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ВІННИЦЬКИЙ НАЦІОНАЛЬНИЙ АГРАРНИЙ УНІВЕРСИТЕТ
АКАДЕМІЯ СІЛЬСЬКОГОСПОДАРСЬКИХ НАУК ГРУЗІЇ

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საქართველოს სოფლის მეურნეობის მეცნიერებათა აკადემია

ВІННИЦЬКИЙ НАЦІОНАЛЬНИЙ АГРАРНИЙ УНІВЕРСИТЕТ
VINNYTSIA NATIONAL AGRARIAN UNIVERSITY

GEORGIAN ACADEMY OF AGRICULTURAL SCIENCES
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АГРАРНА НАУКА ТА ХАРЧОВІ ТЕХНОЛОГІЇ

ЗБІРНИК НАУКОВИХ ПРАЦЬ

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У збірнику висвітлено питання підвищення продуктивності виробництва продукції сільського і рибного господарства, технології виробництва і переробки продукції тваринництва, харчових технологій та інженерії, водних біоресурсів і аквакультури.

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COMPLEX ANALYSIS OF THE INFLUENCE OF DIFFERENT FEEDING ON THE PRODUCTIVITY OF SILVER BLACK, RED AND WHITE FOX (Vulpes Vulpes)

The article presents the results of a comprehensive analysis of the impact on the quality of fox skin of their color type, nutrition and the proportion of changes in meat feeds in rations. At the same time, morphological and commodity-related indicators of silvery-black, red and white foxes are studied. It has been experimentally established that the type of feeding, the proportion of replacing meat fodder on young rations of different color types has a different effect on the quality of furs. It was established that the color type of foxes significantly influenced the manifestation of such productive features as growth of live weight, length and width of the skin, area and mass (P<0.001). The type of meat substitute determined a significant change in the linear and massive parameters of fur. The share of meat replacer significantly influenced the formation of live weight of foxes and furs. The interesting complex impact of research factors on the productive features of foxes. In particular, the complex effect of the type of fox color and the type of substitute manifested itself in significant changes in the mass of animals and the mass of products derived from them (skins). The complex effect of all three factors was similar. However, to study the effect of the type of fox color and substitute particles, it turned out that only the skins changed reliably. They had no effect on the linear size of the fox skin and its assessment of the proportion of the feed additive for meat and the combination of this factor with the type of color and type of substitute.

Keywords: *foxes, productivity, complex estimation, feeding, substitute for meat feed, efficiency*

Fig. 2. Tab. 2. Ref. 15.

The problem as a whole and its relevance to important scientific or practical tasks. The main factor of increasing the commercial qualities of fur skins is the organization of optimal feeding, which takes into account not only anatomical, but also physiological and biochemical processes. Evolutionary predators are inherent in the use of feed for animals, among which a special place is occupied by proteins. The age requirement of animals in the protein is not the same, most of its young are needed [4].

Experimentally proved that predatory animals are not able to independently synthesize all the necessary proteins from organic matter in the absence of intestinal microflora and replace them with fats and carbohydrates. They need more protein than unlike other farm animals. So, for 1 kg of silver-black fox we need 7-15 g protein. The optimal level of digestible protein for adults of silvery-black fox is set at 7.5-8.5 g in the summer, 9-10 g in winter at 100 kcal OE; The optimum level for all biological periods for different sex-age groups is investigated [3, 11].

The total cost of forages for fur animals is determined by a set of amino acids, mainly essential: lysine, methionine, tryptophan, phenylalanine, leucine, isoleucine, threonine, valine. The recommended norm for methionine and cystine is 200 mg and tryptophan 70 mg with a possible decrease of 140 and 65 mg before slaughter. It has been established that the cultivation of young animals requires higher doses of limiting amino acids compared to adult animals [1].

Given the full value of proteins, not all fodder for fur animals is a source of essential amino acids. For foxes containing cellulose, the best protein products are meat, fish, and products of its processing, as well as inorganic hydrobionts of the sea. Along with full proteins you can use inferior (cereals of most cereals) provided they are added. Physiological experiments have shown that on different fodders in fur animals there is a specific release of gastric juice, changes in the digestion of the main components of the diet and the process of restoration of liver secretion. Thus, the maximum amount of juice was observed in the stomach when using fatty animals, and when the oil is introduced, it decreases. However, the acidity of gastric juice does not change [15].

Analysis of recent research and publications. It has been experimentally established that the coefficient of meat digestibility with an increase in its content in the animal diet has increased from 77% to 81%, and vice versa, the overall reduction in the content of meat in the diet worsens the digestibility of all nutrients, including proteins. However, it is noted that foxes, unlike other predators, are more capable of digesting nutrients (by 80%) already with the danger of 50 g of meat, and with an increase in its amount to 200 g, the digestibility increases by only 8%. With full replacement of meat for by-products, high-quality fish and cheese, the digestibility of dietary proteins does not decrease, however, as the protein of the heads of cattle and solid by-products is digested 10-20% lower than meat protein. Thus, the best protein fodders for foxes, besides ordinary slaughter waste, are by-products, blood, fish products and non-food seafood. In particular, the possibility of feeding furs with a flour wing was thoroughly studied, replacing them with up to 40% of animal protein of soft offal. On the contrary, the addition of this flour along with kril-paste (25% protein of meat feed) reduces the productivity of animals. Rich indispensable amino acids are Pacific Squid, which, it is possible to replenish the lack of protein in the diet of animals and significantly increase their skin productivity. Prospective for research is also flour from hydrobionts and mussels [2, 10].

