AGRONOMY

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THE EFFECT OF TREATMENT OF SEEDS AND SOWINGS ON YIELD FORMATION OF WINTER TRITICALE VARIETIES

Elmira F. Vafina ✉, Ekaterina A. Osipova, Tatyana A. Babaytseva,
Olga V. Esenkulova, Anna V. Nikitina
Udmurt State Agricultural University, Izhevsk, Russia
✉ vaf-ef@mail.ru

Abstract. The seed and sowing treatment includes technological techniques that have an impact on the growth and development of agricultural plants, contributing to the achievement of the crop potential. The study of the response of a crop and its varieties to certain preparations in specific soil and climatic conditions is the basis of adaptive cultivation technology. The purpose of our study is to assess the formation of grain yields of winter triticale varieties depending on seed and sowing treatment. The tasks are: to analyze the yield of winter triticale varieties; to provide the scientific rationale for the obtained yield by the elements of its structure, photosynthetic activity of plants. Field studies were conducted at the experimental field of the Agricultural Technology Park of the Udmurt SAU in 2021–2023. The Izhevskaya 2 and Beta varieties of winter triticale were studied, the cultivation technology included the treatment of seeds with a chemical fungicide Oplot Trio (difenoconazole + tebuconazole + azoxystrobin), agrochemical Amicide Micro (macro- and microelements, amino acids, polypeptides), biofungicide Phytosporin-M, Zh (*Bacillus subtilis*), the treatment of crops with Amicide Micro and Phytosporin-M in different phases of plant development, there were 11 treatment options in total for each variety. The productivity of varieties was significantly influenced by the weather conditions of the growing season, the difference in grain yield during the study years was 2.89 t/ha. The highest grain yield of 3.40–3.43 t/ha of Izhevskaya 2 triticale was obtained during the pre-sowing treatment of seeds with Oplot Trio, Amicide Micro separately, with their tank mixture followed by the crops treatment with Amicide Micro once or twice. The Beta variety formed a significantly higher yield of 3.67–3.73 t/ha when processing seeds with Oplot Trio, tank mixture of Oplot Trio + Amicide Micro and spraying crops with Amicide Micro with the pre-sowing seed treatment with the tank mixture. The increase in yields of the Izhevskaya 2 and Beta winter triticale is associated with an increase in the thousand-grain weight by 0.5–0.7 g and 0.6–0.8 g, grain weight per the ear by 0.02–0.04 and 0.02–0.03 g, photosynthetic potential of crops by 6–7 % and 5–8 %, respectively.

Key words: winter triticale, variety, Oplot Trio, Amicid Micro, Fitosporin, yield, thousand grain weight, photosynthetic potential.

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Authors:

E. F. Vafina ✉, Doctor of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0003-3086-2886;

E. A. Osipova, Postgraduate student;
T. A. Babaytseva, Doctor of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-3784-0025;
O. V. Esenkulova, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0001-7310-7448;
A. V. Nikitina, Candidate of Agricultural Sciences, https://orcid.org/0000-0002-5926-3804
Udmurt State Agricultural University, 16 Kirova St., Izhevsk, Russia, 426033
✉ vaf-ef@mail.ru

Original article
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ADAPTATION OF AGROTECHNICAL METHODS DURING AUTUMN SOIL TILLAGE FOR PROMISING VARIETIES OF SPRING SOFT WHEAT OF SHORTANDY SELECTION IN AKMOLA REGION

Arthur V. Werner, Sergei I. Kokonov ✉
Udmurt State Agricultural University, Izhevsk, Russia
✉ nir@udsau.ru

Abstract. The demand for soft wheat and its processed products in the world is growing annually due to population growth. Kazakhstan is increasing its export potential, but grain production in the republic is unstable and heavily dependent on the weather conditions of the main grain region, where the climate is extremely continental with large temperature differences, low-snow winter and torrid summer. To achieve these goals, breeders develop new varieties adapted for cultivation in conditions of moisture deficiency. To realize the potential, each variety requires individual agricultural technology. In this regard, research was conducted to study the effect of fertilizers and seeding rates on the productivity of promising varieties of Shortandy selection Taimas and Shortandinskaya 2012 during the autumn soil tillage, with the second crop after fallow with a predecessor – spring soft wheat, at the field station of the Scientific and Production Centre of Grain Farming named after A. I. Barayev from 2022 to 2023. The soils of the region are southern carbonate chernozems. The conducted agrochemical analysis of the soil showed low phosphorus supply and characterized its condition by the content of nitrate nitrogen from high to low depending on the conditions of the year. The vegetation period of 2022 was classified as very arid, 2023 – dry. The research results show good plasticity of the Taimas and Shortandinskaya 2012 varieties when cultivated in the conditions of the Akmola region. The optimal alternative for obtaining a stable high-quality yield for the studied varieties is pre-sowing application of $P_{20}N_{30}$ and a seeding rate of 3.0 million viable seeds per ha. The use of nitrogen-phosphorus fertilizer gives a reliable increase in yield of 1.0 dt/ha with a gluten content above 30 %, and the seeding rate forms a high productivity of the stem stand, which allows competing with weeds.

Key words: spring soft wheat, varietal agricultural technology, seeding rate, fertilizers, yield, quality, weed infestation.

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Authors:
A. V. Werner, Postgraduate student, https://orcid.org/0000-0002-4415-367X;
S. I. Kokonov✉, Doctor of Agricultural Sciences, Professor, https://orcid.org/0000-0001-7201-3909
Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069
✉nir@udsau.ru

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COMPARATIVE EVALUATION OF SEEDS OF BAST-FIBRE CROPS BY FATTY ACID CONTENT OF OIL IN THE MIDDLE PRE-URALS

Vera N. Goreeva, Elena V. Korepanova✉, Gulzira R. Medvedeva, Chulpan M. Islamova
Udmurt State Agricultural University, Izhevsk, Russia
✉k_evital@mail.ru

Abstract. When assessing the quality of oilseeds, the content of unsaturated fatty acids in their composition is of great importance. Different ratios of fatty acids allow using vegetable oils for various purposes: food and industrial. The aim of the study was a comparative assessment of seeds of bast-fibre crops (fiber flax, oil flax and industrial hemp) grown in the Middle pre-Urals, according to the fatty acid content of the oil. To carry out the research, the following varieties of bast-fibre crops were used: oil flax VNIIMK 620, fiber flax Tomsky 18 and Central Russian hemp Nadezhda, harvested in 2018, 2021 and 2022, grown on soddy medium podzolic medium loamy soil. On average, over the years of the experiment, the yield of industrial hemp seeds of the Nadezhda variety exceeded by 0.09 t/ha the yield of oil flax seeds of VNIIMK 620 and by 0.46 t/ha the yield of fiber flax seeds of Tomsky 18. In terms of fat content and the collection of oil from the seed harvest, oil flax had an advantage, respectively, by 5.1 % and 160 kg/ha than that of fiber flax and by 9.9 % and 72 kg/ha than that of industrial hemp. The composition of oil from hemp seeds of the Nadezhda variety is represented by a greater diversity of fatty acids than that of Tomsky 18 fiber flax and VNIIMK 620 oil flax. The oil from the seed harvest of the studied crops differed in the ratio of fatty acids (ω-3 acids, ω-6 acids). The oil of fiber flax and oil flax contained α-linolenic unsaturated fatty acid (ω-3 acid) 3.3–3.4 times higher than the hemp oil. The highest concentration (55.1 %) of linoleic fatty acid (ω-6) was found in Nadezhda hemp oil. The ratio of omega-6 to omega-3 acids in hemp oil was 3.31 : 1, in flaxseed oil – 0.26...0.28 : 1.

