

перспективалық бағыты-оптикалық-электронды әдістер мен құралдарды дамыту, оның көпфункционалдылығы мен жанаспауына байланысты, бұл сауын сиырлардың биологиялық объект жағдайын бақылау үшін өте маңызды сапа болып табылады. Сонымен қатар, сауылатын сиырдың сауу биотехнологиялық жүйесін сауу жабдықтарының күйіне, биологиялық объектісіне және әсер ету дәрежесі бойынша анықтау маңызды. Сиырдың желінінің термографиялық суреттерін алу және талдау, сиырдың мастит ауруының дәрежесін және оған сауу жабдықтарының әсерін анықтау мен оның жылу өрісін бақылауын жүзеге асыруға мүмкіндік береді. Қолданыстағы өндіріс жағдайында жүргізілген эксперименттік зерттеулер, сауу кезінде саууға дейінгі және кейінгі сиырдың желіні мен сүт безі температурасының көрсеткіштері, термографиялық суреттерде сауын аппараттарының сүт безіне әсерін бағалауды, сүт безі сауын аппараттарының жұмыс сапасының индикатор ретінде қызмет ете алатындығын көрсетуіне мүмкіндік береді. Кенотест сауын сиырларының маститін диагностикалаудың үлгі әдісі ретінде мастит ауруының дәрежесіне байланысты сиырдың желінінің максималды температурасын бөлу статистикасы алынды.

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**EVALUATION OF PRODUCTIVITY AND MEAT QUALITY IN BULLS KEPT
BY ECOLOGICALLY ADAPTIVE TECHNOLOGY WITH THE USE OF NATURAL
BIOACTIVE SUBSTANCES
ANNOTATION**

Ensuring the country's food security is the most important strategic task. The ability of the State to organize the functioning of the most important sphere of life support of the population – food – is a necessary condition for its national security and sovereignty, a guarantee of social peace and tranquility in society. The country's food security is characterized by: the level and quality of nutrition of the population, physical and economic availability of food, the level of production potential of the agro-industrial complex, the independence of the country's food supply from imports, the stability of the food supply system, the size of operational and strategic food reserves.

The food security of the region is a system of satisfying the population's need for food based on the regulation of reproduction of the agricultural sector and imports, ensuring the availability of high-quality food products for the population at the current income level. The development of the agricultural sector is a priority in ensuring the food and economic security of the region.

The article proves the effectiveness of combined prescription of natural bioactive substances to animals at the beginning of periods of growing, rearing and fattening of natural bioactive substances according to developed by us schemes, taking into account regional biogeochemical features. In this From this point of view scientific-economic and laboratory researches have been conducted on 30 bulls-analogues, divided into three groups. The experimental animals were kept from the age of 2 to 150 days according to the ecological-adaptive technology, and then up to 540-days old (the duration of the research) - according to the bioindustrial technology according to the bioindustrial technology. Bulls of experimental groups at the ages of 2, 31, 151, 361 days life were administered with permamik with polystim or with iodomidol. In animals of the compared age dynamics of physiological and clinical and growth parameters, as well as meat quality [2,3,4].

In the simulated experiments it was shown that the administration of permamik to bulls with polystim or with iodomidol was accompanied by an equal somatotropic effect of the body. At the same time meat samples had similar organoleptic, biochemical, microbiological and spectrometric characteristics.

Keywords: *productivity, quality, assessment, forage supply, bulls, permamik, polystim, iodomidol.*

Introduction. Food security for all countries of the world is one of the main priorities in achieving geopolitical, socio-economic stability and, consequently, state sovereignty. In this context, humanity faces the problem of meeting the needs of the population in food according to medical and biological requirements of adequate nutrition. To date, the problem of food security has become paramount due to the following events: environmental deterioration, changes in natural and climatic conditions in the world, overpopulation and, as a consequence, the threat of food crisis. Therefore, against this background, ensuring national food security is not possible without combining the efforts of all branches of government, science and business communities, as well as public unions and organizations [6].

Food products and their industrial production can be attributed to vital tasks that must be performed in order to realize food security of both the whole country and its individual regions. As you know, the task of providing the population with food can be implemented in several ways – by importing the necessary categories of food, as a result of the development of domestic food production, as well as finding a balance between the production of agricultural products and its consumption

Food shortages in many developing countries lead to instability and serious environmental problems. The search for ways to meet rapidly growing food needs, with insufficient attention to the environmental impact of agricultural policies and methods, causes enormous damage to the environment. These include: degradation and depletion in the form of loss of soil and forests; drought and deforestation; loss and deterioration of surface and groundwater quality; reduction of species diversity, including fish stocks; damage to the seabed, waterlogging, salinization and siltation; soil, water and air pollution and eutrophication caused by improper use of fertilizers and pesticides and industrial effluents.