With the development of poultry in Ukraine, the number of available slaughter poultry is growing rapidly as a reliable source of protein for predatory animals. However, the potential of poultry farming in the cultivation of fur animals was not used entirely because of conflictual data in the scientific literature on the usefulness of its waste. Thus, according to the results of separate studies, an increase in the level of these feeds in animal rations leads to a decrease in the digestibility of crude protein from 80.75 to 70.35%, crude fat – from 90.14 to 84, 24% and a significant reduction

in digestibility of carbohydrates. According to researchers, bird waste in its food storage can be equated with fish meal, the proportion of which in the animal diet should be strictly controlled. However, the complete transition to slaughter products of farm birds does not aggravate digestion and does not reduce the quality of the skin of foxes of different types.

According to some scientists [6, 13], a good supply of fodder protein for fur animals is keratin containing raw material – a feather, as well as subfields of all kinds of poultry, which are low-value raw materials for feather-down plants. Numerous studies conducted in different countries of the world indicate that the bird's feather and its waste are protein concentrates: they contain 85-99% crude protein on the basis of dry matter. The fight against fever is rich in threonine, arginine and cystine. Possibility of using the feed supplement obtained during the treatment of the bird was checked for feeding chickens, chickens, piglets, dogs. The first studies of the use of keratin-containing components in the rations of fur animals were carried out in the 70's of the last century [5].

It has been experimentally determined that the digestibility of nutrients of feathers in the worms is (%): dry substance – 76,1, protein – 62,7, fat – 90,2. The biological value of a protein or an index of essential amino acids in it varies within 63.9%. According to the recommendations of scientists, the optimum rate of replacement of the main diet of thistle with feathers flour after digestion of protein is 15% or 2.3 g per 100 kcal OE. During the study, it was found that the live weight of animals at its use was almost 600 g higher compared with control animals. The average area of hides in the mink of the experimental group was at the control level, the number of large granules exceeded the control by 23,4%, a similar pattern was determined by the number of defective skin, the number of which in the experimental group was higher than the control by 20% [14].

Valuable forages are egg yolks, obtained from slaughter of birds. However, in the literature there is practically no material on the productive effect and standards of feeding for fur animals of different species and sex-age groups. The literature contains only recommendations on the use of predatory non-standard chicken eggs and egg products (fresh melange or egg powder). However, this kind of feed for today's domestic producer remains expensive and dangerous because of the threat of bacterial damage [2].

Scientifically valuable but not promising studies were the use of flies of larvae and chlamydemonate paste, since meeting the needs of farms with these feeds is problematic and expensive.

However, their application in animal rations allows replacing up to 20% of digestible protein, contributing to the improvement of the biochemical parameters of serum. Unconventional forage for fur animals, which can be replaced by a meat group, is the silkworm waste. Doll of silkworm is dried after unwinding in hot water cocoons, and in this form it enters the livestock industry [5]. Sometimes, on silk mills

pupae squeeze part of fat. The received feed differs considerably less fat (89% against 16-24% in general dolls). Therefore, puppets of silkworm should be included in rations separate from sources of vitamins, in order to avoid their destruction. In connection with the fact that during transportation frequent cases of seedlings of pupae with a microflora, including pathogenic, before feeding the puppets undergo heat treatment. Puppet proteins are complete. By protein, 1 kg of dried puppets is considered equivalent to 2.5 kg of meat warm-blooded animals. In fox and fox diets, in summer-autumn period, puppets can be replaced by up to 70% (by nutrition) of animal feed. In the period of reproduction of fox and fox pupae of silkworms in their rations can be replaced by 30-50% of animal feed origin, in rations of mink – 20-30%. Scientists note that when introducing into puppets rations the digestibility of feed decreases by 10-12%, therefore the total diet of the diet during its use should be increased accordingly. It is established that its introduction into the ration of animals in recent months, fur formation has a beneficial effect on the quality of pubescence, causing in it, in particular, a pleasant shine. However, unfortunately, with the decline of domestic silkworms, such a valuable substitute for meat feed in the diet of fur animals became inaccessible [2, 9].

It has been experimentally proved that prolonged use of meat, meat-bone, fish meal, dried at high temperatures, leads to digestive disorders. Therefore, a large series of experiments on the use of feed of flies from leather waste was carried out. It is prepared from the border areas of the skin of cattle after contouring. The protein of this flour is not inferior to the protein of meat-bone and fish meal, but lysine in it is contained in 2-3 times less. In the presence of foxes, the flour from the skin waste provides the normal growth of young animals and the receipt of products of excellent origin, quality. At the same time, big savings are made on meat and fish feeds [2].

Different dairy feeds are used for feeding animals. In the period of pregnancy and lactation, as well as in young animals, it is desirable to give whole milk in the first months of life. It contains a full, well absorbed protein and a small amount of fat (cream). Experts recommend that animals only give fresh milk: it is better to recycle it a little better in acid, as it can cause gastrointestinal disease. Predatory animals also give skim milk, as well as obtained from the production of serum butter. The whey obtained in the production of cheese contains not only fat but also protein, only sugar and mineral substances are stored in it almost completely. According to the recommendations of scientists, in a diet of animals it is possible to enter a dry whole or skim milk. However, with the decrease in milk production in Ukraine in recent years and the rise in prices for it, domestic fur producers have been deprived of the massive use of these feeds in feeding animals. According to practitioners, it is possible to purchase whole milk or packaging only for lactating women [1, 4].

