

Original article

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CHANGES IN PRODUCTIVITY AND CHEMICAL COMPOSITION OF GRASS STANDS DURING MEADOW RE-GRASSING

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Abstract. The studies on the floodplain meadow reclamation by means of biological nitrogen fixation were conducted in the floodplain of the Tavla River in the state unitary enterprise “Lukhovskoye” in Lukhovka, urban district of Saransk, Republic of Mordovia in 2018–2021. The purpose of the research is to study productivity, nitrogen fixation of the most common legume perennial grasses and their mixtures with common timothy, the chemical composition of grasses during rapid floodplain meadow re-grassing. We compared the productivity of a natural unimproved floodplain meadow and grass stands of common timothy (8 kg/ha) without fertilizers, with $R_{80}K_{100}$; $R_{80}K_{100} + N_{90} + N_{60}$, a mixture of common timothy with purple hybrid alfalfa, eastern galega and single-species crops of legume grasses with $R_{80}K_{100}$ during rapid re-grassing of a floodplain meadow. The seeding rates of alfalfa are 12 kg/ha, eastern galega – 30 kg/ha of seeds with one hundred percent sowing validity. The mixtures had the seeding rate 30 % of the norm used in single-species sowing in cereal components, and 70 % in the bean components. The timothy-alfalfa mixture and alfalfa provided the maximum productivity – 8.39–7.83 t/ha of dry matter and 1549–1478 kg/ha of crude protein on average for the years of research. The predominant content of crude protein in the dry matter was in alfalfa (19.8 %) in the first mowing, and in the second – in its mixture with timothy (18.3 %), and the content of crude fiber was in timothy without fertilizers in the first and second mowings (34.9 and 34.5 %). Alfalfa (3.30 and 2.93 %) and plants from a natural meadow (3.24 and 3.18 %) in the first and second mowings, and eastern galega (3.34 %) in the first mowing contained the largest amount of potassium. The timothy-alfalfa mixture (1.81 and 2.0 %) and single-species alfalfa sowing (1.88 and 1.76 %) in the first and second mowings had the maximum concentration of calcium.

Key words: meadow, perennial grasses, fertilizers, productivity, protein, fiber, potassium, calcium.

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Original article

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EFFECT OF PLANTING MATERIAL AND CHELATED MINERAL FERTILIZATION ON THE ONIONS PRODUCTIVITY

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Abstract. The essential items for increasing the productivity of vegetable crops are the high-quality planting material and the use of complex fertilizers. The onion is one of the widespread vegetable crops. It is very demanding on soil fertility and therefore, in order to obtain a high yield of bulbs of good quality, it is necessary to apply fertilization in a form accessible to plants. Water-soluble complex fertilizers quickly penetrate plants, improve plant growth conditions, increase productivity and positively affect the quality indicators of the products obtained. The purpose of the research is to compare the responsiveness of onions to technological methods. The research was conducted on the territory of settlement Italmas in the Zavyalovsky district of the Udmurt Republic. The soil of the site was sod-medium podzolic medium loam, it was characterized by a low humus content (2.12–2.14 %), and the degree of acidity was close to neutral. The base saturation percentage is high. The soil supply with mobile phosphorus is very high (323–325 mg/kg), and with exchangeable potassium is higher than normal (141–145 mg/kg). The soil conditions were suitable for growing onions. The application of Aquarin and Rastvorin fertilizers was studied for planting seed onions of different sizes (bulb diameter: I fraction – 0.7–1.4; II – 1.5–2.2; III – 2.3–3.0 cm). The results of the conducted research proved the positive effect of Aquarin and Rastvorin fertilization during planting the seed onion of the third fraction on the total and commercial yield of onions on average for the period 2020–2021. The studied factors had an ambiguous effect on the quality indicators of onion products. In both years of research, the accumulation of dry substances in the bulb of onions was found when planting a small fraction of the seed onion, fertilization did not affect this indicator. There was a significant increase in nitrates in bulbs for small planting material and a decrease in the planting of a large seed fraction in 2021.

Key words: productivity, onion, seed fraction, fertilizers, open ground, quality indicators, Udmurt Republic.

