

AGRICULTURAL SCIENCES

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AGROECOLOGICAL ASSESSMENT OF THE ALFALFA VARIABLE (*MEDICAGO VARIA*) IN THE CONDITIONS OF THE UDMURT REPUBLIC

Selection of new assortments characterized by high fodder productivity and nutrition of fodder, and their introduction into production should be an integral part of modern fodder production. The aim of the work is to identify and select highly productive varieties of alfalfa adapted to the conditions of the region. The research was carried out using the Method of State Variety Testing. Alfalfa varieties were tested at Mozhginsky and Sarapul'sky state variety-testing sites in the Udmurt Republic where for the period 2008–2017 21 varieties of alfalfa were studied. Alfalfa varieties studied were of domestic selection: Uralochka, Sarga, Milena, Galia, Guzel, Vega 87, Sonata, Blagodat', Izumruda, Daria. And varieties of foreign selection: Bardin (Barenbrug holland, Holland), Galaxy, Harp (Gie GRASS, France), Luzelle (Inra-institut national de la recherche agronomique, France), Re-lax (Dif seeds a/s, Denmark). Currently, the Uralochka variety is accepted as a standard. It was developed by creating complex hybrid populations based on 17 self-fertile lines and is characterized by good regrowth in spring and after mowing period. Time-period from the beginning of regrowth to the first mowing makes 50–58 days, and up to the seeds ripen – 94–104 days. Since 2003, the Uralochka variety has been entered into the State Register of selection achievements and has been admitted to implementation over 3, 4, 9, 10 and 11 regions of the Russian Federation. At the Mozhginsky state variety-testing site with sod-podzolic soil, during the testing period the highest productivity was formed by varieties of domestic selection – the Blagodat' variety exceeded the yield of the standard variety by 51 %, and the Victoria, Taisia, Milena Varieties by 44–49 %. At the Sarapul state variety-testing site with the light gray soils, alfalfa varieties of foreign selection had also shown high yields, the surplus in respect of the standard variety made 102–161 %. Relatively high adaptability of varieties of domestic selection should be noted for those of the Victoria, Taisia and Milena which also had formed a high productivity – 9.5–13.1 t/ha of dry matter.

Key words: alfalfa varieties; feed productivity; correlation; edaphic factors.

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INFLUENCE OF THE SEASON OF THE YEAR ON REPRODUCTIVE ABILITIES OF PIGS

The pig breeding is a sector of early mature animal husbandry, which plays an important role in providing meat to the country's population. Successful management of this industry requires an increase in the number of pigs, an increase in their genetic potential and the widespread introduction of industrial technology that meets the current level of scientific and technological progress. That is, the efficiency of industrial pig farming and the level of its profitability largely depend on the proper organization of the reproduction of the herd, on the intensity of use of sows and boars. But practice has shown that a high concentration of animals in a limited area, year-round non-walking keeping pigs in the premises, fixed keeping of animals, along with a number of other factors cause changes in reproductive function. In this regard, studies have been conducted to study the influence of the season of the year on the reproductive functions of sows in the conditions of the pig-breeding complex at the «Vostochny», the Udmurt Republic. Studies have shown that in the winter and spring, repair pigs come into the hunt period earlier, the age of fruitful insemination remained 255 and 267 days, and in the summer and autumn – 271 days, respectively. It was noted that in the summer months, sows after weaning piglets come to the hunt with rather a reluctance. The highest multiple farrow is observed in sows, farrowing in the fall – 17.01 heads that is by 1.81 heads higher than the multiplicity of queens, farrowing in the spring. By the number of weak and stillborn piglets per nest, the best results were obtained in the spring and summer periods. The highest safety of piglets for weaning is observed in spring – 85.5 %, which is 12.0 % higher than in the autumn period ($P \geq 0.95$). The studies have revealed that the season of the year affects the course of the reproductive cycle of sows. Based on this, it is advisable to maximize the use of the most favorable spring period to obtain the largest number of piglets.

Key words: sow; reproduction; season of the year; multiple farrowing; safety of piglets; gestation period; service period.