One of the promising ways to strengthen the livestock feed base and reduce the cost of feeding animals is to find cheap feed resources to replace scarce animal feed. Important role in solving the problem of the absence of feed protein in livestock

production may be played by the waste of various industries, including the seizure of meat-packing plants and sausage shops. In lactating animals, they can be used directly in native or after treatment. Many non-traditional fodders are already used in practice and successfully implemented in livestock feed. One of the new animal feeds is «Hydrolysed animal feed», which is dried protein slurry of skimmed animal raw materials obtained from the processing of all types of slaughter cattle and the production of food, technical and special products. The technology of obtaining this feed involves short-term hydrolysis of slaughter waste with the help of its own enzymes or artificial untreated enzyme preparations, thereby increasing the proportion of peptides and amino acids in the finished product. It has been experimentally established that the inclusion of such feed in a mink diet in the amount of 20-30% of digested protein was higher in skin quality than in a typical general diet [4].

The first scientific research on replacing natural fodder with the synthetic products of the meat group did not lead to the expected result, since the growth and quality of furs of commercial young were lower than control. Many researchers believe that the quality of skin in animals is positively influenced by the introduction of amino acid supplements. Scientists say that the amount of sulfur-containing amino acids introduced into the diet, the consumer's properties of the hair (thickness of the ointment and down, the thickness and length of the ointment, elasticity, strength of hair), the equality of pubescence and shine of the hair) depend on the consumer properties of hair. Interesting results from the experiments of Norwegian scientists who replaced part of the protein with pure methionine. They received positive results: for live weight, growth and productivity - the fur of the experimental group was not inferior to control studies were performed on rabbits and other domestic animals. However, the current state of the study of the effect of amino acid feed supplement on animals confirmed the inexpediency of its use, in addition, the digestibility of organic matter of feed decreased by 4.6%, and therefore, the live weight of experimental animals – by 6.0%. However, synthetic amino acids due to high prices at the present stage of development of domestic livestock are almost inaccessible to domestic producers [2, 5, 10].

The problem of livestock production remains a deficiency of animal protein, so scientists around the world are paying much attention to finding alternatives to nutrition and the biological value of non-essential feed ingredients (vegetable or microbial). However, the plant protein is digested by animals much worse than an animal. In particular, its share in the total number of fox diets should not exceed 50%, and in the reproduction period – up to 15-25%. Unlike animal protein, the plant is worse digested (67-70% versus 92-97%). However, it has been experimentally proved that the more in the ration of vegetable protein, the higher its digestibility [6, 11].

The deficit or excess in comparison with the need of animals of one of the components of nutrients necessarily leads to changes in their use, since In their body,

protein is used directly correlates with the intake of fats and carbohydrates. Experimentally proved that from nutrients carbohydrates are digested in fur animals worse than protein and fat. Vegetable feed fiber is practically not absorbed by predatory fur animals, but they need to dissolve food in small doses and improve peristalsis of the intestine. In the process of domestication, predatory fur animals are increasingly adapting to mixed rations from feeds of plant and animal origin with a gradual decrease in the level of animal protein. It has been established that prolonged deficiency of carbohydrates can lead to deterioration of fat accumulation, formation of ketosis, acid-base balance disruption, decrease of growth rate and degradation of furs (liquid anode) [2].

However, at the beginning of the breeding of fur animals in America to date, a series of experimental data have been obtained, confirming the possibility of breeding animals for the digestion of carbohydrates with fodder plants. Fodder plant fibers are recognized as integral components of ballast, in the absence of which the chemist becomes viscous, compact, thick and slightly diluted, poorly available for enzymes. This inhibits the course of the digestive process of nutrition and reduces its use. Rough and healthy substances of plant fodders contribute to an increase in the velocity of passage of fodder masses through the gastrointestinal tract, a decrease in the release of nutrients with feces and an increase in intestinal motility [2, 11].

Cereals (oats, barley, wheat, millet, corn, rye) are the most valuable carbohydrate food for fur animals, and the products of their processing – derma and bran. Beans (peas and soybeans) are much less used in animal rations, especially in the native form for high anti-nutritional activity. In the fodder mixture of adult inactive silvery-black foxes in June should account for 22-32% of the total caloric content, and from July to November – up to 42%. Between December and February their share for adult foxes will be up to 32%, and in the second half of the race – up to 47% on food. Pregnant and feeding foxes of this color type should consume up to 25% of their feed at the total nutritional value of a cereal crop. In the feed mixture, this feed is introduced gradually: at the age of 1.5 to 3 months, 10-17%, and from 3 to 7 months – 10-25% caloric content of the diet [5].

However, the presence of a negative factor in the grain – non-starch polysaccharide β-glucan and pentosan, leads to a negative impact on the absorption of nutrients in the small intestine. This is due to the high viscosity of their solutions and the substance most contained, which leads to a violation of the water regime and the feces of feces. That is why some grasses, namely barley and wheat, are introduced into the diet of fur animals limited. Enzyme preparations have been developed for better assimilation of nutrients of high-cereal feed. Also recommended are technological techniques and methods for increasing their use by the organism of predatory animals. The latter include fine grinding, steaming, cooking, etc [10].

Particularly cereal feeds in the diet of predators can be replaced by potatoes. According to a number of authors, in recent years, it occupies a significant proportion

in the animal diet. It is proved, if potatoes before boiling of poultry and foxes will boil, then it can replace half of cereal feed in the diet [2].

The introduction of cereal feed rations due to their carbohydrate content, the need for animals the protein is significantly reduced. In addition, foxes differ from other feral animals with the ability to effectively use grain protein feed. The latter in fox diets supplements the meat protein with the content of essential amino acids, resulting in a biological value of the whole ration is increasing. According to past experience, in some farms, the source of carbohydrates for animals was the remnants of bread and crackers. For example, experimentally found that the introduction of bread into the fox diet contributes to the shift of the peak of gastric juice excretion for 1 hour (up to 9.1 g), its inappropriate fall for the second hour and the next jump in the third hour after consumption of food. When determining the amount of gastric juice on fodder from meat and bread, poor nutrition and two times less juice in the stomach are noted. However, this opportunity is practically exhausted with the collapse of multisectoral agricultural enterprises and contractual relations with non-agricultural enterprises [6].