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Original article

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SOWING QUALITIES OF SEEDS IN THE YIELD OF VARIETIES OF CENTRAL RUSSIAN MONOECIOUS HEMP AT DIFFERENT SEEDING RATES IN THE MIDDLE CIS-URAL REGION

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Abstract. The article presents experimental data on the change in the sowing qualities of seeds in the yield of varieties of Central Russian monoecious hemp Nadezhda, Vera and Surskaya, depending on the norm of sowing in cultivation technology for dual use. The studies were carried out on soddy medium podzolic middle loamy soil in 2020–2022. A change in the laboratory germination rate of seeds of hemp harvest of 2020–2022 depended on abiotic conditions by 85.8 %, on the seeding norm by 4.3 % and on the variety by 0.1 %. Soil and meteorological conditions in 2021 and 2022 caused the formation of seeds of hemp varieties with higher laboratory germination by 15–20 % and 13–19 %, respectively, relative to this indicator in 2020. Under abiotic conditions of the vegetation period of 2021 with its length of 118–122 days, hemp varieties formed seeds with a weight of 1000 pieces greater by 2.0–2.4 and 2.1–2.8 g, with germination energy – more by 17–24 % and 9–11 % than similar indicators obtained in 2020 and 2022, respectively. On average for three years of research the hemp variety Nadezhda had seeds with weight of 1000 pcs greater by 0.7–1.0 g compared with this indicator in other varieties. The seeds of hemp varieties provided the largest mass of 1000 seeds (14.2 g) and germination energy (73 %) at a seeding rate of 0.4 mln pcs/ha regardless of the variety. The best laboratory germination of seeds in the varieties Nadezhda (91 %) and Vera was obtained at a seeding rate of 0.4 mln pcs/ha, in the variety Surskaya (89 %) – at seeding rate of 0.4 and 0.8 mln pcs/ha.

Key words: monoecious hemp, variety, seeding rate, germination energy, laboratory germination.

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Original article

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CREATION OF HIGHLY PRODUCTIVE GRASS STANDS OF PERENNIAL RYEGRASS AND FESTULOLIUM WITH LEGUME CROPS

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Abstract. The relevance of research is determined by the necessity of control the production process of perennial forage grasses by means of formation of simple and complex agrocenosis providing high productivity. The research purpose is to create an optimal species composition of mixed crops of perennial grasses with high forage productivity. The research was carried out in the educational, scientific and production complex «Agrotechnopark» of Udmurt State Agricultural University. The soil of the experimental plot was soddy-medium podzolic, medium loamy. The humus content was average; the acidity of the soil solution was close to neutral; the amount of absorbed bases was excessive in 2019 and high in 2020–2021; the degree of base saturation in soil was high. The content of mobile phosphorus and mobile potassium was very high in 2019 and high in 2020–2021. The studied agrocenosis included the following crops and varieties: perennial ryegrass (*Lolium perenne* L.) – Weimar variety, festulolium (*Festulolium* F. Ascherset Graebn) – Izumrudny variety, cat’s clover (*Lotus corniculatus* L.) – Solnyshko variety, variegated alfalfa (*Medicago x varia* Martyn) – Nakhodka variety, white clover (*Trifolium repens*) – Volat variety. According to the results of studies of agrocenosis based on cereal grasses with leguminous grasses, their botanical composition during the period of use and feed productivity in the third year of use, it can be concluded that the cultivation of double mixtures, including perennial ryegrass and/or festulolium and variable alfalfa with a productivity level of 100.9–105.0 GJ/ha of metabolic energy is effective. Triple mixtures, including perennial ryegrass and/or festulolium with alfalfa and cat’s clover, are superior to other agrocenosis in productivity with level of 102.7– 105.6 GJ/ha of metabolic energy.

Key words: perennial grasses, mixed crops, botanical composition, forage productivity.

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Original article

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CULTIVATION OF WINTER RYE IN THE CENTRAL NON-CHERNOZEM REGION

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Abstract. The article analyses the results of cultivation of winter rye hybrids in conditions of Moscow region on sod-podzolic soils. The study examined the effect of microfertilizers on the productivity of winter rye hybrids (Ravo, ZU Forzetti, Eterno (factor A); factor B – options of treatment with agrochemicals (Folirus Active, Folirus Maxi, Lebozol-complete, ArksoilKKR). The results of two-year studies revealed an increase in yield structure and yield indicators for all variants of winter rye with the application of agrochemicals. It is noted that in the period of December 2022 – February 2023 there were unfavorable conditions for overwintering of winter rye in the region, a negative natural phenomenon of ice crust in crops was observed which significantly reduced the safety of grain plants during the resumption of spring vegetation. During the winter period of 2022–2023, rye damage ranged from 28.7 % to 48.8 %, the best survival rate was found to be for variants of the ZU Forzetti hybrid. High yields were found on plots with hybrid ZU Forzetti. The maximum yield was obtained in the variant ZU Forzetti + Folirus Active (4.14 t/ha). As for other hybrids, high yields were achieved in variants: Ravo + Folirus Active (3.57 t/ha), Eterno + Folirus Active (3.26 t/ha), Ravo + Folirus Maxi (3.16 t/ha), Eterno + ArksoilKKR (3.03 t/ha). The analysis of the qualitative indicators revealed that the protein content varied between 9.4–11.5 % for the variants, lower indicators were found in the hybrid ZU Forzetti (9.4–9.9 %), high – in Eterno (10.5–11.5 %). The winter rye hybrid ZU Forzetti showed greater economic efficiency, both in the variant without treatment, and in variants with treatment with all the studied agrochemicals.