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CHARACTERISTIC OF BREEDING FAMILIES IN RUSSIAN HEAVY HORSE BREED

In the last decade, in connection with the unfavorable economic situation in the country, destabilizing the development of the industry, and especially heavy horse breeding, an active process of reducing the number of the livestock began. To determine the modern genealogical structure of the breed a study of breeding families, their quantitative and qualitative composition, was carried out. The livestock from all leading farms, breeding the Russian draft horse breeds were processed. The assessment had been also carried out for the main breeding traits, as well as the progressive, stabilizing and regressing breeding families in the breed stock were determined.

Thus, it has been revealed that in terms of the severity of the type and the correctness of the exterior, the mares of the leading breeding families are approximately at the average breed level. More typical, pedigree, harmonious with the correct exterior representatives of the breed families from PKZ «Vologodsky», LLC «Druzhba». It was found that the desired breeding mares' reproductive qualities do contribute to obtaining an offspring to meet the requirements. The highest foal yield is observed for the mares of the families Soyuznitsa, Trambovka, and Salfetka.

The study of the duration data of the use the mares use of brood families made it possible to determine the relationship of this trait with the breeding advantages of the farming families.

It is to be concluded that the majority of mares with continuous fertility have proved their value in terms of breeding and should be referred to as belonging to the best breeding families.

The most durable are representatives of the Salfetka (average age of retirement 19.3), Kalina (16.7), Pal'ma (16.6) and Trambovka (16.4) breeding families.

Thus, the conclusion is to be drawn that when breeding work with the Russian heavy-draft breed is being carried out it is necessary to pay attention not only to the male lines but to improve breeding families as well.

Key words: breeding families; Russian heavy horse breed; selection; type resemblance; exterior; fertility; durability.

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CATS' AND DOGS' TREATMENT OF LYMPHOMAS

Treatment of tumor diseases in animals is always difficult due to certain features of the veterinary doctor's patients: first, the veterinarian does not have direct contact with the animal. Second, the variety of tumors that occur in cats and dogs, and third, the limited availability of scientific literature, as well as limited opportunities of the veterinary clinic and of the animal owner to diagnose neoplastic processes.

In addition, there is a restriction on surgery and medication for the treatment of lymphomas in small unproductive animals. Lymphomas in animals are always a malignant neoplasm of the hematopoietic system of the animal's body. With the help of available literature, the types of lymphoma in cats and dogs were identified, methods and lymphomas treatment scheme were described. This article discusses and analyzes methods and methods of treatment of various lymphomas in cats and dogs. It had been found that surgical treatment of lymphomas is extremely limited and ineffective, since the lymphatic system spreads throughout the body by means of lymphatic vessels and lymph nodes. The article describes the schemes of chemotherapeutic treatment of lymphoma during the «induction» period, as well as during remission. Despite a small sample of animals, it is concluded that the most optimal method of lymphoma treating for small unproductive animals is chemotherapy. The authors of the article are aware of further work to be continued in this direction, and of monitoring sick animals that is necessary.

Key words: tumors; lymphoma; general blood analysis; blood biochemistry; cat leukemia; treatment of lymphoma; chemotherapy; cytostatics; prednisone; vincristine; cyclophosphamide; induction; remission.

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EXPERIENCE OF GASTROECTOMY (REMOVAL OF THE STOMACH) IN A CAT

The treatment, including surgery, of small unproductive animals is a relatively new and rapidly developing branch of veterinary medicine that requires some clinical research, testing and study. Tumors in small unproductive animals are a frequent phenomenon, according to various literature sources, neoplastic processes account for 60–90 % of all animal diseases. Lymphomas in animals are always a malignant neoplasm of the hematopoietic system of the body. There are many types of lymphomas in cats. Lymphoma can affect almost any organ of the animal. In their practice, the authors of this article encountered a case of stomach lymphoma in a neutered middle-aged cat. In the course of clinical, laboratory and visual studies it was determined that the tumor affected 90 % of the stomach tissue, and the decision was made to completely remove the stomach (gastroectomy). After the operation, the cat was prescribed appropriate chemotherapy treatment. The article describes in detail the results of clinical, laboratory and visual studies in cats with gastric lymphoma; describes the surgical intervention. As well as a successful outcome of the operation and six months of postoperative monitoring the animal's condition.

Key words: tumors; lymphoma; cat; stomach; anamnesis; gastroectomy; general blood analysis; blood biochemistry; x-ray; ultrasound diagnostics; cytostatics.