In recent years, the use of feeding fur-bearing animals has increased juicy particles, especially in the autumn period (hydroponic greens, silos, melons, fresh and dried vegetables, fruits, berries and products of their processing). The nutrition of green fodder, berries and fruits has practically not changed. Compared with them, the source of nutrients (especially sugars) may be carrots and beets. However, the last beasts are fed cautiously because of a strong weakening. It is recommended to give carrots 200-250 g per head per day, completely excluding cereals, beets – no more than 50 g, adults – up to 25 g adolescents. Juicy greens, according to experts, should be fed to animals in combination with meat-and-bone meal and a doll of silkworm, but in the literature there are not enough recommendations regarding the species composition of the green feed. According to the recommendations of animal scientists, the proportion of succulent feeds in the diet of single adults, pregnant women and nursing siblings can be up to 3% for a high-calorie diet, and for young ones – to grow. for slaughter – up to 2% [5].

Allocation of previously unsolved parts of the general problem. The study found that the minimum level of carbohydrates requires the formation of 10-15% of the dietary intake or 3.7 g per 100 calories. The double source of protein, fat and coal is the waste of technical manufacturers. It has been established that a carbohydrate product of technical production takes part in the use of the organism. To prevent acidosis, every 3 g of this feed contains at least 2 g of mixed cereals, or about 1 g of digestible starch. It is also possible to use the raw propane starch (2 g per 100 kcal) instead of these feeds, but with the negative use of bleeding (glue). There is also a negative experience of using such feeds [1, 2, 11].

Widely used in the feeding of waste from the production of sunflower oil. From the thirties of the last century, experiments were conducted on the background

of rations with a large proportion of meat feeds [5]. Today, the shortage of feeds from meat and fish and the almost complete absence of meat have prompted scientists to develop new diets. Thus, according to the recommendations, meat-bone meal in rations of adult females and planted young silvery-black fox can be replaced by other factors by 50-100% by calorie, fish meal – 20-50%, blood flour until 30-60%. It has been established that at a moderate level of digestible protein in rations of fur animals (7.3-8.0 g per 100 kcal) and 15% of soy flour protein can be replaced, but at a higher protein (9.10 g per 100 kcal) – up to 25.5% of animal protein or 20% of total protein. Replacing protein in the fox diet with sunflower meal led to a 6% reduction in the price of sold skins by reducing their length. Successfully applied in the feeding of silver-fox diets, in which 40% of animal feed is replaced by cooked sunflower meal and 20% – fishmeal. We also studied the possibility of digestion of nutrients and the maintenance of nitrogen in animals when feeding the diet with mildew seeds and rapeseed oil. It was established that supplements to the diet of the first caused a decrease in the digestibility of fat and carbohydrates, and sunflower oil supplements – aggravated the absorption of nitrogen [10].

In particular, it is suggested to use phyto-preparations based on oligo-monocutrients as fertilizers in rations of young fur-bearing animals, as they are the cheapest source of energy. So, monosacrules that are absorbed into the blood flow through the portal vein system into the liver, where 3% glucose is retained and converted into glycogen, while the rest enters a large circle of blood and is transformed into fat (up to 30%) and is oxidized to water and carbon dioxide (up to 70%). For enhanced carbohydrates, only 10% glucose, up to 40% in fat, and up to 50% in end products are transformed into glycogen. In addition, carbohydrates are part of nucleoproteins, glucocorticoids, galactoproteins and transformed into the energy of metabolic processes [1, 7].

The role of fat in the diet of fur animals was studied and studied by a number of authors. Additives of vegetable or animal fats to ration of predators improve suction and digestion of other ingredients of the feed mixture, and their energy and metabolic value depends on their origin, structure and chemical composition. The nutritional value of fats for animals is determined primarily by the presence of essential fatty acids in their composition, especially linoleic, linolenic and arachidonic. Their absence inhibits growth, breaks reproduction, leads to a deterioration in the quality of hair. At the same time, the epidermis thickens, the function of the sebaceous glands, dryness of the skin and hair, hyperkeratosis and skin depletion are violated. It is these substances that normalize the function of skin and hair and prevent the exchange of cholesterol. The requirement for linoleic acid for foxes is from 1 to 2% of dry matter (0.25- 0.50 g/100 kcal) [9]. For lactating women, its level should double. However, products rich in polyunsaturated fatty acids are poor in vitamin E and contain oxidation products. It has been established that at high dumps of fat in animals there is a delay in their growth, depigmentation

of hair, deterioration of reproductive properties for influence of products of relocation of tocopherol. It is also established that fat can cause undesirable effects only in the case of carbohydrate and protein deficiencies. The digestibility of fats in the body of fur animals is high and depends on their structure, the composition of fatty acids, and other factors, because predators are able to absorb all types of fats [3].

The metabolic and productive effects of fats depend on the length of the carbon chain and the degree of unsaturation that forms its fatty acids. Low digestibility of animal fats in mammalian organisms is due to the presence of saturated fatty acids that are poorly absorbed in the small intestine. In clarifying the biological features of higher fatty acids in their digestive tract it was noted that from the total amount of acids per day absorbed up to 47% linolenic, 30% oleinic and 18% palmitic acid. Together with triglycerides from the intestines, some amounts of free fatty acids, phospholipids, cholesterol and lipids are delivered to the lymph. For this purpose, the plasma of blood of fur animals increases the number of triglycerides and their derivatives. In the liver, free fatty acids are oxidized and used to build peripheral tissues of the body. In addition, cholesterol is the basis for the synthesis of steroid hormones and vitamins. And lipids of the feed are carriers of fat-soluble vitamins. There is also an opposite dependence, since in the absence of rations of fur animals, vitamins A, D, E and B_{12} fat assimilation is reduced [6].