An important and most significant task in agricultural production is to increase the volume and accelerate the intensification of the production of livestock products such as milk and meat [3]. The meat industry is considered one of the main branches of the economy in the field of material production, and the full nutrition of the population with such products as meat and meat products, dairy products depends on its development. In Kazakhstan, the production and consumption of meat and meat products is associated with the ethnic characteristics of the inhabitants' diet. The increase in consumer demand for meat and meat products, weak investment activity and high rates of dependence of the agricultural market on imports determine the need for the development of the meat industry.

Meat production in Kazakhstan at the end of 2022 increased by 5.2% compared to the same period in 2021 and amounted to 55,958 tons.

The progressive direction of increasing the efficiency of meat production in Kazakhstan is the introduction of innovative technologies, construction and reconstruction of farms, intensive feed production, as well as the use of biologically based feed additives in animal feeding diets. This will ensure not only an increase in productivity, but also an improvement in the health of animals and the quality of the products obtained. A full—fledged balanced nutrition of the body and a special function in the metabolism of the body are performed by biologically active substances - trace elements and vitamins, while having no energy value. The feed and feeding rations of cattle used in farms do not satisfy the physiological need of the body for mineral compounds and biologically active substances. This leads to disturbances of metabolic processes and a decrease in the efficiency of using the productive capabilities of livestock. The existing biologically active substances used in the feeding of farm animals have been studied widely enough, and recommendations for their effective use have been given. However, many issues of their effectiveness in dairy cattle breeding have not been sufficiently studied.

Modern aspects of the development of the state and society, especially in the conditions of market relations, imply mandatory participation in the processes of globalization. The issue of food trade on mutually beneficial terms occupies a rather paramount position in this regard. But at the same time, we should not forget that some processes for a number of states have a negative connotation and are the cause of the emergence or expansion of a major economic problem. It so happened that the food problem has long been a global one, and not just a problem of any particular state. It should be noted here that, in principle, security issues are quite multidimensional, but at the same time they are closely interrelated with each other and become more acute at critical stages of the development of society.

Based on the theory of adaptation of living beings to the influence of biotic and abiotic environmental factors, it follows that the development of pronounced immunomorphological reactions primarily from the immune system organs to various external influences indicates a bioeffective adaptation of the organism [3, 6]. Consequently, the scientific justification for the formation and development of a stable immunomorphological status in productive animals in the conditions of continental territories with the high risk of endemic diseases is one of the urgent problems of modern veterinary and animal science.

The aim of the work is to investigate the body growth and meat quality of bulls under ecological-adaptive system conditions using permamik with polystim or with iodomidol, taking into account the regional biogeochemical specificity.

Material and methods of research.

Modern harsh technological conditions for feeding and keeping highly productive cows in conditions of intensive animal husbandry are the cause of metabolic disorders, loss of genetically determined productivity and premature culling of animals. Various physiological periods, in particular hotel stress, cow milking, as well as periods of changing types and feeding regimes, are interrelated with the restructuring of the digestive system. Due to the dysfunctions of the pre-pancreatic, intestinal digestion, against the background of a decrease in feed intake, there is a lack of intake of a complex of nutrients and energy into the exchange fund of the body of new-bodied cows [1, 2, 3]. In order to ensure biologically complete nutrition of the body in accordance with the developed detailed norms, there is a need to use ergotropic compounds, in particular, with a high methylating ability [4, 5]. In this regard, it is of scientific and practical interest to study the physiological and productive action of vitamins in a protected form from the indirect effects of the symbiotic microflora of the pancreas. To date, the important role of vitamins in protected form has been established in metabolic processes and relationships with remethylation reactions, which play an important role in the biosynthesis of protein and nucleic acids, the realization of genetic information, as well as used for the prevention and treatment of diseases, neutralization of mycotoxins, etc.