Key words: winter rye, Central part of the Non-Chernozem zone, agrochemical, crop yield, grain quality, economic efficiency.

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Original article

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IMPROVEMENT FEASIBILITY OF FELLINGS OF MATURE AND OVERMATURE PLANTINGS IN POTENTIAL CEDAR FORESTS

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Abstract. The proposals are made for the improvement of fellings of mature and overmature plantings in the Western Siberian middle taiga plain forest area of the Khanty-Mansiysk Autonomous Region – Yugra. They were based on the six sampling areas laid out in 130–140 year old secondary plantings with three units of Siberian stone pine (*Pinus sibirica* Du Tour) in the stand composition. It has been established that stands of green moss and green moss berries forest types in above mentioned age have a good sanitary condition and high relative density. This fact provides the possibility to recommend to refuse from localized clear fellings replacing them with two even gradual fellings and leaving behind a tree stand with a relative density of at least 0.5 after the second thinning. The above will ensure the stability against wind for the cedar trees left for further cultivation. The fellings are recommended to be carried out in winter using the wide-swath technology with the placement of logging residues on skidding trails in order to prevent damage to the roots of the remaining parts of the tree stand. These fellings will make it possible to harvest a significant amount of mature wood, to preserve the ecological functions of the plantations and reshape them into native pine forests. The latter will be greatly facilitated by the population of cedar undergrowth from 1.3 to 4.4 ths. pcs/ha (in terms of large ones). The conducting of these fellings does not contradict the current standards of the regulatory documents on felling of mature and overmature plantings.

Key words: potential cedar forests, fellings of mature and overmature plantings, Siberian stone pine, undergrowth, even gradual felling.

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MATHEMATICAL MODELLING OF THE IMPACT OF FOREST STRIPS, SHRUBBY BELTS AND FERTILIZERS ON THE PRODUCTIVITY OF PASTURE LANDS IN THE STEPPE ZONE OF THE VOLGA REGION

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Abstract. The purpose of the study is to increase the productivity of pastures by applying the protective forest plantations and fertilizers. The regularities of formation of the pasture grass harvest reflected the influence of the humidification of the year, protective forest plantations and fertilizers. During the dry years of 2018 and 2019, the impact of nitrophos on grass productivity was less than on plantations, up to 44.0 %, during the wet years of 2021 and 2022, the influence of nitrogen and phosphorus increased as compared with plantations up to 77.0 %, which was due to a sufficient amount of moisture in the soil. The productivity of grasses while applying forest reclamation and agrochemical techniques was higher than in the control by an average of 81.6 %, and in dry years it increased up to 200 %. The use of fertilizers on pastures with the forest strips and shrubby belts reduces the coefficient of water consumption by grasses compared to open landscapes by 32.6 %, and in dry years this indicator reaches 62.6 %. The studies have found that productivity and water consumption of grasslands are associated with the use of forest reclamation and agrochemical techniques for 87–98 %. The best and complete absorption of fertilizers occurs in wet years, therefore, phosphorus and nitrogen are recommended to be applied in a higher dose than in dry years – up to 60 kg/ha of each $N_{60}P_{60}$. The maximum efficiency of fertilizer application was recorded in pastures with forest strips and shrubby belts.

Key words: pastures, grass productivity, protective plantings, water consumption, fertilizers, modelling, steppe zone of the Volga region.