In the course of studies of some scientists it was found that the effect of growth and protein-preserving effect of fat in young foxes manifests itself when fed in May-June to 50% OE (5.5 g per 100 calories). The need for foxes of various sex-age groups in fats is uneven and depends on a number of exogenous and endogenous factors. During hot weather feeding of fatty additives to fur animals helps dissipation of heat in an organism. For this reason, the inclusion in the diet of fur animals in fat in summer improves the transmission of the negative effects of hyperthermia [5].

It has been experimentally established that the best productive parameters were obtained from fur animals during feeding of fat and mixtures of fats and oils in a ratio of 2:1. In general, the need for fur animals in essential fatty acids is met by introducing into the diet of animal fats up to 8-10%, fats of marine animals and fish – up to 6%, or vegetable oils to 3% of dry matter of rations [13].

The assimilation of nutrients in fur animals correlates with the availability and availability of mineral substances in the diet. If in the amount of 100 kcal of animal feed less than 4 to 6 grams of crushed bone, from 12 to 15 grams of crushed heads, or from 8 to 10 grams of legs, or 8 to 10 grams of meat-bone meal, or excluding entire fish, animals lack phosphorus and calcium. The best sources of these elements for fur animals are bone flour of industrial production, as well as burning of bone, ash bone. With a rare exception, as scientists point out, in fodder for fur animals potassium contains more sodium. Only the addition of fodder powder to predatory blood, beet and salad determines the feedback between these elements. Therefore, in diets created for ration of animals that do not have sodium, it is advisable to replace the salt with

the kitchen: for fox and fox, it is introduced at a rate no more than 3-4 g [5].

Fur animals do not suffer from other minerals. However, in some countries, local fodder may have deficiencies in some of the trace elements that need to be added to rations. For example, in the Baltic countries it is necessary to apply cobalt salts in the diet of fur animals. In Ukraine there are certain biogeochemical zones and provinces with deficiency of some trace elements in which mink, fox and fox are grown [12]. Therefore, the most relevant today is the use of non-traditional sources of minerals for animals, in particular, natural mineral sorbents, which are characterized by relative cheapness, unique ion exchange and sorption properties, such as zeolite tuffs, bentonite clays, diatomites. Due to their structure and physicochemical properties, these minerals are well sorbet, rich in organic and inorganic substances. They are capable of removing exotoxins from the body, heavy metals, radionuclide's and destroying pathogenic microorganisms. Natural sorbents contain a large number of biogenic macro-, micro- and ultra-micronutrients (iron, copper, zinc, cobalt, etc.), which can take an active part in various metabolic processes and make biochemical and antigenic-structural changes, homeostasis of animals [5].

The approbation of additional natural mineral sorbents to the basic diet of younger mountain animals in the period after disconnection to the prohibition allowed to establish that the indicators of productivity and stable metabolism, optimized for rations, are 1.0% and mink 0.5% of mass feed. Allows to optimize the doses of natural mineral varieties, stimulate trauma, strengthen the substance, increase the coefficients of the dry matter flow at 2.93-6.8%, organic matter – 2.92-6.52%, crude protein – 2.43-8.12%; raw cattle's – 3,17-14,85%) (in the mink), raw fat – 0,78-6,92%, raw ash – 7,29-17,05%, BER – 0,87-24,56%, as well as deposition of nitrogen in the body from taking feed from 1.31-5.17% and from digestion – by 1.06-5.99%, which increases the nature of the mass of young mass and oil. to slaughter at 4.6-11.9%.

The purpose of the study was to study the productivity of foxes in different types of feeding. Establish a comprehensive correlation between the productivity of foxes of different types of color and the type of substitute meat in the diet and substitutes. Object of research – silvery-black, red and white foxes of various sex-age groups, blue sand, animal feed. The subject of the study is the productivity of the marketable young foxes and foxes, the quality of furs

Material and methods of research. The experiment was conducted in 10 groups of young, silvery-black, red and white foxes not segmented by gender (n=25) according to the scheme given in Table 1. The study of growth indices was carried out by means of weighing, monthly absolute and average daily increments were determined.

Having considered and established the fact of ripening of fur, they were killed. The hides were removed from the «stockings», manually removed subcutaneous fat and dried [5]. The dried skins were processed in a drum with the addition of sawdust,

then turned the fur, scissors and evaluated the quality of the skins according to the standard [8]. The complex of linear and qualitative parameters determined the sale price taking into account market prices of the current year.

Table 1

Scheme of experiment

Group	Duration of the period, days		n	Features of the experiment
	preparatory	the main one		
1 control	30	183	25	MD [x]
2 experimental	30	183	25	50% meat protein of bone meal is replaced by protein of sunflower meal
3 experimental	30	183	25	30% protein of meat feed is replaced by sunflower oil
4 experimental	30	183	25	40% protein of meat feed is replaced by sunflower oil
5 experimental	30	183	25	50% protein of meat feed is replaced by sunflower oil
6 experimental	30	183	25	50% meat and bone meal is replaced by corn
7 experimental	30	183	25	30% meat and bone meal is replaced by corn
8 experimental	30	183	25	40% meat and bone meal is replaced by corn
9 experimental	30	183	25	60% protein of meat feed was replaced by corn and sunflower meal (1: 1 per caloric content)
10 experimental	30	183	25	30% protein feed is mixed with the protein of boiled chicken blood

Note: [x]MD – the main diet consists of meat feed (chicken meat and bone meal, chicken by-products, corn, sunflower meal, additive «Biomix» (2-5 g/g/day)

Three-factor analysis was performed using the statistical analysis method using Excel computer system.