Scientific and productive experiments were carried out on 185 cattle of the black-motley breed in one of the agricultural farms of the Volga region of the Chuvash Republic. For that purpose, three groups of newborn bulls-analogues of 10 animals each were selected. They were kept for the first day in maternity barns together with cows, and then, up to the age of 150 days, in conditions of elevated air temperatures ($17,5 \pm 0,60^{\circ}\text{C}$ with variability from $9,4 \pm 0,41$ to $22,1 \pm 0,68^{\circ}\text{C}$) by adaptive technology in individual preventive facilities of group pavilions with unregulated microclimate [10]. Then, up to 540 days of life activity (duration of observations), the experimental bulls were kept in typical premises in accordance with the bioindustrial technology [5]. Experiments were conducted on the background of the basic diet (OR) in compliance with the feeding norms of the RAAS [3]. Experimental animals were fed permamik daily from 21 to 150 days of life in an amount of 1.25 g/kg of body weight (MT) in combination with intramuscular injections of polystim (group 2) and iodomidol (group 3) at the rates of 0.1; 0.03; 0.03; 0.02 ml/kg MT, respectively, at 2, 31, 151 and 361 days of age. Bovines of the control group (1) were injected intramuscularly with saline at the same dose at the same time.

Under the conditions of adaptive housing technology the quality of the microclimate in the animals under study was assessed monthly according to the methods standard in zoohygienic studies [4]. On days 1, 30, 60, 150, 360, 390, 540 the dynamics of physiological and clinical and growth parameters (body temperature, respiration rate (BPM) and heart rate (HR), as well as MT and its average daily gain (ADG) were determined in 5 bulls of each group according to the methods commonly accepted in clinical practice. Meat samples of the animals decapitated at the age of

30-, 150-, 540-days were evaluated according to organoleptic (appearance, consistency, smell, degree of exsanguination; smell, taste, broth transparency and the presence of fat droplets on its surface), biochemical (pH, ammonia nitrogen, peroxidase and copper sulfate tests), microbiological (OMO - total microbial insemination of surface and deep layers of meat) indicators in accordance with the "Rules of veterinary inspection of slaughter animals and veterinary and sanitary examination of meat and meat products" [8]. In addition, spectral analysis of the same samples for arsenic, mercury, cadmium, lead, copper, zinc, using X-ray spectrometer "Spectroscan-346" and software package for quantitative examination of food [9] Received in the simulated experiments digital data were subjected to biometric processing using software materials Statfor Windows MicrosoftExcel-2016.

Research results. It was established that in individual preventoriums and group pavilions of facilitated type (04. - 08.2017), where experimental bulls were kept, the average air temperature was 17.5 ± 0.60 °C, its relative humidity was 72.0 ± 1.18 %, movement speed was 0.41 ± 0.11 m/s, carbon dioxide concentration was 0.04 ± 0.001 %, there was no ammonia and hydrogen sulfide presence. It follows from this that in these types of premises with unregulated microclimate there was a relatively favorable environment for animals, which was practically devoid of both harmful and poisonous gases.

Analysis of the physiological and clinical condition of the bulls under study revealed that their body temperature decreased within a narrow range of fluctuations from 39.2 ± 0.26 - 39.3 ± 0.31 to 38.6 ± 0.19 - 38.7 ± 0.21 °C; at the same time their HR and RPM per 1 min were constantly decreasing within a broader range (126.0 ± 2.66 - 129.0 ± 2.71 vs. 0 ± 2.71 versus 82.0 ± 1.32 - 85.0 ± 1.49 and 36.0 ± 1.36 - 38.0 ± 1.42 versus 20.0 ± 1.6 - 22.0 ± 1.21 , respectively) without significant difference between-group comparison. Consequently, the above-mentioned parameters in the studied animals did not go beyond the variability of the physiological norm.

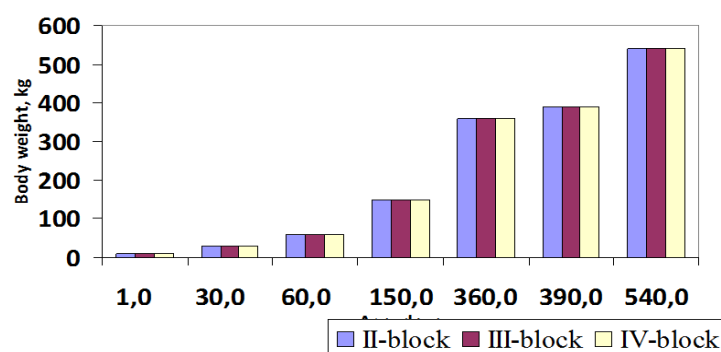


Figure 1 –Variation in bull productivity

In our study of the age dynamics of growth processes (figure 1) we observed that MT of bulls from the control and experimental groups increased unequally in the process of maturing from $31,7 \pm 1,51$ to $463,2 \pm 6,39$ kg and from $31,3 \pm 1,62$ - $31,4 \pm 1,40$ to $499,4 \pm 6,92$ - $505,2 \pm 6,78$ kg respectively. The 150-, 360-, 390-, 540-day-old animals of groups 2 and 3 under conditions of complex administration of permamik with iodomidol exceeded their control counterparts by 6,3-7,3 and 7,0-8,3% ($P < 0,05$) in productivity.