Key words: oil flax, fiber flax, industrial hemp, seed yield, fat content, fatty acid content of oil.
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Authors:
V. N. Goreeva, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0003-3115-7695;

E. V. Korepanova ✉, Doctor of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-7989-9455;

G. R. Medvedeva, Candidate of Agricultural Sciences, Senior Lecturer, https://orcid.org/0000-0003-3544-9521;

Ch. M. Islamova, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-8324-9033

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

✉k_evital@mail.ru

Original article

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INFLUENCE OF THE VARIETY AND AGROMETEOROLOGICAL CONDITIONS ON THE BIOCHEMICAL COMPOSITION OF BERRIES OF GARDEN STRAWBERRY IN THE MIDDLE VOLGA REGION

Mikhail I. Dulov ✉, Maria I. Antipenko

Scientific Research Institute of Horticulture and Medicinal Plants 'Zhiguli Gardens', Samara, Russia

✉dulov-tehfak@mail.ru

Abstract. The garden strawberry berries are in high demand with customers due to their delicate taste and richness of biologically active compounds. The genetic features of the variety, weather conditions during the periods of plant growth and crop formation have a significant impact on the biochemical composition of strawberry berries, determine their taste and technological qualities. The purpose of the study is to assess and determine the degree of closeness of the correlation of the biochemical composition of the garden strawberry berries and the agrometeorological conditions of the growing season, to identify the best genotypes for industrial production and further use in the selection to improve the chemical composition of berries. The research was carried out on the basis of the Research Institute 'Zhiguli Gardens' in 2021–2024. The evaluation of varieties according to the chemical composition of berries was carried out in accordance with generally accepted methods. The research results determined that the Carmen variety formed the highest dry matter content in the berries of the strawberry. The sugar content in 100 g of berries was on average 5.79...6.40 %. The amount of sugars in the berries of the Zenga Zengana and Zhanna varieties was more stable over the years. The Asia and Carmen varieties had titrated acidity in berries at an optimal level (0.8...1.0 %). Favorable values of the sugar-acid index were noted in the Zenga Zengana, Asia and Carmen varieties. The amount of ascorbic acid in strawberry berries, depending on the variety and agrometeorological conditions, varies from 38.0 to 88.0 mg %, anthocyanins – on average from 33.8 to 40.7 mg %. When developing new types of garden strawberries with improved biochemical composition of berries for the maximum amount of dry substances and sugars in berries, the optimal content of titrated organic acids in them, a harmonious combination of sugars and organic acids in fruits, it is advisable to use the Carmen and Asia varieties as a source of valuable economic characteristics.

Key words: garden strawberry, variety, fruits, agrometeorological conditions, biochemical composition, correlation.

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Authors:

M. I. Dulov✉, Doctor of Agricultural Sciences, Professor, Leading Researcher, https://orcid.org/0000-0002-7118-9520;

M. I. Antipenko, Candidate of Agricultural Sciences, Leading Researcher, https://orcid.org/0000-0002-8255-7114

Scientific Research Institute of Horticulture and Medicinal Plants 'Zhiguli Gardens', 100, Experimental gardening station, Samara, Russia, 443072

✉dulov-tehfak@mail.ru

Original article

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EFFICIENCY OF ACCELERATED RE-GRASSING OF FLOODPLAIN MEADOWS

Alexander P. Yeryashev✉, Alexander M. Guryanov

Mordovian Research Institute of Agriculture –

Branch of the Federal Agricultural Research Centre of the North-East, Saransk, Russia

✉eryashev_alex@mail.ru

Abstract. The purpose of the research is to provide the scientific rationale of high productivity, dynamics of botanical composition, economic and energy efficiency of agrocenosis of the most common leguminous perennial timothy grasses during the express regeneration of a floodplain meadow in the Republic of Mordovia. The experiments were carried out in the floodplain of the Tavla River in the Lukhovskoye state unitary enterprise of the city district of Saransk in 2018–2021. We compared the productivity of a natural unimproved floodplain meadow and grass stands of common timothy (8 kg/ha) without fertilizers, with the introduction of $P_{80}K_{100}$, $P_{80}K_{100}$ + N_{90} + N_{60}, a mixture of common timothy with purple hybrid alfalfa and eastern galega, of alfalfa and eastern galega with the introduction of $P_{80}K_{100}$ during the accelerated re-grassing. The seeding rate of alfalfa is 12, galega is 30 kg / ha of seeds with 100 % of sowing validity. The mixtures have the seeding rate amounted to 30 % of cereals and 70 % of the legume component of the norm used in single-species sowing. The effectiveness of the fundamental improvement of the natural meadow with common timothy, leguminous grasses and their mixtures without using fertilizers and with mineral nutrients fertilization was shown. It was revealed that on average over the years of research the alfalfa crops with $P_{80}K_{100}$ introduction had the largest gathering of digestible protein (1.33 t/ha), the maximum cost of production (78.9 thousand rubles/ha), the yield of gross energy (182.3 GJ/ha), the net operating (58.4 thousand rubles/ha) and energy profit (58.2 GJ/ha), the economic effect (44.4 thousand rubles/ha). The application of nitrogen fertilizers contributed to a decrease in the proportion of wild grasses in timothy crops (up to 33–43 %). Alfalfa and its mixtures with timothy turned out to be the most competitive, the share of the legume component in the agrocenosis was 92–98 %.

Key words: natural floodplain meadow, common timothy, leguminous perennial grasses, digestible protein, cost of production, costs, net profit, profitability, cost of dry matter, energy profit, bioenergetic coefficient, energy efficiency factor.