Research results. For the complex analysis, the influence of the color type (three gradations – silver-black, red-and-white fox), substitute (two varieties – sunflower meal and corn) and substitute particles (three gradations – 30, 40, 50%) using algorithm 3-factor dispersion analysis. To do this, data from the 2nd, 3rd, 4th, 6th, 7th and 8th experimental groups was used.

Table 2 shows the results that illustrate the likely impact of the investigated factors (and their combinations).

As we can see, for all investigated features a high probable effect on the type of color and the nature of the substitute is established. For most signs, the replacement of sunflower oil or cucurbit protein may also be affected. Exception is made only of estimates, linear measurements of the skins.

Particular attention is paid to the analysis of the results of the combination of all three of the factors under investigation. For all signs (with the exception of skin evaluation), such a combination had a likely effect. Thus, it can be argued that for foxes with different color types, the best were rations that are characterized as different types of animal protein substitute, and a different percentage of substitution.

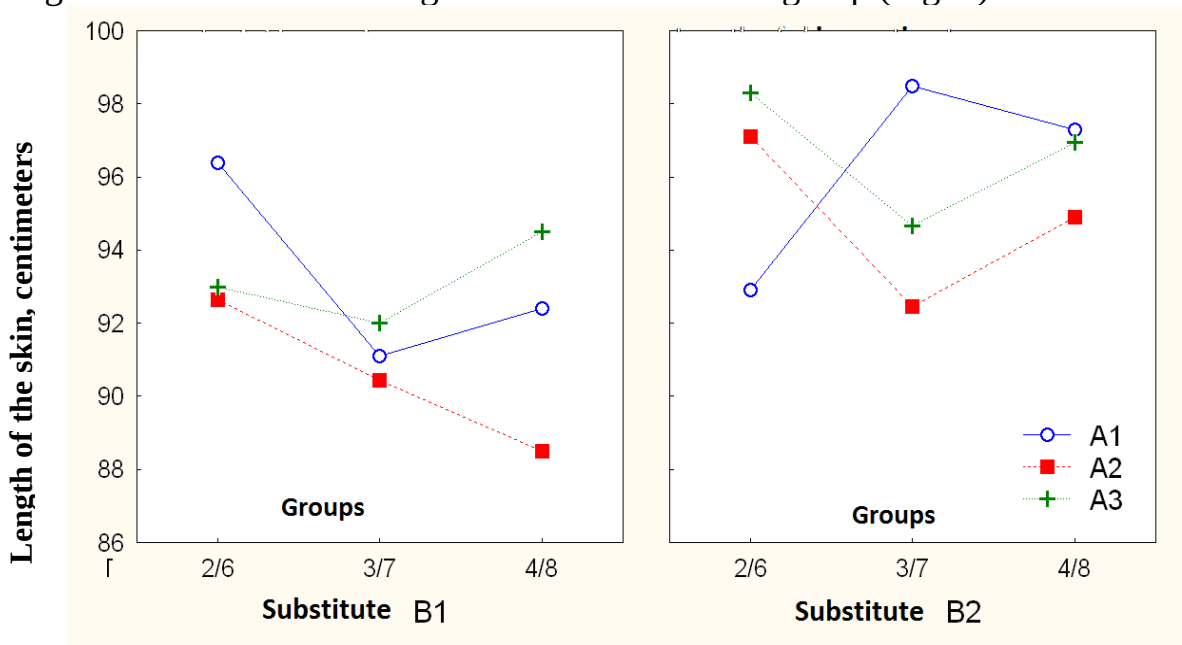
Table 2

Results of 3-factor dispersion analysis of the influence of color type (A), substitute (B) and substitution (C) on the economic and biological features of fox

Indicator	A	B	C	A×B	A×C	B×C	A×B×C
Live weight at the end of the experiment	<0,001	0,059	<0,001	<0,001	0,167	<0,001	<0,001
Absolute increment	<0,001	0,002	<0,001	<0,001	0,006	<0,001	<0,001
Average daily gain	<0,001	0,002	<0,001	<0,001	0,006	<0,001	<0,001
Valuation	0,019	0,007	ns	ns	ns	ns	ns
Length of skin	0,052	<0,001	ns	ns	ns	ns	0,028
Width of the skin	<0,001	<0,001	ns	ns	ns	ns	0,004
Area of skin	<0,001	<0,001	ns	ns	ns	ns	0,010
Weight of the skin before removing subcutaneous fat	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001
Weight of the skin	<0,001	ns	<0,001	<0,001	<0,001	0,013	<0,001

Note: The value of the significance level (p) for the estimates of the dispersion coefficient (F) is given. ns – the possible effect is not set

Thus, the use of corn in the fox diet increased the length of their skins, but at the same time, animals of the 6th group (for red-white) or 7th or 8th group (for silvery-black) had better performance. High values of the length of the skin were obtained using sunflower cake – among animals of the second group (Fig. 1).



Ілл. Fig. 1. **The results of the 3-factor dispersion analysis of the influence of the color type (A1 - silver-black type, A2 - red type, A3 - white type), substitute (B1 - sunflower seed bar, B2 corn) and the share of substitution for the length of fox skin**

The use of corn in the diet greatly increased the quality of the skin (their assessment). At the same time, foxes of the silvery-black type dominated other animals of any type, irrespective of the type of substitute, or its particles in the diet (Fig. 2).