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VOLUMES OF WOOD HARVESTING DURING CLEAR AND SELECTIVE FELLINGS OF MATURE AND OVERMATURE PLANTINGS

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Abstract. The article analyzes the volumes of possible harvesting when carrying out clear and alternate strip gradual fellings in the secondary soft-wooded broadleaved plantings by the example of one of forest fund areas rented by the JSC «Uvadrev-holding» for timber harvesting. According to the analysis of electronic databases of forest management materials, it was established that commercial forests amounted to 64.2 % of the total rented area 43 808 ha. Mature and overmature plantations amounted to 49.0 % of the areas covered with forest vegetation in commercial forests without specially protected areas; these plantations were dominated by birch forests in terms of area and volume stand, 83.0 and 81.0 % respectively. Secondary birch and aspen plantations were formed on the site of indigenous coniferous in the most potentially productive forest types: linden, wood sorrel, goutweed, broad-leaved grasses. In this case, the secondary plantings have relative density mainly 0.6–0.8. Replacing clear fellings with alternate strip gradual ones in the secondary soft-wooded broadleaved plantations will not lead to a reduction in the amount of forest use. In that way, the calculated cutting area, with conducting two alternate strip gradual fellings with a thinning interval in 10 years will allow to increase the calculated area by 69.9 % compared to the current one. In addition, the introduction of selective felling, in particular strip gradual felling, will lead to the timely development of protective forests, provided that their protective functions are preserved.

Key words: forest management, fellings of mature and over-mature plantings, clear cutting, strip gradual felling, calculated cutting area.

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EFFICIENCY OF AFFORESTATION USING INTRODUCENTS IN THE SANITARY PROTECTION ZONE OF ASTANA

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Abstract. The article analyzes the effectiveness of using introduced species during afforestation in the sanitary protection zone of Astana on the base of electronic databases of forest management materials and the results of authors' studies. It is noted that forest crops older than 10 years are represented by ten species. Plantings of Siberian elm, Scots pine and silver birch dominate among these artificial plantings. The high preservation of older forest crops is explained by their creation on forest suitable soils. At the same time the lack of rejuvenation measures led to the drying out of 61.8 % of all planted Siberian elm plantations. Due to the efforts of scientists and practitioners the assortment of species used in afforestation has more than doubled over the past 10 years. In addition, earlier 28 % of all old forest plantings died out, but now only 5 % of created forest plantations has been failed over the past 10 years. The forest plantations began to be created not only on suitable but on relatively and conditionally suitable soils. Besides, an original method of rejuvenation shrubs has been proposed that minimized the costs of manual labour when carrying out the work.

Key words: sanitary protection zone, the city of Astana, afforestation, introduced species, preservation, species diversity.

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EVALUATION OF THE DEVELOPMENT OF DOUGLAS FIR (*PSEUDOTSUGA MENZIESII* (MIRB.) FRANCO) IN THE CONDITIONS OF THE FOREST-STEPPE REGION IN THE EUROPEAN RUSSIA

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Abstract. To solve the problems of preserving the ecological potential in the protective forests of the forest-steppe region of the European part of Russia, it is envisaged to develop and apply technologies that ensure the preservation of the ecological functions of forests and their biological diversity, where the introduction of introduced species is allowed during afforestation. In order to study the state and development of the Douglas fir in the Voronezh region, studies were conducted at the sites of Semiluksky Collection Arboretum, Ostrogozhsky Forestry and Khrenovsky Forestry College. The results revealed high taxation indicators and a healthy vegetal condition of the breed with a slight degree of damage. In terms of decorative value and gas resistance, this species is superior to spruce. The obtained assessment of the vital condition of the species coincides with the assessment of pest resistance, and Douglas fir should be classified as resistant species, in contrast to the heavily damaged European spruce. The plantation of the Khrenovsky Forest College has the underestimated age indicators, taking into account the poorer type of growing conditions and the population origin of the seed material. The relevant conclusions are drawn: on the base of the conducted research and planned future studies of the ecological and biological potential of the species, it is necessary to ensure its introduction in order to obtain sustainable biodiversity in landscaping and agrarian landscapes of the forest-steppe and steppe zones of the south of the Russian plain. When creating forest plantations, it is necessary to focus on the width of the row spacing of 3.5 m, placing it at the age of 40 years in a row 3 m from the usual planting step of 0.7 m by means of improvement cuttings.

Key words: area, height of the tree, diameter of the trunk, introduction, timber volume, Douglas fir.