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Authors:

A. P. Yeryashev ✉, Doctor of Agricultural Sciences, Professor;

A. M. Guryanov, Doctor of Agricultural Sciences, Professor, https://orcid.org/0000-0003-2642-1498

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

✉eryashev_alex@mail.ru

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ELEMENTS OF ADAPTABILITY OF WINTER TRITICALE VARIETIES ACCORDING TO THE 1000 GRAIN WEIGHT FACTOR

Nina L. Zobnina
Ural Research Institute of Agriculture –
Branch of the Ural Federal Agrarian Research Centre
of Ural Branch of RAS, Ekaterinburg, Russia
zobnina_1968@mail.ru

Abstract. The article presents the results of five years of research (2017, 2018, 2020, 2021, 2022) on the adaptive capacity of winter triticale varieties in the Sverdlovsk region. The aim of the work is to assess the adaptive potential of winter triticale varieties based on the 1000 grain weight. The objects of the research were eight domestic winter triticale varieties in an ecological testing nursery. The standard variety was Bashkirskaya Korotkostebel'naya. The research years were characterized by significant contrasts in weather conditions. The environmental conditions index (Ij) for the thousand grain weight factor was 26.6 in 2017, 48.6 in 2018, 26.3 in 2020, 73.5 in 2021, and 25.1 in 2022. The most favorable year for forming large grains was 2018. The influence of the year's conditions was greater (29.6 %) than the influence of the genotype (24.6 %), with factor interaction at 23.2 %. The fluctuations of the 1000 grain weight factor were quite substantial, ranging from 38.28 g (Sirs 57) to 49.17 g (Privada). The lowest coefficient of variation was observed in the varieties Kornet (11.8 %) and Privada (13.1 %). The highest variability in the factor was noted in the Sirs 57 variety (17.2 %). The Kornet and Privada varieties demonstrated the highest homeostaticity (4.1 and 3.7, respectively). The Tornado variety showed higher multiplicativity compared to others (1.14). The Kornet, Bard, Tornado, and Privada varieties, with an adaptability coefficient (AC) above 100 %, are considered potentially adaptive. According to the research results, the Tornado variety has the highest resistance to changing weather conditions, with low variability and high indicators of adaptability, homeostaticity and stability. The Tornado, Privada, Tsekad 90, Bashkir-

skaya Korotkostebel'naya, and Sirs 57 varieties, which stood out for different traits, were selected for further use in the breeding process.

Key words: 1000 grain weight, stress resistance, plasticity, homeostaticity, adaptability, environmental conditions index.

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Author:

N. L. Zobnina, Senior Researcher, https://orcid.org/0000-0002-3177-4303

Ural Research Institute of Agriculture – Branch of the Ural Federal Agrarian Research Centre of Ural Branch of RAS, 21 Glavnaya St., Ekaterinburg, Russia, 620061

zobnina_1968@mail.ru

Original article

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THE EFFECT OF HUMIC PREPARATIONS ON THE PROPERTIES OF SOD-PODZOLIC SOILS AND CROP YIELD IN THE CROP ROTATION LINK IN THE CONDITIONS OF THE UDMURT REPUBLIC

Anna B. Mertsalova, Tatiana Yu. Bortnik ✉

Udmurt State Agricultural University, Izhevsk, Russia

✉ agrohim@udsau.ru

Abstract. The article presents a summary of the results of the model and field experiments for the crop rotation link 'barley with clover sowing-clover of the first year of use-clover of the second year of use', conducted on soddy medium podzolic medium loamy soils of the Udmurt Republic in 2017–2019. The effect of humic preparations Humy 30+, Zoloto Poley, Zhivaya kaplya, Humat +9, Humat K was studied in comparison with the Natural Humic Acid (NHA) Life Force humic preparation. The model experiment revealed the acidifying effect of preparations, their introduction to the soil led to the increase of exchange and hydrolytic acidity. The effect of humic preparations on biological properties of the soil has been established. There is a tendency to increase the intensity of carbon dioxide release from the soil when using most humic preparations. In the field experiment, the preparation was introduced under barley with clover sowing in doses of 0.3–0.5 t/ha as a soil conditioner-improver. The aftereffect of this preparation was studied on clover. A significant decrease in the incidence of clover anthracnose was revealed when introducing NHA Life Force 0.3 t/ha, as well as a decrease in the incidence of clover weevil when using the NHA Life Force in both doses, but most strongly at a dose of 0.3t/ha. It was found that the introduction of the NHA Life Force humic preparation into the soil in doses of 0.3–0.5t/ha had a positive effect on the yield of the crop rotation link 'barley + clover – clover of the first year of use – clover of the second year of use' during three years. The significant gain in the yield green mass was 6.5 t/ha in 2018, and 9.5 t/ha in 2019.

Key words: humic preparations, sod-podzolic soils, soil fertility indicators, barley, meadow clover, yield.

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Authors:

A. B. Mertsalova, Candidate of Agricultural Sciences, Assistant;

T. Yu. Bortnik✉, Doctor of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0003-1899-5176

Udmurt State Agriculture University, 16 Kirova St., Izhevsk, Russia, 426033

✉agrohim@udsau.ru

Original article

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VARIETY INVESTIGATION OF BLUE HONEYSUCKLE

Lyubov A. Nesmelova✉, Anna V. Nikitina

Udmurt State Agricultural University, Izhevsk, Russia

✉lubownecmelowa@yandex.ru

Abstract. A new tendency in modern gardening in the 21st century is the creation of medicinal gardens; their products are necessary for the preventive care and promotion of public health, they also are in great demand in the domestic and foreign markets. The example of such a valuable berry crop is edible honeysuckle (*Lonicera caeruleae* L.), which has high winter hardiness, its early ripening extends the period of consumption of fresh berries. The research purpose is comparative assessment of blue honeysuckle varieties. The research was conducted on the site of the Educational Garden of the Udmurt SAU. The soil of the site is sod-podzolic, medium loamy, lightly eroded, characterized by a very low content of organic matter which is 1.56 %. The response of the soil environment is neutral with a high content of mobile forms of phosphorus (191 mg/kg) and very high exchangeable potassium (256 mg/kg). Sod-podzolic soils are characterized by a low value of the total exchangeable bases, which caused primarily by the low content of organic matter. When analyzing a soil sample, the value of the total exchangeable bases was low and amounted to 5.7 mmol/100 g of soil. Soil conditions are suitable for growing berry crops. The following varieties of blue honeysuckle were studied: Tomichka (st.), Volshebnitsa, Sibiryachka, Boomerang, Zolushka, Polyanka Kotova, Nimfa, Lenita. On average over 2022–2023 the research results proved that the high content of water-soluble sugars up to 13.20 % was noted in the Polyanka Kotova variety, ascorbic acid in the Boomerang, Polyanka Kotova and Zolushka varieties – 12.33; 13.67; 12.67 mg/100 g. The Tomichka (st.), Polyanka Kotova and Sibiryachka varieties were distinguished by the highest yield. The yield was 0.83–0.92 kg per bush, respectively.

Key words: productivity, blue honeysuckle, variety, feeding area, quality indicators, ascorbic acid.