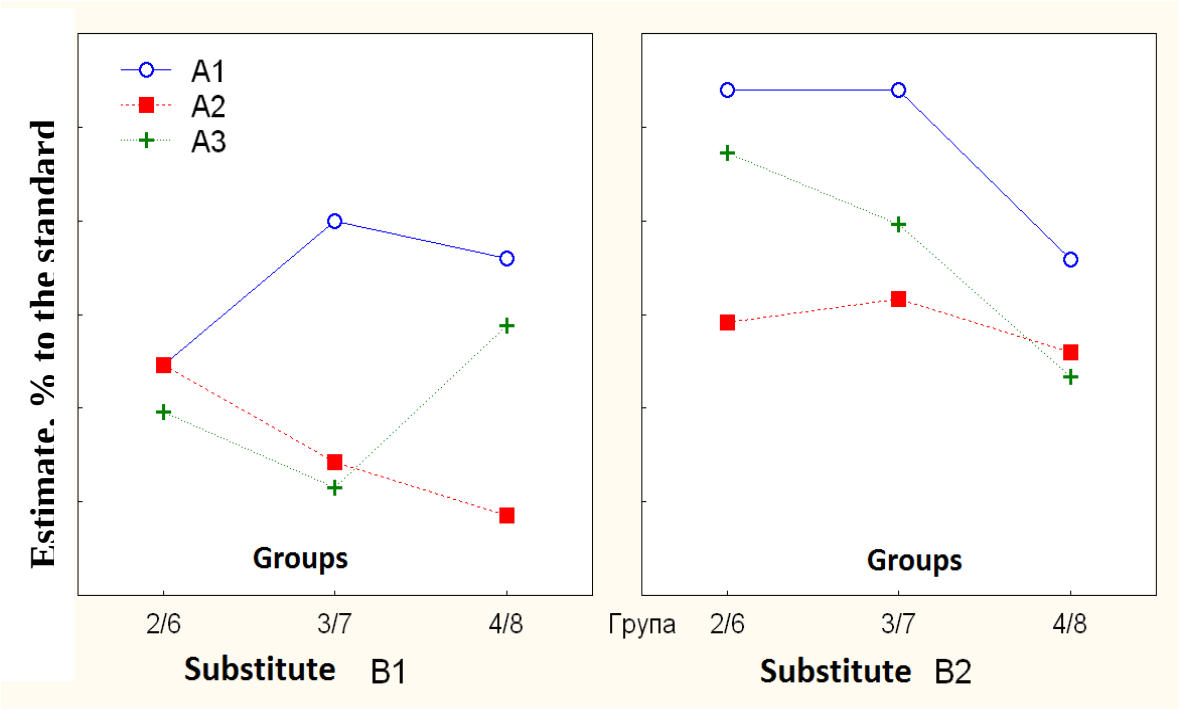


Fig. 2. **Results of the 3-factor dispersion analysis of the influence of color type (A1 - silver-black type, A2 - red type, A3 - white type), substitute (B1 - sunflower meal, B2 corn) and particles of substitute for the assessment of fox skin**

During the experiment, we studied the quality of the skins of females and males. As a result of the study, it was found that the skin of females of silvery-black foxes of the 2nd, 6th and 7th experimental groups was more severe than before and after eating. In addition, the latter group showed a significant increase in the area (to 27.1 against 22.8 dm2 in the control, $P<0.05$).

The quality of the resulting skins is as follows: the worst in animals is 10 groups. In addition, the deterioration of perception in 3 chest and flowers was detected – in 5 experimental groups.

The skins of males of silver-black fox did not have significant changes. However, in group 7 there was an increase in linear sizes and a significant increase in the weight of the skin by 1.1 kg ($P<0,05$). The skin of male silvery-black foxes of the 8th group was characterized by a deterioration of color (by 20%) and silver (40%). Worst skins were found in animals grown on technical blood rats: they showed an increase in the proportion of skin of II color, II group of silver, II group of defects and II grade – by 40%.

The skin foxes of foxes in experimental groups did not differ significantly from control. However, there was an increase in the size category of skin of the 5th, 6th and 9th groups. The maximum replacement of meat products with sunflower meal increases the length of fox males. A slight increase in the size category of red males' skin was established, 5, 10 experimental groups.

Females of red foxes, which were offset by protein content in sunflower oil up to 40%, and maize up to 50%, as well as their mixtures of up to 60%, had better fur (80% of the skin of the I class and 60% of the control) . The skin of the 5th and 7th experimental groups by type did not differ from the control ones, while the 6th and 10th even prevailed the first group by 40% by the number of I-pellets. In men of this color type, improvement in skin quality was observed in the 2nd, 4th, 7th and 9th experimental groups.

Female foxes of the 7th and 9th experimental groups were characterized by a significant increase in the mass of unopened skin. In addition, animals of this color type, which moderately replaced the protein of the meat group with other proteins of origin, were characterized by a higher dimensional category of skin. Similar tendencies of changes in linear and mass sizes of the skin were also males of white fox. Estimation of white fox sheep showed that an increase in the share of skin class I was observed in animals of the 2nd, 4th, 6th and 9th experimental groups, while the 3rd and 5th animals, by contrast, degraded and decreased.

The skin of fox males of 4, 6, 7 and 9 experimental groups was characterized by increased quality and a decrease in the skin particle of the second group of defects. Animals of the 3rd, 5th groups did not differ in size, but had 40 and 20% more skin of the second group of defects and a lower value of the magnitude. Skins of the 10th group were characterized by an increased proportion of skins of the II class and the third group of defects (the appearance of a large number of black spots on the fur).