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PRODUCTION TECHNOLOGY AND QUALITY ASSESSMENT OF KEFIR ENRICHED WITH PROPIONIC ACID BACTERIA

Currently, there is a certain interest in so-called «enriched products», usually created based on traditional products. This paper considers the production of kefir enriched with probiotic microorganisms, namely propionic acid bacteria. These microorganisms have unique immunostimulating and antimutagenic properties. They enrich products with useful organic acids and b vitamins, including vitamin B₁₂. Thus, several samples of biokefir with different ratios of starter cultures in the combined starter culture were developed. It was found that the optimal ratio of starter cultures contained 4 % of kefir starter culture and 2 % of propionic acid bacteria starter culture. The technology of production of the new product does not differ from the technology of classic kefir, except for the maturation stage, which is recommend to conduct at a temperature of 15–17 °C for 8–10 hours. Kefir enriched with propionic acid bacteria meets the requirements of regulatory documentation. It had a milky-white colour, thick consistency, slight gas formation, a peculiar smell and taste of kefir with an additional sweet and spicy taste.

Key words: kefir; enriched fermented milk products; propionic acid microorganisms; vitamin B₁₂; sourdough; kefir maturation; tasting assessment; kefir acidity; kefir thickness.

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USE OF STEADER BIFIVIT AND *LACTOFERM ECO* IN CURD PRODUCTION

The research was carried out on the influence of ferment microorganisms on the quality of curd. The research had been carried out at OJSC «Votkinskmoloko», and at the Department of Technology of Livestock Product Processing, Izhevsk State Agricultural Academy. For the research, three prototypes were formed. Sample number one based on the Bifivit starter culture, sample number two with the addition of the Lactorerm Eco starter culture, and sample number three with the addition of the KLT starter culture. The milk used for the production of cottage cheese fully meets the requirements of GOST R 52054-2003 Raw cow's milk. Technical conditions. Taste and smell characteristic of raw milk, wet white. The mass fraction of protein was 3.09 %, SOMO 8.62 %, acidity 17 °T, density 1028.0 kg/m³, somatic cells in 1 cm³ 2.36×10⁵. The curd was produced in an acidic way. The curd of the first and second samples was distinguished by a more delicate consistency, while the third sample contained protein particles. The color of all samples was white, uniform throughout the mass, and only the second sample had had a cream shade. According to the results of the tasting assessment, the highest number of points (25 points) was given to the curd of the Lactoferm Eco brew production. In terms of physical and chemical parameters, the curd of all samples meets the requirements. Thus, moisture was at the level of 75.0–79.2 %, acidity 176–181 °T. The least consumption of milk per 1 kg of product for the sample supported by the Lactoferm Eco starter culture has made 5.6 kg. Profitability level of the curd has proven to be higher on the basis of Bifivit s starter culture 28.27 %, which is 0.19 % more than that of the curd produced on the basis of Lactoferm Eco, and 0.76 % more than the third sample.

Key words: milk; curd; Bifivit starter culture; Lactorerm Eco; KLT; bifidobacteria; propionic acid bacteria; lactobacilli; concentrate of lactococci and thermophilic streptococci.

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FEEDING WHITE GIANT RABBITS AT MEAT GROWING

The problem of raising and feeding rabbits is especially relevant when using expensive compound feeds. When conducting the research, the purpose of the work was to study the effect of feeding complete-ration mixed feeds of different production on the fattening qualities of white giant rabbits. For this, three groups of rabbits were formed at the age of 45 days. The feeding rations of the rabbits of the control group included full-feed compound feed of the PZK-94-1 brand produced by the feed mill in Glazov (Udmurt Republic). Rabbits of the 1st experimental group were fed by a compound feed of the KK-90-3 brand produced by «Soyuzpishcheprom» (Chelyabinsk). The second experimental group of rabbits received compound feed of the PZK-90 brand produced by the feed mill in Bogdanovich (Sverdlovsk Region). As a result of the studies, it was determined that it is more expedient to feed young animals with PZK-90 compound feed produced at the Bogdanovich plant, which contributes to an increase in the profitability indicator up to 98.6 %, or with KK-90-3 compound feed produced by «Soyuzpishcheprom» (Chelyabinsk) when the level of profitability has reached 94.8 %.