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Authors:

L. A. Nesmelova ✉, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0001-5409-2180;

A. V. Nikitina, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-5926-3804

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

✉ lubownecmelowa@yandex.ru

Original article
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DENDROLOGICAL REVIEW OF INTRODUCED SPECIES IN THE LANDSCAPING OF FOREST PARKS IN YEKATERINBURG

Anna A. Korotkova, Sergey M. Korotkov, Natalia P. Bunkova ✉
Ural State Forestry Engineering University, Yekaterinburg, Russia
✉ bunkovanp@m.usfeu.ru

Abstract. Studying the landscaping of the forest parks of Yekaterinburg, it can be concluded that along with indigenous tree and shrub species, introduced breeds also perform sanitary, protective and aesthetic functions. They occupy more and more forest and forest park spaces, adapting to abiotic and biotic environmental factors in a certain area, and it happens that they become invasive species. The main purpose of our work was to study the dendrological assortment of forest parks in Yekaterinburg. The plantings of the Forest Park named after Foresters of Russia and the Shartashsky Forest Park were identified as the object of research. Three permanent trial areas, 0.25 hectares each, were laid out in each forest park. The potential of the introduction of naturalized species was assessed using the methodology of the Main Botanical Garden and an assessment of the sanitary condition. We also conducted a comparative analysis of the place of origin of the introduced species and determined its potential in the conditions of the Sverdlovsk region. During the research we identified introduced species of two life forms among the studied breeds. The data obtained indicate that some species of introduced breeds, such as dwarf apple (*Malus baccata* L.), Norway maple (*Acer platanoides* L.), Maak cherry (*Prunus maackii* L.), had successful acclimatization and can be recommended for use in planning forest parks in Yekaterinburg. The research results can be applied for increasing the diversity of landscaping spaces, as well as forest parks of Yekaterinburg, for improving their aesthetic assessment and sanitary and hygienic functions.

Key words: introduced species, forest parks, life forms, tree species, shrub species, habitat, origin.

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Authors:
A. A. Korotkova, Master's degree student, https://orcid.org/0009-0007-4859-4652;
S. M. Korotkov, Master's degree student, https://orcid.org/0009-0008-5927-5478;
N. P. Bunkova ✉, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-7228-4693
Ural State Forestry Engineering University, 37 Sibirskiy tract St., Ekaterinburg, Russia, 620100
✉ bunkovanp@m.usfeu.ru

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ACCUMULATION OF WINTER PRECIPITATIONS UNDER CANOPY OF PLANTATIONS OF VARIOUS FORMATIONS IN RUDNY ALTAY

Stanislav V. Rogovsky[1], Andrey A. Kalachev[2], Sergey V. Zalesov[3] ✉
[1,3]Ural State Forestry Engineering University, Yekaterinburg, Russia
[2]Kazakh Scientific Research Institute of Forestry and Agroforestry named after A. N. Bukeikhan, Shchuchinsk, Republic of Kazakhstan
[3]zalesovsv@m.usfeu.ru

Abstract. The purpose of the work is to analyze snow accumulation in plantations of various formations of the Rudny Altay of the Republic of Kazakhstan. Based on three years' observations the dynamics of snow accumulation in stands with domination of birch (*Betula pendula* Roth.) aspen (*Populus tremula* L.), Siberian fir (*Abies sibirica* Ledeb.) and Siberian pea shrubs (*Caragana arborescens* Lam.) was established. The results of snow measurement revealed that most often the maximum thickness of snow cover was formed by the end of the first third of March. This is despite the fact that the snow covering sets in November and it melts at the end of April. The dynamics of snow accumulation varies from year to year. In 2021–2022, the depth of snow cover exceeded one meter by the end of December. The composition of stands influenced the depth of snow cover. Birch stands accumulate the most snow. In 2020–2021, the thickness of snow cover in birch stands was 133.0±1.63 sm, in 2021–2022 – 177.3±7.32 sm in 2022–2023 – 146.7±1.36 sm. The minimum snow depth was fixed in firry stands in 2020–2021 – 117.7±8.83 sm, in shrubs in 2021–2022 – 140.0±2.36 sm, and in 2022–2023 in aspen stands – 141.7±1.96 sm. The difference between the maximal and minimal average snow depth was in 2020–2021 – 13.0 %, in 2021–2022 – 26.4 % and in 2022–2020 – 4.7 % from the minimal average value. Data on the dynamics of the depth of snow cover should be taken into account in planning and conducting forestry activities.

Key words: Republic of Kazakhstan, Rudny Altay, forest formation, snow accumulation, dynamics, depth of snow cover.

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Authors:
S. V. Rogovsky[1], Postgraduate student;
A. A. Kalachev[2], Doctor of Agricultural Sciences, https://orcid.org/0000-0002-4444-0193;
S. V. Zalesov[3] ✉, Doctor of Agricultural Sciences, Professor, https://orcid.org/0000-0003-3779-410X
[1,3]Ural State Forest Engineering University, 37 Sibirskiy trakt St., Yekaterinburg, Russia, 620100
[2]Kazakh Scientific Research Institute of Forestry and Agroforestry named after A. N. Bukeikhan, 58 Kirova St., Shchuchinsk, Republic of Kazakhstan, 021704
[3]zalesovsv@m.usfeu.ru

Original article
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TECHNOLOGY OF DISTURBED LAND RECLAMATION BY THE EXAMPLE OF THE SAND PIT IN THE WEST-SIBERIAN NORTHERN TAIGA PLAIN FOREST REGION

Ekaterina P. Rozinkina[1], Konstantin A. Basheguro[2], Veronika S. Kotova[3], Regina A. Osipenko[4], Sergey V. Zalesov[5] ✉
[1,2,4,5]Ural State Forestry Engineering University, Yekaterinburg, Russia
[3]Ural Forestry Engineering College of USFEU, Yekaterinburg, Russia
[5]zalesovsv@m.usfeu.ru

Abstract. The purpose of the research is to analyze the effectiveness of reclamation of worked-out sand pits in the conditions of the Yamalo-Nenets Autonomous District. We studied the existing experience of reclamation of dry-excavated sand pits on the territory of the West-Siberian Northern taiga plain forest region. It is noted that the brief summer period drives the need of work intensification and heavy equipment concentration, which significantly damages the environment. The area of disturbed land is greater by 20–22 % than the boundaries of the mining allotment. The natural overgrowing of pits lasts for many decades because of harsh climatic conditions and low substrate fertility, and sand bulges are often formed by the flow of sand from the pit territory to the adjacent landscapes. The reclamation of pits is carried out in two stages. During the technical stage of reclamation, a peat-sand mixture is applied on the surface of the pit in a layer of 10 sm. During the biological stage, grass mixtures are sown and willow cuttings are planted. This technology has disadvantages. Freezing of grass mixtures is often observed. The site does not recover, since only shrubby willows grow on it. It is recommended to select grass mixtures of local species and to plant common pine after sand fixation.

