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### **Optimization of irrigation regime for alfalfa hay under soil-climatic conditions in Bashkortostan**

Sustainable livestock farming is possible by using highly nutritious legume crops for feeding, the most valuable of which is alfalfa. It has a high digestibility and nutritional qualities; it contains necessary substances for farm animals in the proportions that meet zootechnical requirements and has the unique ability to improve soil fertility. This article presents the results of the study of the irrigation effect on the productivity of alfalfa grass stands under the conditions of southern forest-steppe of the Republic of Bashkortostan. The determination of total water consumption of alfalfa was carried out in 4 ways: by water balance method (control), the calculation methods of A.M. Alpatiev (bioclimatic coefficients of alfalfa were used established in Ukraine), N.N. Ivanov and L.I. Zubenok. The results of the study showed that total water consumption according to the mentioned calculation methods produced overestimated quantities compared with the actual water consumption: according to the method of A.M. Alpatiev it was overstated by 9%, according to the method of N.N. Ivanov - by 18%, according to L.I. Zubenok - 27%. Due to the saturation of the soil with excess irrigation water, herbage yield was lower by 6-11%. To optimize the water consumption of alfalfa some zonal (local) biological coefficients of this culture were established experimentally. They can be used in the design and operating organizations in the calculation of total water consumption and irrigation rate of alfalfa under different moisture conditions of irrigated area. To ensure optimum moisture regime in the alfalfa herbage in the southern forest-steppe zone in the Republic of Bashkortostan on typical black soil the carrying out of vegetation irrigation with irrigation rate is required: 1400-1500 m<sup>3</sup> / ha in slightly dry years, 1800-1900 m<sup>3</sup> / ha - in dry years and 1600-1700 m<sup>3</sup> / ha - in the average moisture years. Irrigation rates should be adjusted depending on spring moisture reserves, the groundwater level and the natural moisture of the growing season.

**Key words:** hybrid alfalfa, alfalfa irrigation, irrigation system DKSH-64, irrigation regime, total water consumption, herbage yield, biological coefficients, the coefficient of irrigation efficiency.

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### **Influence of fertilizer on agroecological soil properties, yield, crude gluten, amino acid and elemental composition in the grain of soft winter wheat**

The article studies the influence of fertilizers on humus content, the main macro- and micronutrients in the soil, the accumulation of heavy metals and natural radionuclides in the soil, and the influence of mineral fertilizers on grain yield, crude gluten, amino acid and elemental composition in the grain of soft winter wheat. The humus content in the soil tended to increase from 0.34 to 0.36-0.44% during thirty-one years of field experiments. The highest accumulation of humus and nutrients was observed in the variants with medium use of mineral fertilizers and biological technology. The highest content of all microelements in the soil, but for cobalt Co and manganese Mn, was notable for biological technology. In the variants with high rates of fertilizers and chemicals the higher accumulation of mobile forms of cobalt Co and manganese Mn was recorded. The content of mobile forms of heavy metals showed that the accumulation of chromium Cr and cadmium Cd was more in the variants with higher rates of fertilizers. The highest content of Pb and Ni was recorded with biotechnology. This is due to its lesser removal of grain and after-effect of organic fertilizers. Application of nitrophosphate for winter wheat increased the specific activity of  $K^{40}$  in the last 15 years of experiments. The specific activity of  $Ra^{266}$  and  $Th^{232}$  slightly increased in the variants with higher application rates of nitrophosphate. It is established that the maximum grain yield increase compared to control (without agrochemicals) was obtained on the background of mineral fertilizers applied in autumn ( $N_{98}P_{64}K_{124}$ ) and two feedings: during spring vegetation and early phase of booting ( $N_{30}$ ). This variant provided the planned level of productivity (over 5.6 t/ha) with crude gluten in grains more than 28%. The quality of crude gluten was agreeable to the standards for valuable wheat. The high level of mineral nutrition of plants ( $N_{98}P_{64}K_{124}+N_{30}+N_{30}$ ) led to the highest accumulation of both basic and essential amino acids. The highest removal of such macroelements as potassium (3100-3700 mg/kg), phosphorus (3100-3300 mg/kg), sulfur (1500 mg/kg), magnesium (840-1000 mg/kg), calcium (400-510 mg/kg) was recorded. The grain, grown on the background of mineral fertilizing  $N_{98}P_{64}K_{124}+N_{30}+N_{30}$ , had the highest content of all macronutrients studied. There were differences in the accumulation of some microelements, except selenium and cobalt. Their content was poorly identified by modern instruments. The highest removal of such microelements as magnesium, zinc, barium, titanium, nickel and copper was fixed. The removal of such toxic elements as cadmium, caesium, mercury, lead and arsenic was insignificant. Thus, the cultivation of winter wheat for food purposes in the system of crop rotation: vetch-pea-oat mixture for green mass, winter wheat, potatoes, spring barley, with the application of mineral fertilizers for the planned productivity, provides environmentally safe feed grain of high quality.