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DYNAMICS OF THE FRACTIONAL COMPOSITION OF THE FOREST LITTER IN ARTIFICIAL PINE PLANTATIONS CREATED ON THE ABANDONED CLAY QUARRY

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Abstract. The article analyzes the dynamics of the fractional composition of the forest litter in the conditions of the middle Ural taiga forest region by the example of artificial pine plantations created during the reclamation of worked-out clay quarries. The study is based on the method of trial sites. Ten registration plots of 0.1×0.1 meter size were laid on each of the 11 trial sites. After the gathering of forest live cover and forest litter on the registration sites, they were dried to an air-dried basis and then the forest litter was sorted into fractions: cones, needles, branches, rags, dust. Then each of the forest litter fractions was dried out in drying ovens at a temperature of 1050 to an absolutely dry state. It was found that the total mass of plant community in an absolutely dry state varied from 1 kg/ha in 23-year old pine forests to 1050 kg/ha in 13-year old ones. At the same time the mass of the forest litter increased from 7042 to 28 544 kg/ha over the same period. The share of different fractions in forest litter varies significantly with the age of the stands. The canopy of 18-year old plantations lacks the cone fraction, but at the age of 46 years their mass achieves 7358 kg/ha with a share in the forest litter 18.8 %. Data on the dynamics of phytomass and fractional composition of the forest litter can be used while designing and carrying out the silvicultural and fire prevention measures.

Key words: clay quarry, disturbed lands, reclamation, forest plantations, forest litter, fractional composition.

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Original article

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PRODUCTIVITY AND BIOLOGICAL CHARACTERISTICS OF HORSES OF NATIVE BREEDS IN THE CONDITIONS OF THE UDMURT REPUBLIC

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Abstract. The research aims to study the milk productivity and biological characteristics of mares from native breeds of different ecological groups in the Udmurt Republic. To conduct the research the entire herd was divided into three groups based on their ecological group origin. The first group included horses of forest type (Vyatka breed), the second – mountain type (Novoaltaiskaya breed), the third – steppe type (Bashkir breed). A comparative assessment of exterior features was conducted; the milk productivity of native mares, the physical and chemical composition of their milk were studied; the reproductive qualities of mares were evaluated. All indices were calculated using standard zootechnical methods. Milk productivity was measured through monthly control milkings. The research revealed that the clinical scores and blood biochemical analysis in mares of all native breeds were within the physiological range. The comparative assessment of the external characteristics of the aboriginal breeds defined that the Novoaltaiskaya mares were the largest ones, their withers height and chest girth were 148.3 and 186.7 cm, that is higher than those of the Vyatka and Bashkir mares by 2.1–5.7 %, respectively ($P \geq 0.99$). The Vyatka breed had high results in total and actual milk yields, which were 3143 and 1047.7 litres, respectively, which is lower by 10.9 % than the Novoaltaiskaya and higher by 10 % than the Bashkir breeds specialized in dairy horse breeding ($P \geq 0.95$). The qualitative characteristics of milk productivity, in particular the mass fractions of fat and protein, vary from 1.15 to 1.34 % and from 1.91 to 2.02 %, respectively, with insignificant differences between the breeds. The acidity of the milk does not exceed the requirements of the national standard. The tendency of the highest milk production is observed in the colostrum milk yield of Novoaltaiskaya mares, its actual volume was 10.7 litres for the three-day period, with a clear characteristic dependence of its increase from the first to the third day. The colostrum milk yields of Vyatka and Bashkir mares were lower by 1.8–1.9 litres than that of Novoaltaiskaya mares ($P \geq 0.99$). Bashkir mares had the worst reproductive performance, with a foaling percentage of 66.7, which was lower by 23.3–33.3 % than the other two analyzed groups.

Key words: native breed of horses, Vyatka breed, Bashkir breed, Novoaltaiskaya breed, milk production, clinical scores, measurements, biochemical analysis of blood.

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IMPLEMENTATION OF GENOMIC PROGNOSIS OF MILK PRODUCTIVITY IN DIFFERENT TECHNOLOGICAL CONDITIONS

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Abstract. Nowadays genomic evaluation indices are used when selecting animals for herd reproduction, which allow predicting their breeding value at an early age. Ultimately, using the results of genomic evaluation, it is possible to select animals, to form technological groups that provide the maximum profit and efficiency of the herd. In this regard, the study of the influence of different technological conditions of milk production on the implementation of the genomic prognosis of dairy cattle productivity is of scientific and practical interest. The research was carried out in JSC «Oshmes» of the Sharkansky district of the Udmurt Republic in 2022–2023. The study was conducted on the Holstein heifers with the results of a genomic assessment in the number of 73 heads. The results of the conducted research revealed that under different technologies of animal management and milking used at the enterprise, the realization of the breeding value of milk yield and the mass fraction of protein in milk is almost the same and is at the level of 126.5–129.6 % and 98.3–98.6 %, respectively. Significant differences between the animals of the compared groups were obtained by the mass fraction of fat in milk. The percentage of realization of the breeding value of fat content in the first-calf cows under tethered keeping and pipeline milking is higher by 4.6 % compared to the first-calf cows under loose keeping and parlor milking at the Europaralel installation. During tethered keeping and pipeline milking the realization of breeding value was significantly higher in animals that had a negative prognosis of breeding value, and amounted to 138.9 % versus 128.7 % with non-tethered technology.