Key words: West-Siberian Northern taiga plain forest region, sand pits, reclamation, grass mixtures, common pine.

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Authors:

E. P. Rozinkina[1], Postgraduate student, https://orcid.org/0000-0002-8000-9122;

K. A. Basheguro[2], Head of the sector of organization and support of scientific and innovative activities, https://orcid.org/0000-0002-9050-8902;

V. S. Kotova[3], College student, https://orcid.org/0000-0001-7342-5577;

R. A. Osipenko[4], Candidate of Agricultural Sciences, https://orcid.org/0000-0003-3359-3079;

S. V. Zalesov[5] ✉, Doctor of Agricultural Sciences, Professor, https://orcid.org/0000-0003-3779-410X

[1,2,4,5]Ural State Forest Engineering University, 37 Sibirskiy trakt St., Yekaterinburg, Russia, 620100

[3]Ural Forestry Engineering College of USFEU, 35 Sibirskiy trakt St., Yekaterinburg, Russia, 620100

[5]zalesovsv@m.usfeu.ru

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ANALYSIS OF SOIL MORPHOLOGY FEATURES IN DIFFERENT FOREST TYPES IN THE MOUNTAINOUS PART OF THE MIDDLE URALS

Lidia A. Senkova ✉, Lyubov P. Abramova, Valeryan N. Lugansky, Sergey V. Zalesov, Olga M. Astafieva, Leonid A. Belov, Evgeny P. Platonov, Regina A. Osipenko
Ural State Forest Engineering University, Yekaterinburg, Russia
✉ senkovala@m.usfeu.ru

Abstract. The result of the analysis of morphological features of soils of different forest types in the mountainous part of the Middle Urals is presented. The research purpose is to study the morphology features of mountain soils associated with plantations of various forest types. Field studies were carried out in the Educational and Experimental Forestry by the method of laying out soil sections with a profile description of external features at the sites classified by relief and vegetation of 10 forest types of Medvezhka mountain in 2023. It is shown that soils are formed on eluvial-deluvial deposits. The close occurrence of dense rocks to the day surface is a water proof layer contributing to increased soil moisture, intra-soil weathering with sand accumulation. Soil profiles are shortened, enriched with rock fragments. Relief forms and their location provide penetration of wet and warm winds from the west, which affected the severity of brown soil formation. Zonal processes of soil formation are manifested in the form of characteristic flaggy structure, silica powdering. The soils of the studied forest types are both podzolic and brown forest soils, which differ at subtype, genus and species taxonomic levels depending on exposure, steepness and height of slopes. Podzol formation and brown soil formation are combined in them to different degrees. Natural soils of forests are currently degraded by fires, their morphological features are manifested in the profile in the form of ash, charcoal and turbidity. The results of research are necessary for soil and forest protection, application in the educational process.

Key words: morphological features of soil, forest type, soil formation process, brown soil formation, degradation.

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Authors:

L. A. Senkova ✉, Doctor of Biological Sciences, Associate Professor, https://orcid.org/0000-0002-2597-662X;

L. P. Abramova, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org//0000-0002-2472-7787;

V. N. Lugansky, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-7823-7505;

S. V. Zalesov, Doctor of Agricultural Sciences, Professor, https://orcid.org/0000-0003-3779-410X;

O. M. Astafieva, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-9230-4380;

L. A. Belov, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-6397-3681;
E. P. Platonov, Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0001-8502-1350;
R. A. Osipenko, Candidate of Agricultural Sciences, https://orcid.org/0000-0003-3359-3079
Ural State Forest Engineering University, 37 Sibirskiy trakt St., Yekaterinburg, Russia, 620100
✉ senkovala@m.usfeu.ru

Original article
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ANALYSIS OF THE DEGREE OF AGGRESSIVENESS OF THE OPERA HOUSE PARK IN YEKATERINBURG

Yaroslava V. Stanislav
Ural State Forestry Engineering University, Yekaterinburg, Russia
yaroslava.stanisvav@yandex.ru

Abstract. The article presents studies of landscape pictures of the park near the Opera House in the city of Yekaterinburg. The history of the creation of the territory goes back to the 30s of the last century; the appearance of the object has been changed several times. This area is of interest for study, as it is located in the central part of the city and is popular among different categories of the population. The total area of the facility is 2.1 hectares. The degree of aggressiveness of the territory was determined in several stages. The first stage included photographic recording of the chosen route, taking into account attractive views, at the researcher's eye level. At the second stage the selection of the most successful pictures was carried out. The third stage involved calculating the working surface – a grid calculated according to the technical parameters of the camera. The degree of aggressiveness was determined after applying the grid to the canvas of the photo, then the number of repeating cells and their ratio to the total number were calculated. Gradation of the degree of aggressiveness: from 0 to 35 % – a favorable visual environment, from 36 to 75 % – a conditionally comfortable one, over 75 % – an aggressive visual environment. The park near the Opera House is considered a relatively comfortable visual environment according to the average indicator. The territory is dominated by areas where the studied indicators increase; these include the central part of the park. In the leafless period, a large area of the road and path covering increases the degree of aggressiveness. In summer and spring, background plantings come to the fore, but their percentage is insignificant. To enhance the visual environment in the city, it is necessary to ensure diversity in the color palette of the space, avoid large clusters of straight line plantings, and carry out timely maintenance of green spaces.

Key words: visual visible fields, the degree of aggressiveness of the landscape, landscape picture, saccade, aggressive field, homogeneous field.

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Author:

Y. V. Stanislav, Postgraduate student, https://orcid.org/0000-0003-2902-966X

Ural State Forestry Engineering University, 37 Sibirskiy trakt St., Yekaterinburg, Russia, 620100

yaroslava.stanisvav@yandex.ru

Original article
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THE ASSESSMENT OF BREEDING RESOURCES OF STUD HORSES IN THE UDMURT REPUBLIC

Svetlana P. Bass✉, Aleksander I. Lyubimov, Elena M. Kislyakova
Udmurt State Agricultural University, Izhevsk, Russia
✉sveta.bass@inbox.ru