A similar pattern was established in the dynamics of the SSP which in bulls of experimental groups at the age of 1 to 150 days (rearing period) and from 151 to 540 days of activity (periods of rearing and feeding) exceeded the control parameters by 8.1-9.3 % ($P < 0,05$). Hence, it was reasonably concluded that in bulls kept by combined use of permamik with polystim or iodomidol with regard to local biogeochemical specificity the somatotrophic effect was practically equal to that of the body.

During the study of organoleptic properties of meat samples from experimental animals, it was found that the muscle tissue had a pale pink color and dry crust drying; the place of its cut was uneven and slightly moistened, leaving no visible stain on the filter paper, and also impregnated with blood stronger in comparison with other tissues of the carcass; the presence of blood in the muscles and vessels was not noted, under the peritoneum and pleura small blood vessels and capillaries were not seen; the surface of the cut lymph nodes was light gray; the smell of the meat carcass - specifically

pleasant, inherent to fresh meat, and the consistency - dense and moderately elastic; when pressing the surface of the carcass with a finger the resulting pit quickly leveled; the surface fat was soft, elastic and had a pale pink color. The cooked broth was transparent, flavorful and pleasing to the taste, on the surface of which there was a small accumulation of fat droplets with a predominance of medium to large size.

Veterinary and sanitary examination of biochemical microbiological properties revealed that in meat samples of 30-, 150-, 540-day-old bulls 1 (control), 2 (permamik + polystim), Groups 3 (permamik + iodomidol) the variability of pH was $6,1 \pm 0,06$ - $6,2 \pm 0,07$, $5,9 \pm 0,05$ - $6,1 \pm 0,06$, $5,8 \pm 0,06$ - $6,0 \pm 0,05$, amino-ammonia nitrogen - $0,90 \pm 0,01$ - $0,95 \pm 0,01$, $0,90 \pm 0,01$ - $0,94 \pm 0,01$, $0,89 \pm 0,01$ - $0,93 \pm 0,01$, respectively. At the same time, tests for peroxidase and with sulfuric copper were characterized by positive and negative reactions, respectively. At the same time, no microorganisms were detected both in the surface and in the deep layers of the meat carcasses of the bulls under study.

Spectral analysis of meat quality showed that in the examined samples the presence of As, Hg and Cd in all terms of examination was absent. At the same time, the level of Pb in meat samples of animals from control and experimental groups gradually increased from the beginning to the end of observations with different quantitative intervals respectively from 0.02 ± 0.001 to 0.05 ± 0.001 and from 0.02 ± 0.001 to 0.03 ± 0.001 mg/kg. In the analyzed samples of 150-, 540-day-old experimental bulls a significantly lower concentration of Pb than in the control group was noted. In accordance with the variability of Pb content there was a dynamics of C concentration, but at a higher quantitative expression.

