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PROSPECTS FOR THE DEVELOPMENT OF FEED PRODUCTION FOR FUR ANIMALS

Abstract

The article considers the species of fur animals bred in Ukraine. The volumes of fur production and the number of animal farms in the world and Ukraine are analyzed, of which Denmark, China and Poland are in the top three. The share in the total volume of fur production in Ukraine is only 1%. Domestic enterprises for breeding fur animals, which keep about 700 thousand minks in industrial conditions, are considered.

The structure of the gastrointestinal tract of carnivorous and herbivorous fur animals, their consumption of nutrients and biologically active substances in feed were analyzed. Features of feeding fur animals are determined by the seasonality of vital functions, which determines changes in metabolism and nutritional value of feed. The importance of access to fresh drinking water in the diets of carnivorous fur animals is considered.

The necessity of production of compound feeds for fur animals, which meet the norms of feeding and restrictions on the introduction of components, is substantiated.

The need of fur-bearing animals in nutrients and biologically active substances for the production of high-quality nutritious compound feeds, for obtaining high-quality shine and density of fur, better digestibility by the body is shown. The ratios of digestible nutrients in the diets of minks of domestic and Scandinavian breeds are given, the percentage of metabolic energy in different feeding periods is given. The low percentage of compound feed production for fur farming is substantiated.

Types of compound feeds and their advantages are presented. Technological methods of production of compound feeds for fur animals such as extrusion, expansion and granulation with the introduction of fat into the press granulator are analyzed. Finished feed should be solid and have a granule size of 4.5... 5 mm for grinding cutters, with high nutritional properties and biological value, and improved sanitation. Thanks to modern technologies, harmful microflora is disinfected and shelf life is increased.

The state of domestic feed mills for the production of quality feed for fur animals is analyzed. Thanks to the emergence of new recipes and compliance with feeding standards, the technology of compound feed production for fur farming is being improved.

Key words: fur animals, animal husbandry, digestion, compound feed for fur animals, types of compound feeds.

Introduction

Fur farming is a branch of agriculture that involves breeding animals to produce fur products. The process of growing and feeding fur animals on animal farms takes place according to international strict rules for keeping this species of animals. [1-3].

In Ukraine, farmers breed minks mainly, from which 90 % of all fur is obtained (Fig. 1), the remaining 10 % is accounted for by: fox (about 5 %), arctic fox (4 %) and other species (1 %) [4]. According to the Association of Breeders of Ukraine, there are 10 large animal farms, 4 of which are industrial. Today, Ukrainian animal farms keep about 700,000 minks in industrial conditions [5, 6].

The largest producers of fur animals are Denmark, which ranks first among the countries of the European Union (EU) and provides about 17 million skins a year. Next among the EU countries are Poland, which produces about 5 million skins a year, and the Netherlands - 4 million skins a year. Among the developed non-EU countries, the leaders in fur production are China - about 17 million skins per year, Canada - about 1.5 million skins per year and the United States - 3.9 million skins per year (Table 1) [3, 7].

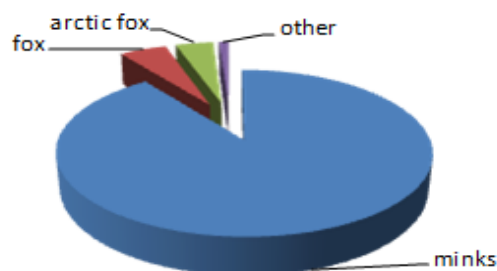


Fig. 1. Growing fur animals in Ukraine

In Ukraine, fur companies operate in such regions as Kyiv (LLC "Pelskom", LLC "Mink Farm "Viking", LLC "Baryshivsky animal breeding farm"), Kharkiv (LLC "Animal Husbandry Izyumske"), Dnipropetrovsk (LLC "Production and Construction Company" Agroprominvest") and Kherson region (Tivoli Fur LLC, Pereyaslav-Khmelnitsky animal breeding farm of the Kyiv Regional Union of Consumer Cooperatives) and others.