Abstract. The research purpose was to assess the state of the pedigree stock of horses of stud breeds in the Udmurt Republic. To achieve this goal, the following tasks were defined: to analyze the dynamics of the total number of stock in the republic, to study the breed and class composition of the stock of horses of stud breeds. The study was conducted on horses of the Russian heavy draft breed (58 heads), the Orlovsky trotting breed (30 heads) in breeding enterprises of the Udmurt Republic: OOO Druzhba of Uvinsky District, Udmurtskaya State Stable Farm with a hippodrome. The research was based on data from the Territorial Authority of the Federal State Statistics Service for the Udmurt Republic, primary zootechnical records, database of the All-Russian Research Institute of Horse Breeding Koni-3, and our own research. An analysis of the dynamics of the stock number for 19 years showed that the quantitative composition changed from year to year along a decreasing trajectory from 12,600 heads in 2004 to 2,600 in 2023. At the date 01.01.2023 Udmurtskaya State Stable Farm had 29 stallions-producers of four breeds, where the largest share in the stock structure was occupied by representatives of the Russian heavy draft breed – 62 % (18 heads), Orlovsky trotting breed – 24 % (7 stallions). 85.7 % of producers were assessed as elite class, however, the measurements of the stallions-producers were inferior to the standard indicators established for the breeds. The linear composition of stallions of the Russian heavy draft breed in the Udmurtskaya State Stable Farm is quite diverse, the stock is represented by five lines: Gradus, Podenshchik, Rubin, Rubikon, Svist. The existing composition of the Druzhba breeding stud farm is represented by 4 stallions-producers belonging to three lines: Rubikon, Gradus and Kovarny. Stallions are not inferior to the breed standard in all measurements, except for the oblique body length by 2.4 cm. The mares of the stud farm correspond to the breed standard in measurements and indices. The breeding stock of the Orlovsky trotting breed at 01.01.2024 was represented by twenty mares of different ages, but relatively young. The age limits of mares are between 3 and 19 years. The group of mares belong to 4 lines – Pion, Pilot, Otboy, Barchuk, 85 % of the breeding stock belongs to the elite class.

Key words: pedigree horse breeding, stud breeds, Russian heavy draft breed, Orlovsky trotting breed, measurements and indices, lines.

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Authors:

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

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

E. M. Kislyakova, Doctor of Agriculture Sciences, Professor, https://orcid.org/0000-0002-2802-2354

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

✉sveta.bass@inbox.ru

Original article

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RESULTS OF BEE COLONIES WINTERING WITH THE USE OF CHELATED VITAMIN-MINERAL FEEDINGS

Svetlana L. Vorobieva[1] ✉, Ekaterina A. Mikheeva[2],

Alexander V. Shishkin[3], Marina Yu. Popkova[4]

[1,2,4]Udmurt State Agricultural University, Izhevsk, Russia

[3]Production Company Izhsintez-Khimprom, Izhevsk, Russia

[1]vorobievasveta@mail.ru

Abstract. The research purpose was to study the effect of a feed additive consisting of mineral components, water-soluble and fat-soluble vitamins in chelated form on the state of bee colonies after wintering. The studies were carried out on 4 experimental groups, selected by the method of pairs-analogues during 2021–2024. The analyzed groups were located on the territory of Zavyalovsky district in the Udmurt Republic under the same climatic conditions during the calendar year. When performing the experiment, we analyzed changes in the strength of bee colonies after wintering, the consumption of feed honey during wintering, and the safety of bee colonies during the winter keeping. There was the difference in using feed additives of various dosages and a chelated form of feed in the experiment. The use of a chelated feed additive in the maximum dosage for three years leads to maximum wearing out of the bodies of worker bees and leads to the death of bee colonies and their weakening. The best option for chelate-vitamin feeding has proven to be a dosage of 0.25 ml per 0.5 liter of liquid sugar syrup, and as for the dry mixture – 0.5 g per 0.5 liter of sugar syrup. When comparing the use of a chelated feed additive and the traditional one used in the first group, the best result was in this group. The first experimental group had a maximum indicator of 6.5 of between-frames space, which is more than in the control and in the 3rd groups by 0.7 and 1.9 of between-frames space, respectively.

Key words: chelate compounds, wintering, winter hardiness, bee colony, feed consumption, colony strength, feed additive, vitamin, minerals.

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Authors:

S. L. Vorobieva[1] ✉, Doctor of Agricultural Sciences, Professor, https://orcid.org/0000-0001-5640-3472;

E. A. Mikheeva[2], Candidate of Veterinary Sciences, Associate Professor, https://orcid.org/0000-0002-9274-5856;

A. V. Shishkin[3], Doctor of Medical Sciences, Leading Chemist Developer, https://orcid.org/0000-0001-9720-5042;

M. Yu. Popkova[4], Postgraduate student, https://orcid.org/0009-0006-3492-537X

[1,2,4]Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069

[3]Production Company Izhsintez-Khimprom, 2 Ordzhonikidze St., Izhevsk, Russia, 426063

[1]vorobievasveta@mail.ru

Original article

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FORMATION OF GROWTH AND DEVELOPMENT IN YOUNG PIGS IN THE GROWING PERIOD DEPENDING ON GENOTYPE

Oksana A. Krasnova✉, Elena P. Kirillova

Udmurt State Agricultural University, Izhevsk, Russia

✉krasnova-969@mail.ru

Abstract. The scientific experiment was conducted in the Kigbaevsky Bacon pig-breeding complex of LLC Vostochny in Sarapulsky district of the Udmurt Republic. The research purpose was to study the influence of genotype on the formation of growth and development of gilts and boars during the period of completion of growing in the conditions of industrial technology. The young pigs of different genotypes were the object of the study. Depending on the genotype and sex of young pigs, taking into account live weight and health of the animals, six groups of young pigs were formed at the age of 27 days with 30 pigs in each group: the control group I (YxY) – purebred Yorkshire gilts; the experimental group I (YxL) – gilts obtained from crossing purebred sows of Yorkshire breed with purebred boars of Landrace breed; the experimental group II (YxL) xD – gilts obtained from crossing F1 sows inseminated with purebred boars of Duroc breed; the control group II (YxY) – purebred Yorkshire boars; the experimental group III (YxL) – boars obtained from crossing purebred Yorkshire sows with purebred Landrace boars; the experimental group IV (YxL)xD – boars obtained from crossing F1 sows inseminated with purebred Duroc boars. Dynamics of live weight gain of young animals in the growing period was determined by weighing in the morning, before feeding, before the experiment and at the end of the experiment; average daily, absolute and relative gains in the period of completion of growing were determined by calculation. The research findings indicate that application of combination of genotype (YxL) xD in experimental groups II and IV has the maximally positive effect on the live weight increase, average daily, absolute and relative gains, that is reliably confirmed by live weight of gilts of 42.3 kg and boars of 42.7 kg; average daily gains of 599 g and 603 g; absolute gains of 35.8 kg and 36.19 kg; relative gains of 146.7 % and 147.0 %. To complete the research and establish the meat qualities of fattening boars, growth and development of replacement gilts, it is advisable to continue research work.

Key words: genotype, gilts, boars, period of completion of growing, live weight, average daily gain, absolute gain, relative gain.