It is important to note that 390-day-old animals of group 3 under the conditions of complex use of permamic with iodomidol, according to the studied humoral immunity factor, also significantly exceeded the peers of group 2 who were kept with the appointment of permamic with polystim. This fact testifies to the thyroid-stimulating effect of the body of bulls of group 3. Visual examination of micro-preparations of the thymus gland 133 noted that it is represented by lobules having branched lymphoepithelial strands. The basis of the gland parenchyma consists of epithelial cells that form a dense network. In each lobule there are peripheral (cortical) and central (cerebral) zones or layers of the same name. The cortical zone is lined with densely arranged small mononuclear cells – T-lymphocytes (thymocytes), and the cerebral zone is lined with a relatively smaller number of thymocytes and reticuloepithelial cells of different shapes and sizes. In the brain layer, concentrically layered single cells – Gassal's corpuscles - were also revealed. They were characterized by a state of degeneration and had signs of cellular decay with the formation of an insignificant amount of homogeneous mass. The ratio of the cortical layer to the cerebral layer was 0.5–1.0:1.5, the boundary between which looked slightly blurred. The study of the microstructure of the thymus gland showed that the width of its cortical zone as the experimental bulls grew initially increased from 30 to 150 days of life (352.5 ± 8.50 – 371.4 ± 9.30 versus 397.3 ± 10.90 – 440.1 ± 12.30 microns), and then narrowed to their 540-day age (completion of studies) to 110.4 ± 6.20 – 120.3 ± 7.50 microns. According to the studied parameter, 150, 540-day-old animals of 2 (permamic + polystim) and 30, 150, 540-day-old animals of 3 (permamic+iodomidol) groups outperformed intact peers by 7.0-8.8% ($P_{0,05}$) and 5.1- 10.1% ($P_{0,05-0,01}$), respectively. At the same time, the width of the brain zone of the thymus in experimental bulls in the age aspect invariably increased from 100.4 ± 3.70 – 105.2 ± 3.10 to 443.3 ± 13.00 – 461.8 ± 11.7 microns without significant difference in the intergroup aspect. It was found that in growing animals of control groups and experiments, the number of T-lymphocytes in the cortical area of the gland gradually increased (respectively 132.0 ± 5.70 , versus 158.0 ± 6.90 and 138.0 ± 6.00 – 140.0 ± 5.80 versus 183.0 ± 8.70 – 186.0 ± 8.50 pcs.). According to this cellular immunity factor, experimental animals of 150, 540-day-old (group 2) and 30, 150, 540-day-old (3) significantly exceeded their control peers.

A different pattern was revealed in the age-related variability of the number of T-lymphocytes in the brain area of the gland under study, which in the studied bulls initially increased from 30 to 150 days of vital activity (28.0 ± 1.90 – 29.0 ± 2.00 versus 46.0 ± 3.30 - 49.0 ± 4.10 pcs.), followed by a decrease by the end of observations to 33.0 ± 2.40 – 41.0 ± 3.30 pcs. At the same time, 540-day-old (group 2) and 150,134-540-day-old (3) animals under the conditions of joint use of permamic with polystim or with iodomidol exceeded intact peers in this morphometric indicator by 15.4% ($P_{0,01}$) and 6.1- 19.5% ($P_{0,05-0,005}$), respectively. In the cortical layer of the studied gland, no Ghassal bodies

expressing degenerative processes were found. At the same time, as the bulls of the control and experimental groups grew, their number in the brain layer increased unequally from 1.5 ± 0.10 to 4.5 ± 0.60 and from 1.0 ± 0.00 – 1.0 ± 0.10 to 3.0 ± 0.30 – 3.0 ± 0.40 pieces, respectively. Moreover, the animals of the experimental groups at all periods of observation were significantly inferior to the peers of the control group in terms of the number of Ghassal bodies, which indicates less pronounced degeneration processes in their brain area. It should be noted that the bulls of group 3 killed at the age of 150 days also had statistically significantly fewer Ghassal bodies compared to those of their peers of group 2.

Another pattern was observed in the nature of changes in Zn, which in the samples of animals of the compared groups initially increased from 30 to 150 days of life (22.3 ± 0.01 – 23.1 ± 0.01 vs. 25.5 ± 0.01 – 27.1 ± 0.01 mg/kg), and then decreased to 23.3 ± 0.01 – 24.0 ± 0.01 mg/kg by the end of experiments ($P > 0.05$).

Thus, in the simulated studies it was found that bovine meat samples in the control and experimental groups were characterized by almost similar organoleptic, physical and chemical microbiological parameters, confirming the environmental harmlessness of the tested bioactive substances.

Conclusion. Bearing in mind the biogeochemical specificity of the Volga Region of Chuvashia, the cultivation, rearing and fattening of bulls under conditions of the ecologically adaptive technology with the application of natural biologically active substances against the background of OR was accompanied by the stimulation of their productivity level. Moreover, the growth-stimulating effect was equivalent when the animals used permamik in combination with both polystim and iodomidol.

Under simulated conditions, meat samples of bulls from both intact and experimental groups were characterized by almost identical organoleptic and biochemical properties. At the same time, spectral analysis showed that they did not contain As and Hg, the concentration of Pb, Cd, Cu and Zn did not exceed the maximum permissible concentration regulated by SanPin 2.3.2.1078-01.

The obtained data indicate the indifference of meat carcasses of experimental animals to the studied bioactive substances and their ecological safety for the organism.