Key words: genomic assessment, breeding value, heifers, first-calf cows, dairy productivity, management technology.

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BIOCHEMICAL BLOOD INDICATORS AND MEAT PRODUCTIVITY OF PIGS DEPENDING ON THE FEEDING CONDITIONS DURING THE REARING PERIOD

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Abstract. The scientific experiment was conducted at the pig breeding complex “Vostochny” in the Zavyalovsky district of the Udmurt Republic. The research purpose was to study the effect of the various complete compound feeds on the biochemical blood parameters of piglets during the rearing period and their meat productivity. The research targets were piglets of two-breed sows (Yorkshire x Landrace) and boars of the Duroc breed. Three groups of animals (a control group and two experimental ones, with 80 animals in each group) were formed for rearing period at the age of 28 days, depending on the feeding scheme with complete compound feeds for pigs (SPK). During the feeding in rearing period we determined live weight, average daily gains, biochemical blood parameters of animals: total protein, g/l; albumin, g/l; AlAT (alanine aminotransferase), u/l; AsAT (aspartate aminotransferase), u/l; alkaline phosphatase, u/l. The research results allow us to note that the application of complete compound feeds SPK-4 and SPK-5 in experimental group 1 has a positive effect on live weight, average daily gains of three-breed hybrids (YxL)xD, which is reliably confirmed by a live weight of 29.4 kg and average daily gains 440 g, by the results of biochemical parameters in blood serum: total protein 74.8 g/l and albumin concentration 35.02 g/l. The highest amount of AlAT in blood serum 45.12 u/l is observed in experimental group 2, which is significantly higher by 5.9 % than in the control group. The maximum amount of AsAT (56.9 u/l) is registered in experimental group 2 at 80 days of age, which is significantly higher by 12.4 % than in the control group and significantly higher by 11.1 % than in the experimental group 1. At the end of experiment by the age of 80 days, the animals showed a decrease in the alkaline phosphatase index, the highest index of 150.9 u/l was observed in experimental group 1, which may indicate an increase in the growth activity of the animals. To establish the meat qualities of fattening animals, it is advisable to continue the research.

Key words: three-breed hybrids (YxL)xD, rearing period, types of complete compound feeds, total protein, aminotransferases, alkaline phosphatase, live weight, average daily gain.

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ASSESSMENT OF IMPACT OF THE LINE AND SELECTION METHODS ON THE DAIRY PRODUCTIVITY OF COWS WITH DIFFERENT MANAGEMENT SYSTEMS

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Abstract. Line breeding is currently a key issue for increasing the dairy productivity of animals in breeding farms. The selection of animals for breeding plays an essential role in preserving and increasing qualitative economic and beneficial characteristics, which makes it possible to select the most valuable individuals for further breeding. The research purpose was to determine the effect of selection on the productive qualities of cows, taking into account their linear origin. The research was carried out on Holstein cows in the breeding plant of the Vavozhsky district of the Udmurt Republic of the agricultural complex «Kolos». The average age of the cows under study was 2.4 lactations. The study included the lines of Reflection Sovering, Vis Back Ideal and Montwick Chieftain. The research results revealed that the milk yield of cows of intraline selection was higher than with interline selection and amounted to 9322.5 kg. In case of intraline selection the Reflection Sovering line had the highest milk yield (9728.82 kg), and in case of interline selection the cross of Vis Beck Ideal x Reflection Sovering lines – 9359.42 kg. The Vis Back Ideal cows of the intraline selection had the best productivity result with a loose-cubicle keeping method, and in case of interline selection the cross of Vis Back Ideal x Seiling Tridejune Rocket lines had the best milk productivity – 9857.42 kg. The results of the evaluation of the dairy productivity of cows with different linearity coefficients in the process of breeding animals of the Vis Back Ideal line indicate that it is necessary to focus on the linearity coefficient from 62.5 % to 100 %, since there is an increase in productivity. The Montwick Chieftain line had the best result with an interline selection with a linearity coefficient of 25 % – 9105.2 kg. The cows of the Reflection Sovering line had the best productivity with a linearity coefficient of 62.5 % – 9643.8 kg.