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Authors:
O. A. Krasnova✉, Doctor of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-0304-512X;
E. P. Kirillova, Assistant
Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069
✉krasnova-969@mail.ru

Original article
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DETERMINATION OF THE WASHING EFFICIENCY OF STAINLESS STEEL EQUIPMENT UNDER THE INFLUENCE OF DETERGENTS AND DISINFECTANTS ON BIOFILM

Ekaterina A. Mikheeva[1]✉, Konstantin L. Shklyaev[2],
Evgeny V. Kurteev[3], Artem L. Shklyaev[4], Mikhail R. Kudrin[5]
[1,2,4,5]Udmurt State Agricultural University, Izhevsk, Russia
[3]OOO Production Company Izhsintez-Khimprom, Izhevsk, Russia
[1]mikhkatia@yandex.ru

Abstract. One of the important stages of the production process is the organization of washing, cleaning and disinfection of surfaces of technological equipment. To carry out high-quality cleaning of equipment and work surfaces, it is necessary to use professional detergents that ensure proper removal of organic pollutants and destruction of the exopolymer matrix of biofilms. The quality of disinfection depends on the completeness of the removal of impurities. The best removal of organic contaminants before disinfection can be achieved by using high alkaline multi-component detergents. The aim of the work was to determine the effectiveness of stainless steel equipment washing when exposed to certain detergents and disinfectants on the biofilm. The biofilm was grown on 10×10 cm stainless steel plates for 10 days. Products manufactured by Production Company Izhsintez-Khimprom were used as detergents and disinfectants: Clesol NUK-15, high alkaline detergents Aquadol-std and Aquadol-std-f. The prototypes were exposed to detergents and disinfectants without mechanical actions on the surface according to the following schemes: No. 1 – washing with 1 % and 2 % solution of Aquadol-std, steam; No. 2 – washing with 1 % and 2 % solution of Aquadol-std, hot water washing; No. 3 – disinfection with Clesol NUK-15 in a concentration of 0.025 % of the active substance; No. 4 – washing with 1 % and 2 % solution of Aquadol-std-f, disinfection with Clesol NUK-15 in a concentration of 0.025 % of the active substance; No. 5 – washing with 1 % and 2 % solution of Aquadol-std, disinfection with Clesol NUK-15 in a concentration of 0.025 % of the active substance. Swab tests were carried out from the surface of the plates. The inoculation was carried out on meat-peptone agar (MPA), followed by incubation in a thermostat and CFU calculation. The visual presence of biofilm was confirmed by luminometry and reaction with 3 % hydrogen peroxide. The study showed that the

biofilm containing bacteria of the genera *Staphylococcus*, *Bacillus*, *Streptococcus* was most effectively removed from the stainless steel surface by means of washing with a 2 % solution of alkali Aquadol-std-f and Aquadol-std followed by the use of Clesol NUK-15 in a concentration of 0.025 % of the active substance.

Key words: biofilm, detergents and disinfectants, agricultural processing enterprises, stainless steel equipment.

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Authors:

E. A. Mikheeva[1] ✉, Candidate of Veterinary Sciences, Associate Professor, https://orcid.org/0000-0002-9274-5856;

K. L. Shklyaev[2], Candidate of Technical Sciences, Associate Professor, https://orcid.org/0000-0003-2458-7267;

E. V. Kurteev[3], Leading process engineer;

A. L. Shklyaev[4], Candidate of Technical Sciences, Associate Professor, https://orcid.org/0000-0001-5531-1859;

M. R. Kudrin[5], Candidate of Agricultural Sciences, Associate Professor, https://orcid.org/0000-0002-6273-4267

[1,2,4,5]Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069

[3]OOO Production Company Izhsintez-Khimprom, 2 Ordzhonikidze St., Izhevsk, Russia, 426063

[1]mikhkatia@yandex.ru

Original article
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INFLUENCE OF THE LINEAGE OF COWS ON LONGEVITY AND PRODUCTIVE ABILITIES

Anastasia O. Nikiforova
FSBEI HE Nothern Trans-Ural State Agricultural University, Tyumen, Russia
moskaljova.ao@ibvm.gausz.ru

Abstract. The genetic potential of cattle will be particularly influenced by the genealogical lines of animals. Identification of the influence of breeding lines on the duration of economic use and on the level of lactation performance is very important for further reproduction. The research purpose is to study the productive longevity of the Black-and-White cattle, taking into account their genealogical belonging. The study was conducted in the educational and experimental farm of the Nothern Trans-Ural State Agricultural University in the Tyumen region. To conduct the research, a database of displacement animals was created for the period from January 2019 to December 2021. The obtained data were processed by statistical analysis and calculated biometrically according to the method of N. A. Plokhinsky. An analysis of the disposal of animals from

the herd was carried out, in total, 887 cows were disposed during the reporting period. The main causes were limb diseases (24.7 %), breast diseases (22.2 %) and gynecological diseases (21.3 %). The cattle herd of the experimental farm of the Northern Trans-Ural SAU is represented by 3 genealogical lines: Vis Back Ideal, Montvik Chieftain and Reflection Sovering. According to the results of the study, it can be concluded that cows of the Reflection Sovering 198998 line have the highest milk productivity. The average milk yield was 6479.2 kg of milk per lactation. The total life duration in cows of the Reflection Sovering line was 5.1 years, including the duration of productive use – 3.0 lactations.

Key words: longevity, productive longevity, Black-and-White breed, cattle, lineage.

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Author:

A. O. Nikiforova, Postgraduate student

FSBEI HE Nothern Trans-Ural State Agricultural University, 7 Respubliky St., Tyumen, Russia, 625003

moskaljova.ao@ibvm.gausz.ru

Original article
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THE TENDENCY OF COMBINED METHODS DEVELOPMENT FOR SURFACE HARDENING OF MACHINE PARTS BY APPLYING MAGNETIC FIELD ENERGY

Leonid M. Akulovich[1] ✉, Vladimir G. Misko[2], Oleg S. Fedorov[3] ✉
[1,2]Belarusian State Agrarian Technical University, Minsk, Republic of Belarus
[3]Udmurt State Agricultural University, Izhevsk, Russia
[1]dekanat.fts@bsatu.by
[3]fos1973@ yandex.ru

Abstract. The most loaded machine parts are the parts that work in conjunction, as well as the surfaces of the working bodies of agricultural and construction machinery. The reliability and durability of such parts depends primarily on the ability of the surface layers of the parts to resist destruction. One of the ways of increasing the wear resistance of surfaces, creating barriers for corrosion spots, centers of fatigue microcracks is to strengthen the working surfaces of parts. To harden the surfaces of machine parts, many different surface hardening methods have been developed based on coating or changing the condition (modification) of the surface. Difficult operating conditions of machine parts usually require surface properties, which can be obtained by a combination of hardening methods, one of them is selected as the basic one, and the rest are additional. The purpose of the research is to provide a scientific rationale for the tendency of the development of combined methods for surface hardening of machine parts and its use at the stage of synthesis of methods for combined hardening of machine parts surfaces in a magnetic field. The research results justify the stepwise increasing shape of the boundary of effective areas of impact by the structural components (basic and complementary methods) of combined hardening treatment, each stage of which shows when the level of combined hardening technology achieved at this stage of development has exhausted its capabilities and is replaced by a new improved technology of the next level. It is shown that of the combined methods of surface hardening of parts in a magnetic field, the most promising ones in terms of performance are the combination of magnetic-electric hardening and fine grinding, as well as the combination of magnetic abrasive treatment and magnetic pulse hardening.

