Direction for import substitution of the PrimeraDMC 9000 seeder coulter. *The Bulletin of Izhevsk State Agricultural Academy*. 2025; 1 (81): 168-174. (In Russ.). https://doi.org/10.48012/1817-5457_2025_1_168-174.

Authors:

V. F. Pervushin[✉], Doctor of Technical Sciences, Professor,
<https://orcid.org/0000-0003-0572-2080>;

M. R. Kudrin, Candidate of Agricultural Sciences, Associate Professor,
<https://orcid.org/0000-0002-6273-4267>;

A. G. Ipatov, Candidate of Technical Sciences, Associate Professor,
<https://orcid.org/0000-0003-2637-4214>;

M. Z. Salimzyanov, Candidate of Technical Sciences, Associate Professor,
<https://orcid.org/0000-0002-0877-4372>;

S. N. Shmykov, Candidate of Economical Sciences, Associate Professor,

<https://orcid.org/0000-0002-2103-8695>

Udmurt State Agricultural University, 9 Studencheskaya St., Izhevsk, Russia, 426069

✉ pervushin54@mail.ru