Key words: rabbit breeding; white giant breed; feeding rabbits.

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TECHNICAL SCIENCES

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MORE ACCURATE CALCULATION AND DETERMINATION OF STRESS CONCENTRATION COEFFICIENT IN THE TRANSITIVE SECTION OF THE STEP SHAFT

Shafts are referred to the most critical parts, the failure of which usually poses a threat to an entire drive mechanism, or a machine. Failure of step shafts is often associated with the occurrence of fatigue cracks within the transition from a smaller section to a larger one. For strength calculation, it is necessary to know the value of the stress concentration coefficient depending on the radius of the rounding hollow chamfer of the transition surface of the shaft. In theoretical studies, an analytical solution of the direct boundary value problem of the stress state in the middle surface of the step shaft is presented. One special (singular) integral equation with a Cauchy kernel is applied, the solution of which is in the form of an unlimited increase in stresses at the ends of the integration interval in the absence of rounding hollow chamfers. Stress concentration in the hollow chamfers of constant curvature was also studied. Comparison of the

results obtained with experimental data had confirmed the adequacy of the solution offered, and indicates the achievement of the research goal.

Key words: step shaft; transition cross-section; stress concentration coefficient; laser polariscope.

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APPLICATION OF MODERN AUTOMATION TOOLS IN HEAT SUPPLY SYSTEMS

The housing-and-communitive sector is the largest consumer of heating energy whereas having great potential for energy saving and improving energy efficiency. There are various measures to reduce heating energy consumption and increase energy efficiency. These measures involve installation of heating energy metering units, dispatching service, modernization and reconstruction of heat pipelines, central heating points, individual heating points and intra-house heating systems.

The article considers the use of modern automation equipment in heat supply systems implementation exemplified by technical re-equipment of a heat station of a tenement house.

The method of picking out the needed equipment requiring therefore careful selection in case of a circulation pump and a control valve. A schematic diagram of the heat station of a tenement house with the introduction of an automated control unit is compiled, which is represented by a compact heat station designed to control the parameters of the coolant in the heating system in relation by the air temperature outside, and the conditions of construction operating.

Because of technical re-equipment, the annual heat energy consumption for heating had been reduced by 124.44 Gcal, or 24.8 %. The biggest decrease in heat energy consumption is observed in the «winter-spring» and «autumn-winter» transition period and reaches the value of 50.2 % of the total heat energy consumption during the transition period.

Key words: automated control nodes; automation; energy saving; energy efficiency; designing; heating supply.

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MATHEMATICAL MODEL FOR DETERMINING THE LED PLACEMENT WITHIN THE INTEGUMENTARY TISSUES ILLUMINATION DEVICES

Based on the analysis of the features of radiation interaction with the integumentary tissues, emitters of the nearby infrared range were selected to create devices for illuminating the integumentary tissues. IR LEDs were suggested as those of emitters. A mathematical model is proposed for calculating the design parameters of devices (tilt angle towards the vertical, distance to the illumination surface) based on IR LEDs. As a rule, mathematical models for calculating the location of LEDs in luminaires assume the size of LEDs to be much less than the distance to the illumination surface. The main difference of the developed model lies in the calculation of the illumination of surfaces, the distance to which is comparable to the size of LEDs and does not exceed 10 mm.

Computer calculations made for a single IR LED of the illumination dependence for different heights of the emitter above the tissues ($H_0 = 0; 0.1 \text{ mm}$ and 0.5 mm) with changing the angle γ between the vertical and the center line of the luminous intensity curve showed that the most optimal angle is 36° . This value of the angle has been entered into the design of the emitter for visualisation of veins based on a single IR LED. The illumination at point P (12.5mm; 25mm) created by 15 identical LEDs was calculated by PC. The optimal (for the given geometry of the LEDs) placement height $H_0 = 5.5 \text{ mm}$ was found, at which the illumination was maximum ($E_{\max} = 6.94 \text{ lux}$). Studies on the illumination of integumentary tissues during visualisation of blood vessels have also shown the need to maintain a clearance between tissues and LEDs up to 5-6 mm in the process of detecting vessels.

Key words: luminous intensity; illuminance; luminous intensity curve; luminous flux.

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