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ТҮЙІН

Мақалада аймақтық биогеохимиялық ерекшеліктерді ескере отырып, біз әзірлеген схемалар бойынша табиғи биоактивті заттарды өсіру, өсіру және бордақылау кезеңдерінің басында жануарларға табиғи биоактивті заттарды біріктіріп тағайындаудың тиімділігі дәлелденген. Осы тұрғыдан алғанда үш топқа бөлінген 30 аналогты бұқаға ғылыми-экономикалық және зертханалық зерттеулер жүргізілді. Тәжірибе жануарлары экологиялық бейімделу технологиясы бойынша 2 жастан 150 күнге дейін, содан кейін 540 күнге дейін (зерттеу ұзақтығы) биоөнеркәсіптік технология бойынша ұсталды. Тәжірибе топтарының 2, 31, 151, 361 күндік жасындағы бұқаларына полистим қосылған пермамик немесе йодомидол енгізілді. Салыстырылған топтардың жануарларында физиологиялық-клиникалық және өсу көрсеткіштерінің жастық динамикасы, сондай-ақ ет сапасы зерттеді.

Имитациялық тәжірибелерде бұқаларға полистиммен немесе йодомидолмен пермамик енгізу организмнің бірдей соматотропты әсерімен қатар жүретіні көрсетілген. Сонымен қатар ет үлгілері органолептикалық, биохимиялық, микробиологиялық және спектрометриялық сипаттамаларға ұқсас болды.

РЕЗЮМЕ

В статье доказана эффективность комбинированного назначения животным в начале периодов выращивания, дорастивания и откорма естественных биоактивных веществ согласно разработанным нами схемам, учитывая региональные биогеохимические особенности. В этом ракурсе проведены научно-хозяйственные и лабораторные исследования на 30 быках-аналогах, разделенных на 3 группы. Подопытных животных с 2- до 150-дневного возраста содержали по эколого-адаптивной технологии, затем до 540-дневного (длительность исследований) -

согласно биоиндустриальной технологии. Быкам опытных групп в возрасте 2, 31, 151, 361 день жизни применяли пермамик с полистимом или с йодомидолом. У животных сопоставляемых групп изучали возрастную динамику физиолого-клинических и ростовых параметров, а также качество мяса.

В моделируемых опытах показано, что назначение быкам пермамика с полистимом или с йодомидолом сопровождалось равноценным соматотропным эффектом организма. При этом пробы мяса имели аналогичные органолептические, биохимические, микробиологические и спектрометрические характеристики.

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DEVELOPMENT OF FOOD MIXTURE RECIPES FOR WATERBIRDS, ACCORDING TO THEIR PRODUCTIVITY PERIODS IN THE CONDITIONS OF WESTERN KAZAKHSTAN

ANNOTATION

The full realization of the genetic potential of the bird is possible when the environmental conditions are maximally favorable for its manifestation. In this regard, when creating and using highly productive poultry, it is important to improve the technology of its cultivation and maintenance in parallel with the improvement of feeding conditions. The article presents the results of the analysis of the chemical composition and nutritional value of the feed, on the basis of which the recipe for the preparation of feed for ducks of different sex and age groups was compiled. The analysis of the results showed that the exchangeable energy content ranged from 6.1 to 12.0 MJ, crude protein from 205.0 to 438.0 g. Also, the highest content of amino acids was observed in meat meal and fodder yeast (27.9 - 34.4 / 10.3 - 12.9). In the course of the first two weeks of growing young ducklings, starting feeding rations were used. The feeding of young ducklings met the standards, and in days 1-7, "Start" compound feed was used, and in the following 7 days (7 - 14 days) - "Rost" compound feed. In the first period of cultivation (1-2 weeks), compound feed for birds (poultry) contained 20.20 - 21.90% protein and 13.99 - 14.27 MJ of exchangeable energy. In the second period of cultivation, the developed recipe feed contains 1,274 to 1,356 MJ of exchangeable energy and 17.2 to 17.6% crude protein. The results of this study are relevant and will be used to meet the demand of consumers in domestic selection of waterfowl adapted to the natural and climatic conditions of the region.

Key words: ducks, feed, chemical composition, nutritional value, protein, diet, feeding.

Актуальность. Currently, in the industrial poultry farming of the republic, only hybrid poultry is mainly used, which is distinguished by high productivity, vitality, good payment for feed, and adaptability to intensive keeping technologies. The long-term plans for the development of poultry