**Key words:** soft winter wheat; fertilizing system; application rate of fertilizers; humus; macro-and micronutrients; heavy metals; natural radionuclides in soil; grain yield;

crude gluten content in grain; amino acids; biogenic macro- and microelements and heavy metals in grain.

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## VETERINARY SCIENCES

**Yu.G. Krysenko, L.I. Gorodilova**  
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### **Dynamics of some blood indicators of sows after treatment of beta-carotene source**

The article presents the results of biochemical studies of blood serum after administration of beta-carotene in the sows' diet. The positive influence of beta-carotene in the investigated drug Lipokar on metabolic processes is proved as beta-carotene inhibits free radicals, prevents the oxidation of fats, and stabilizes vitamins. An objective increase of the content of vitamin A after application of beta-carotene is determined: in the first experimental group applying Lipocare in the diet at a dose of 3g/head by 126.1%, in the second experimental group – 4g/head per day by 127.5% compared with the control group; increase of total protein - by 106.8 and 108.4%, albumin – by 114.2% and 123.9%, glucose – 113.5 and 117.7%, vitamin E – 351.6 and 358.1%. Albumin content in the serum of lactating sows significantly increased respectively by 123.9 and 114.2% compared with the control group, indicating the effects of the drug on protein metabolism. There is an increase in the level of  $\alpha$ -globulin in the experimental groups by 117.7 and 111.4% respectively. The drug effect on carbohydrate metabolism is proved, which is reflected by the objective increase in the amount of glucose in the first experimental group by

113.5% and in the second – 117.7%. Thus, the investigational source of beta-carotene provided not only a stimulating effect on the biochemical processes in the sows organisms, but also contributed to better growth of piglets.

**Key words:** sows; lactation period; beta-carotene; vitamin A and E; feed additives; biochemical processes.

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## **TECHNICAL SCIENCES**

**V. I. Shirobokov, L.Ya. Novikova, S. P. Ignatyev, V.A. Bazhenov**  
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### **Research of the dust collector for grain grinders**

The article is devoted to the investigation of the laboratory facility for dust separation from a pneumatic system of the hammer grain grinders. The analysis of devices for dust separation shows that efficiency of their use for grain grinders is low. The aim of the research is the development and investigation of the dust collector. According to this aim the following problems are solved: pilot studies of parameters of the dust collector; improvement of the constructive and technological scheme of a hammer grain grinder using the dust collector. The two-stage dust collector for the hammer grain grinders was developed containing: a frame; a top cover with a branch pipe; a fan with a shaft; spokes; a frame of the first stage; a cover; a cover of the first stage; an exit branch; a mixer. At the first stage the studies with liquids of different density at the fixed values of other factors were conducted. The amount of the separated dust was accepted as a criterion of optimization. The mixer surface area at the accepted values of parameters was theoretically determined: the diameter of an air duct; liquid density (hydrochloric solution); standard density air; the setting angle of fan blades. The research experimental facility was developed containing a dust collector, a vacuum cleaner, air ducts. Pilot studies of the dust collector operation were conducted by applying methods of single-factor experiment. For this purpose the influence of liquid density in the dust collector on amount of dust in the first and second stages was estimated. As a research result the mathematical model was obtained demonstrating steady reduction of the liquid catching ability with the increase of its density. This model allows to define the solution concentration for using as working liquid in grain grinders and to define frequency of liquid replacement in the dust collector. It is established that the increase in liquid density in the dust collector reduces the dust catching ability. Water application for dust collection is the most acceptable. However, at subzero temperatures water can't be used

therefore, depending on air temperature, the received mathematical model on the basis of experimental data will allow to define solution concentration for applying as working liquid.

**Key words:** dust collector; grain grinders; efficiency; fan; mixer; pressure; liquid density; model.

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## ECONOMIC SCIENCES

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### **Development and management of agricultural production**

The article considers the issues of organization and development of agricultural production management. Under modern crisis conditions there is an objective necessity of system reorganization of agricultural production management, improvement of its quality, functions and methods of internal production management in agricultural enterprises. The development of the management system in agricultural enterprises should be aimed at the creation of internal business units, that is, the specific business segments, by means of preliminary studies and the selection of criteria of their formation, the organization of proper segmental control in these units. Hence we can note the necessity of theoretical ideas exploration and development of practical recommendations in the organization and management system development of agriculture. The paper proposes specific measures for the proper management. Practical recommendations and the model of management development in agriculture are also developed. The article presents recommendations for the evaluation of material inputs and of agricultural products in the planning and management accounting at a reasonable (fair) value for the control purpose.