Key words: cattle, line, intraline selection, interline selection, milk productivity, management method, linearity coefficient.

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PRODUCTION TECHNOLOGY FOR THE FUNCTIONAL DAIRY DESSERT

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Abstract. To reduce the negative impact of harmful environmental factors on the human body, it is necessary to introduce functional food products into the diet. Of particular interest is the creation of dairy desserts with functional ingredients, the amount of which in such products should be from 10 to 50 % of the daily requirement. We have developed technologies for the production of functional products based on the dairy dessert “Whipped Cream” in two directions: with a sedative effect using mint extract and a vitamin premix, as well as with an antioxidant effect using carrot extract and freeze-dried mango. The research was carried out in the following stages: selection of ingredients for the product being developed, development of prototypes; carrying out calculations on the content of vitamins in prototypes of dairy desserts, assessing the quality of the finished product. Experimental samples of the dessert were produced using classical technology, but taking into account the technological properties of the added components. The mint extract and vitamin premix were added to the cream after pasteurization and cooling, so that water-soluble vitamins were not destroyed by high temperature, the carrot extract and freeze-dried mango were added to the cream before pasteurization, so that the fillers were also heat-treated, since vitamins A and E are heat-stable. The functional dairy dessert “Whipped Cream” with a sedative effect contained the greatest amount of vitamins B1 – 17.44 % and B12 – 10.50 %, and the dairy dessert with an antioxidant effect contained the most of vitamin A – 12.80 % of the daily requirement. The developed products met existing requirements in terms of organoleptic and physicochemical indicators, and also received high scores in the tasting assessment, which indicates that the product will be in demand among buyers.

Key words: functional product, functional ingredient, dairy dessert, carrot extract, freeze-dried mango, mint extract, vitamin premix.

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Original article

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ANALYSIS OF THE LAMBS SURVIVABILITY OF ROMANOV BREED UNDER DIFFERENT BREEDING METHODS IN THE PERM REGION IN WINTER

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Abstract. The advantages of Romanov sheep are their prolificacy, polyestricity, and tolerance to the keeping conditions. The conducted research has shown that in the conditions of large sheep breeding enterprises it is difficult to create conditions for maintaining a high level of survivability of young animals at multiple lambing. The analysis of the results shows that lambs born in single- and 2–3-fetus lambings have the best indicators of survivability and average daily body weight gains. The survivability of lambs in single-fetus lambings with weaning in 60 days was 98 %, in 2–3-fetus lambings it was at the level of 93 %. The average daily body weight gain of lambs at the time of weaning from ewes was at the level of 141 g for single-fetus lambings, 117 g for twin lambings and 119 g for triple lambings. Lambs of the 4-fetus and more lambings showed survivability and body weight gains significantly lower: 68 % with an average daily increase of 114 g. Lambs born at the same level of sheep fertility and raised with the ewe's milk substitute had a survivability level of 58 % and an average daily body weight gain of 101 g. Lambs born in 5-fetus lambings and raised under their ewes showed a survivability level of 28 %, and a body weight gain of 118 g/day. Lambs born at the same level of multiple lambing, but grown with the use of ewe's milk substitute had survivability of 22 %, and an average daily weight gain of 106 g. At the level of multiple lambing of 6 lambs and growing under the ewe, the survivability remained 26 %, with an average daily increase in body weight of 118 g, growing lambs from such lambings with the use of ewe's milk substitute showed the survivability of young animals of 22 %, with an average daily increase of 104 g. Based on the conducted research, it is recommended to organize breeding work aimed at obtaining a prolificacy of ewes at the level of 2–3 lambs.

Key words: Romanov sheep, prolificacy, the survivability of lambs, breeding methods.