Key words: surface hardening, combined hardening treatment, cyclic productivity, laser infusion, magnetic-electric hardening, surface modification.

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Authors:
L. M. Akulovich[1] ✉, Doctor of Technical Sciences, Professor;
V. G. Misko[2], Senior lecturer;
O. S. Fedorov[3] ✉, Candidate of Technical Sciences, Associate Professor, https://orcid.org/0000-0001-6079-6897

[1,2]Belarusian State Agrarian Technical University, 99/2, Prospect Nezavisimosty St., Minsk, Republic of Belarus, 220023
[3]Udmurt State Agricultural University, 9 Studentskaya St., Izhevsk, Russia, 426069
[1]dekanat.fts@bsatu.by
[3]fos1973@ yandex.ru

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SCALAR ESTIMATION OF THE PARAMETERS FOR THE OPTIMAL SPATIAL ARRANGEMENT OF THE LIGHTING LINES IN A POULTRY FLOOR HOUSE

Tatiana R. Gallyamova✉, Daniil A. Vasiliev
Udmurt State Agricultural University, Izhevsk, Russia
✉trgall11@yandex.ru

Abstract. The article considers the poultry floor house, for its lighting N longitudinal lines of LED lamps are used. The location of the lines is characterized by the distance L between them and the height of their suspension H. The need to increase poultry productivity leads to the problem of creating an efficient energy consumption regime at an agricultural unit. The solving of the problem requires consideration of the issue of estimating the parameters of the optimal spatial arrangement of the lines L_{opt} and H_{opt}. The issues of efficient energy consumption in production are of primary importance, so this task is relevant. The purpose of the study is to evaluate the parameters of the optimal spatial arrangement of the lighting lines of the poultry floor house using a scalar criterion that does not depend on the reflected component of illuminance. We determined that the criterion could be $(E_{min})_{max}$, the maximum of minimum light intensity. We converted $(E_{min})_{max}$ into the equivalent criterion of ε_{max}, independent of the reflected component of illuminance. An algorithm for computer evaluation of L_{opt} and H_{opt} according to the ε_{max} criterion was developed. Computer calculations demonstrated the assessment of the L_{opt} and H_{opt} of the poultry house with a width of 18 m. We received an estimate of L_{opt} = 5.5 m and H_{opt} = 3.5 m, consistent with the values of L and H of the poultry house of LLC Udmurt Poultry Farm. Poultry houses of standard width b, multiple of 6 m, were examined. The results of the evaluation of the L_{opt} and H_{opt} in the form of a table were presented. The tabular dependencies of $L_{opt}(b)$ and $H_{opt}(b)$ were approximated by quadratic functions. We obtained a computer assessment of the L_{opt} and H_{opt} of four poultry houses with a width multiple of 6 m using a scalar criterion independent of the reflected component of illumination. The evaluation results were presented in the table. It has been determined that the approximation of tabular results by analytical functions makes it possible to perform an express assessment of the L_{opt} and H_{opt} of poultry houses, the width of which is in the range of 6 m $\leq b \leq$ 24 m. We can state that an express assessment adequate to computer estimation with an error of no more than 2 % may be of interest to specialists at the design stage of the LED lighting system of poultry houses.

Key words: LED lighting, illumination, energy efficiency, unevenness of illumination, criterion, express assessment, poultry floor house.

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Authors:
T. R. Gallyamova ✉**,** Candidate of Technical Sciences, Associate Professor;
D. A. Vasiliev, Senior Lecturer
Udmurt State Agricultural University, 11 Studencheskaya St., Izhevsk, Russia, 426069
✉ trgall11@yandex.ru

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RESULTS OF STUDIES OF A WHEELED SEMI-FRAME POWER UNIT WITH A FRONTALLY MOUNTED PIERCER-SLITTER

Sergey V. Shchitov, Zoya F. Krivutsa ✉, Elena S. Polikutina,
Elena V. Panova, Roman O. Surin
Far Eastern SAU, Blagoveshchensk, Russia
✉ zfk20091@mail.ru

Abstract. The agricultural machines currently used for soil slitting have one significant drawback – the impossibility of simultaneous use with other units, which would allow several operations to be carried out concurrently. This is extremely important when the processes of soil preparation and sowing are carried out almost at the same time, especially on soils with high humidity during the spring planting work. The purpose of the research is to determine the optimal parameters of interacting factors during the operation of an experimental machine–tractor unit with a frontally mounted piercer-slitter. It was necessary to identify the impact of the design and technological parameters of the proposed device on the depth of immersion of the working bodies and the change in the state of the surface layer (physical and mechanical characteristics). The experimental studies were conducted in the fields of the Zhukovin S. A. farm enterprise in the Amur region. The objects were the mass produced wheeled semi-frame tractor K-700A + BDM-6x4p and the experimental wheeled semi-frame tractor K-700A + BDM-6x4p + the front piercer-slitter. According to the research results, in order to meet the agricultural and technological deadlines for the early spring planting work, it is proposed to carry out the processes of soil slitting and subsoil tillage simultaneously with heavy disc harrows used for these purposes. This allows you to remove excess moisture to the lower horizons of the soil, prepare the soil for further sowing operations. The application of a piercer-slitter provides the possibility of slitting the soil to a depth of 0.33 to 0.42 m by adjusting the length of the outlet of the hydraulic cylinder rod from 0.55 to 0.64 m or by changing the angle of inclination of the device frame from 5.45 to 12.05°.

Key words: piercer-slitter, soil preparation, combined units, soil slitting, power device, track depth, tractor axles.

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Authors:

S. V. Shchitov, Doctor of Technical Sciences, Professor, https://orcid.org/0000-0003-2409-450X;

Z. F. Krivutsa ✉, Doctor of Technical Sciences, Professor, https://orcid.org/0000-0002-5345-1732;

E. S. Polikutina, Candidate of Technical Sciences, Associate Professor, https://orcid.org/0009-0007-1421-3321;

E. V. Panova, Candidate of Technical Sciences, Associate Professor, https://orcid.org/0000-0003-1667-7123;

R. O. Surin, Postgraduate student, https://orcid.org/0000-0002-7667-551X

Far Eastern SAU, 86 Politekhnicheskaya St., Blagoveshchensk, Russia, 675005

✉zfk20091@mail.ru