Conclusions. Studies show that the type of fox color, type and part of meat restriction affect the productivity and quality of furs. Yes, it significantly affects the weight, weight gain and weight of the skin. However, the linear sizes and cost of furs do not significantly change under the influence of the combination of investigated factors of technology of furs production.

Prospects for further research. Further studies will focus on the study of the histological picture of fox skin of various types of color. It will be interesting to see a comprehensive assessment of the influence of fodder and color factors on the formation and development of individual skin structures, as well as the correlation between research factors.

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АННОТАЦИЯ
КОМПЛЕКСНИЙ АНАЛІЗ ВПЛИВУ РІЗНОЇ ГОДІВЛІ НА ПРОДУКТИВНІСТЬ СРІБЛЯСТО-ЧОРНОЇ, ЧЕРВОНОЇ ТА БІЛОЇ ЛИСИЦІ (Vulpes Vulpes)

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В статті подані результати комплексного аналізу впливу на якість шкурок лисиці їх кольорового типу, годівлі та частки зміни м'ясних кормів в раціонах. При цьому вивчались як морфологічні, так і товарознавчі показники хутра сріблясто-чорної, червоної та білої лисиць. Експериментально встановлено, що тип годівлі, частка заміни м'ясних кормів в раціонах товарного молодняку різних кольорових типів по-різному впливає на якість хутра. Виявлено, що кольоровий тип лисиць достовірно впливав на прояв таких продуктивних ознак, як приросту живої маси, довжину та ширину шкурок, площу та масу їх (P<0,001). Вид замінника м'ясних кормів визначав достовірну зміну лінійних та масових параметрів хутрової продукції лисиць. Частка кормового замінника м'ясних кормів достовірно впливала на формування живої маси товарного молодняку та готової хутрової продукції.

Цікавим виявився комплексний вплив дослідних факторів на продуктивні ознаки лисиць. Зокрема, комплексний вплив типу кольору лисиць та вид замінника проявлявся у достовірних змінах маси тварин та маси одержаної продукції (шкурок) від них. Аналогічною

була комплексна дія всіх трьох дослідних факторів. Проте, за вивчення комплексного впливу типу кольору лисиць та частки замінника достовірною виявилася лише зміна маси сирої неміздрованої шкурки. Не мали будь-якого впливу на лінійні розміри шкурок лисиць та її оцінку частка замінника м'ясного корму та поєднання цього фактору з типом кольору та видом замінника.

В ході експерименту вивчалися також гендерні особливості адаптації лисиць до зміни годівлі. Установлено, що самки сріблясто-чорного типу 2, 6 та 7 дослідних груп мали краще хутро, а самці 10 – характеризувалися погіршанням якості шкурок. Самки і самці червоної лисиці краще адаптувалися до раціонів із частковою заміною м'ясних кормів макухою соняшниковою. В цих групах спостерігалось покращення лінійних та якісних показників шкурок. У лисиць білого кольорового типу найважчі та якісніші шкурки виявилися у самок 7 і 9 дослідних груп, а у самців – 4, 6, 7 та 9 груп.

Ключові слова: *лисиці (Vulpes Vulpes), товарний молодняк, продуктивність, комплексна оцінка, годівля, замінник м'ясних кормів, ефективність*

Рис. 2. Табл. 2. Літ. 15.

ANNOTATION

КОМПЛЕКСНЫЙ АНАЛИЗ ВЛИЯНИЯ РАЗЛИЧНОГО КОРМЛЕНИЯ НА ПРОИЗВОДИТЕЛЬНОСТЬ СЕРЕБРИСТО-ЧЕРНОЙ, КРАСНОЙ И БЕЛОЙ ЛИСИЦЫ (Vulpes Vulpes)

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В статье представлены результаты комплексного анализа влияния на качество шкурок лисы их цветного типа, кормления и доли изменения мясных кормов в рационах. При этом изучались как морфологические, так и товароведные показатели меха серебристо-черной, красной и белой лисиц. Экспериментально установлено, что тип кормления, доля замены мясных кормов в рационах товарного молодняка разных цветовых типов по-разному влияет на качество меха. Выявлено, что цветной тип лис достоверно влиял на проявление таких продуктивных признаков, как приросты живой массы, длину и ширину шкурок, площадь и массу их (P<0,001). Вид заменителя мясных кормов определял достоверное изменение линейных и массовых параметров меховой продукции лисиц. Доля кормового заменителя мясных кормов достоверно влияла на формирование живой массы товарного молодняка и массу готовой меховой продукции. Интересным оказался комплексное воздействие исследовательских факторов на продуктивные признаки лисиц. В частности, комплексное воздействие типа цвета лис и вид заменителя проявлялся в достоверных изменениях массы животных и массы полученной продукции (шкурок) от них. Аналогичным было комплексное воздействие всех трех опытных факторов. Однако, за изучение комплексного влияния типа цвета лис и доли заменителя достоверной оказалась лишь изменение масса сырой немездренной шкурки. Не установлено влияния на линейные размеры шкурок лисиц и их оценку доли заменителя мясного корма и сочетания этого фактора с типом цвета и видом заменителя.

Ключевые слова: *лисица (Vulpes Vulpes), товарный молодняк, производительность, комплексная оценка, кормление, заменитель мясных кормов, эффективность*

Fig. 2. Tab. 2. Ref. 15.

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ЗМІСТ

ГОДІВЛЯ ТВАРИН ТА ТЕХНОЛОГІЯ КОРМІВ

СУЧАСНІ ПРОБЛЕМИ СЕЛЕКЦІЇ, РОЗВЕДЕННЯ ТА ГІГІЄНИ ТВАРИН

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