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THE RESULTS OF RESEARCH ON THE OPERATION OF THE PLANT FOR THE PREPARATION OF GRAIN MOLASSES WITH A TUBULAR SHREDDER

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Abstract. Nowadays technologies for processing grain by using enzymes into liquid feeds (grain molasses), which have a high sugar content, are intensively being developed. Special installations are used for the production of such feeds. However, in order to obtain a more uniform composition of molasses, to intensify the process of its production, additional grain grinding operations are necessary, or additional grinding devices are added to the installations. The paper considers the urgent task of evaluating the operating parameters of a plant for the preparation of grain molasses with a tubular shredder. The study of the developed installation was carried out in the scientific research laboratory of Nizhny Novgorod State University of Engineering and Economics in two stages. At the first stage, the operation of the installation without a tubular shredder was evaluated. At the second stage, the influence of the diameters of the grating holes of a tubular shredder was considered. The efficiency of the installation was evaluated based on energy costs and the quality of molasses. Energy efficiency was assessed through specific energy consumption, and the quality of molasses was assessed by the number of whole grains in the sample. As a result of research, it has been found that it is better to carry out the preparation of wheat molasses using a cylindrical lattice with a hole diameter of 6 mm. In this case, the preparation time of 100 liters of molasses is 30 minutes, the specific energy consumption is 34.3 kWh/l, and the average power consumption is 5.1 kW. For the preparation of barley molasses, it is more rational to use a cylindrical lattice with a hole diameter of 8 mm. In this case, the preparation time of 100 liters of molasses is 37.5 minutes, the specific energy consumption is 39.3 kWh/l, and the average power consumption is 4.7 kW.

Key words: hole diameter, grain, molasses, quality indicator, tubular shredder, whole grains, specific energy consumption.

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STUDY OF ANTIWEAR PROPERTIES IN RECOVERY METAL MATRIX COMPOSITES

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Abstract. The paper presents the studies aimed at examination of the tribological characteristics of thin metal-matrix coatings under the conditions of limited lubrication. Two types of coatings with different metal base in contact with various antifriction alloys are considered. Metal-matrix coatings are obtained by short-pulse laser melting using a metal base - cobalt and nickel. A ceramic composition based on boron carbide was used as a hardening phase. The application of boron carbide gives a positive tribological effect, proven by numerous studies of foreign and domestic scientists. The metallic matrix of nickel and cobalt is substantiated by their special physical and mechanical properties, among which chemical resistance and thermal strength can be noted. The resulting coatings were subjected to comparative tribological tests under oil starvation conditions corresponding to boundary friction. In the process of friction, the dynamics of the evolution of the friction coefficient in a pair of friction with bronze BrAZh9-4, gray cast iron SCH-18 was studied. The conducted studies revealed the different efficiency and performance capability of the obtained coatings under dry friction conditions. Regardless of the material of the opposite element, the cobalt-based metal-matrix composite appears to be the most attractive in terms of friction coefficient. Wear tests revealed a high stability of the coefficient of friction in the dynamic load range and the absence of seizing of the contacting surfaces. The friction coefficient ranges from 0.1 to 0.2.

Key words: metal matrix coatings, scuffing resistance, coefficient of friction, oil starvation, heat resistance.

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INVESTIGATION OF THE OPERATION OF THE UPGRADED TRAY VIBRATION DISPENSER OF AVMA INGREDIENTS

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Abstract. To maximize the advantages of vibration during the intensification of technological processes, it is necessary to provide a uniform vibration load from the point of application of the vibrational impact on the entire thickness of the bulk material. The most effective way is to use elastic activators. The purpose of the research is to determine the operation patterns of the upgraded tray vibration dispenser. To conduct the research, a laboratory installation of an upgraded tray vibration dispenser with activators installed in the bottom of the tray, providing an opportunity to spread vibration evenly throughout the entire layer of bulk material, has been developed. Wheat grains of the Iren variety, the average grain size of 3.8 mm and vitamin A (beta-carotene) were used as the dosed material. The average diameter of microgranules is 0.8 mm. As a result of the research, it has been found that the use of elastic activators significantly affects the technical and economic performance of tray vibration dispensers. There is a significant increase in throughput capacity when dosing grains, with an increase in the number of activators from 6 to 18 (in increments of 6). The throughput capacity increases from 7.6 g/s to 16 g/s, it is an increase by 210 %, and when dosing beta-carotene particles with an increase in the number of activators from 6 to 18 (in increments of 6), the throughput capacity decreases from 8.2 g/s to 4.3 g/s, it is a decrease by 190 %. A study of the regularities of dosing accuracy depending on the number of activators and the average diameter of particles shows that the accuracy of dosing wheat grains varies from 0.8 % to 1.3 %, beta-carotene particles from 1.6 % to 2.4 %. The obtained results of pilot studies indicate that the introduction of activators has a significant impact on the technological performance of the dispenser, and further research is required to determine the optimal design and technological parameters.

Key words: vibration amplitude, vibration frequency, premix, AVMA, inertial property, ingredients dosing accuracy.

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