**Key words:** management; units; requirements; activities; development; reasonable value; function; system; evaluation; agricultural production; principles.

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**Classification of responsibility centers in the management accounting system in the poultry farming**

The article discusses the model drafting of the data creation of management accounting of financial results in the poultry industry. Any management decision and optimization of production factors, including the rational use of financial results, should be based on reliable, relevant, timely and complete information of management accounting. In the informational system of management accounting data are formed: the costs, expenses, income and results of operations in analytical aspects required for management purposes. Thus the management of the poultry organization independently decides in which sections to classify management objects and how to carry out their accounting. Information of management accounting is its content and is intended for executives and managers of the poultry organization, it is a commercial secret and is strictly confidential. The main objective of this article is to improve the accounting of financial results in the poultry industry through the development and implementation of specific organizational, methodological, practical recommendations and regulations providing an opportunity to create an effective system of accounting and control.

**Key words:** poultry; accounting; management accounting; responsibility center; costs; financial results; revenues; expenses.

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### **Justification of biologicity of inventory management system in poultry industry**

The article considers theoretical foundations of the conception of management biologicity at the enterprise. The differences in terminology and basic concepts characterizing biological control systems are revealed. The article analyzes cases of application of the concept of management systems biologicity by different authors. Methodological approaches are proposed for consideration biologicity of inventory management as the property of a general control system of the enterprise to regulate inventory and logistics management of the enterprise to meet the needs of biological systems. Biological systems at the plant and objects of management in biosystems are defined. The article established relationships of biological systems, the general business management system of enterprise and inventory management subsystems for the poultry enterprise. Modeling possibilities of the process of requirements alteration are determined. Regulating activities in biological control systems for the greatest economic benefit are specified.

**Key words:** biologicity; inventory management; poultry; entropy; poultry stock; biological systems.

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## **ZOOTECHNICAL SCIENCES**

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### **Influence of pre-starter and starter feed compounds in suckling period on growth and development of holmogorsky breed heifers**

The article presents information on the replacement heifers growing technology of Holmogorsky breed from birth to 18 months while feeding in the suckling period with pre-starter and starter feed compounds. Their positive impact on the growth and development of heifers is revealed. The highest feed consumption was observed in the experimental group, as feeding in the suckling period with pre-starter and starter feed compounds promoted better feed edibility with its high nutritional value and balance. In the experimental group, especially in the suckling period, the differences in EFU were more by 68.0; in the group from 7 to 12 months – 27.53 and from 13 to 18 months – 48.42 as compared with the control

group. This was reflected in the growth and development of the experimental heifers. With the same live weight at birth the average live weight of 6 month old heifers in the control group was 161 kg, in the experimental group – 189.3 kg, that is higher than in the control group by 28.3 kg, or 17.59% ( $P < 0.001$ ). The average live weight of 12 month and 18 month old heifers was also higher in the experimental group respectively by 36.9 kg (12.93% ( $P < 0.001$ )) and 42.4 kg (12.93%). The average daily gain over the study period was higher in favor of the calves in the experimental group by 11.88% ( $P < 0.001$ ).

**Key words:** replacement heifers, content, live weight, pre-starter and starter feed.

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**A.I. Lyubimov, E.N. Martynova, E.M. Kislyakova, Yu.V. Isupova, V.M. Yudin**  
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**Aging changes in quantitative and qualitative indicators of servicing bulls' semen of various breed-lines**

The importance of artificial insemination as a powerful booster of genetic progress in cattle breeding, and particularly in dairy farming, has grown immensely since it was successfully combined with the sire evaluation by offspring quality. The results of the artificial insemination of dairy cattle depend not only on their reproductive status, but also to a large extent on the semen quality of sires. Therefore, the economic efficiency of a breeding enterprise or an artificial insemination centre directly depends on the quality and quantity of produced semen doses. In this connection a precise estimate of biological value of sperm produced at a breeding enterprise has great economic and biological significance. Comparing the average indicators for breed-lines it can be noted that the largest ejaculate volume was produced by bulls of line Reflection Owl Ring (6.3 ml). The smallest ejaculate volume was produced by bulls of line Montvik Chieftain (5.1 ml). It is naturally since this line is presented by young bulls. Also, bulls of this line are characterized by the lower sperm concentration (0.95 billion / ml). The largest ejaculate volume was obtained in the group of mature bulls older than 5 years (6.5 ml.) In a group of bulls under three years, this indicator is lower by 3.0 ml, and in the group of bulls aged 3-5 years – by 0.8 ml.

**Key words:** sires; semen; ejaculate; ejaculate quantity; ejaculate volume; semen concentration; activity.

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