In the world and, when keeping fur-bearing animals on farms, new and by-products are obtained, which are used in various industries (Fig. 2). The main role of

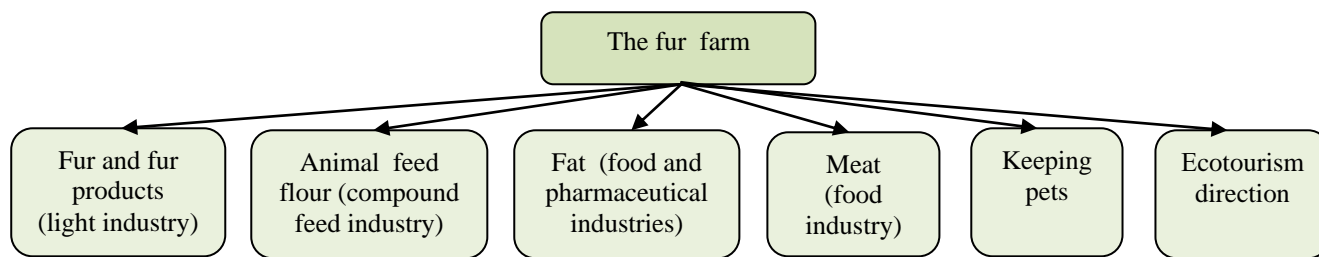


Fig. 2. Use of animal farm products

Table 1 – Volumes of fur production and the number of animal farms in the world

Country	Production volumes, million units for a year	Share in total production, %	Number of animal farms, units.	Share in the total number of farms, %
Denmark	17.0	28.0	1400	29.1
China	17.0	28.0	800	16.6
Poland	5.0	8.2	600	12.5
Netherlands	4.0	6.6	300	6.2
USA	3.9	6.4	350	7.3
Finland	2.0	3.3	400	8.3
Greece	1.8	3.0	200	4.2
Russia	1.7	2.8	55	1.1
Lithuania	1.6	2.6	100	2.1
Canada	1.5	2.5	250	5.2
Sweden	0.8	1.3	50	1.0
Spain	0.7	1.2	70	1.5
Ukraine	0.63	1.0	10	0.2

Ukrainian animal farms is the utilization of animal waste generated in the food industry, which significantly reduces the burden on the environment with waste of biological origin and solves the issue of their utilization.

In 2019, animal farms consumed 44,000 tons of animal by-products not intended for human consumption. As a result, during 2019, poultry farms and fisheries received UAH 253 million from mink farms as revenue for the sale of these by-products of animal origin [11].

Purpose and objectives of the analysis

The purpose of the study is to find information about the feasibility and economic attractiveness of the production of feed for fur animals, the peculiarities of feeding and the state of production of domestic feed for fur animals.

Results and its discussion

Fur farming is a seasonal business, the highest feeding costs are in the summer, because the basis of animal health, their beautiful and thick fur, is a balanced feeding, feed that is rich in nutrients and biologically active substances.

Cage-bred fur-bearing animals are divided according to the nature of feeding into carnivores, omnivores and herbivores. Under natural conditions, carnivorous fur-bearing animals feed mainly by animal feeds, as evidenced by the structure of the skull, teeth and various parts of the digestive tract. Their oral cavity is small, the teeth are adapted only to tear off pieces of meat or fish, which they swallow almost without chewing. In carnivorous

fur animals, the stomach is small, the intestines are much shorter than in herbivores. The small length of the intestine causes the rapid passage of food through the gastrointestinal tract. In the feeding of carnivorous fur animals, animal feed should be up to 70...80 % of the rations in terms of energy nutrition, concentrated feed - up to 15...20 %, vegetables and fruits - up to 5...10 % [14].

Carnivorous fur-bearing animals should have access to clean drinking water. Restriction in water reduces feed intake, impairs reproductive function and growth of young animals. In hot weather it is necessary to watch that in drinking bowls there was cool pure water (temperature +15...+18 °C). It is necessary to change water every 1,5...2,0 hours [14].

Herbivorous fur-bearing animals have a single-chambered stomach and are able to consume large amounts of bulky food. To provide nutrients, the stomach must be constantly filled with food [8, 9]. For feeding

herbivorous fur animals use mainly feed of plant origin, which have different nutritional value [16].

Modern rations for fur animals are based on their biological characteristics, species and physiological period. The main biological features of fur animals include seasonality of vital functions, which determines changes in metabolism, nutrition and energy at different times of the year. Fur animals are characterized by fertility, high growth rate and precocity. Comprehensively balanced feeding during the growing season greatly affects the development of the organism and the formation of future productive qualities. The level of feeding of adult fur-bearing animals in the summer should provide restoration of body weight, in the autumn - a stock of energy in the form of deposition of considerable quantity of fat [10].

With the change of the fodder base of animal husbandry, the composition of the rations of fur animals has changed significantly. The content in the rations of animal feed has decreased. Fodder products of food production began to occupy a large share and the amount of grain raw materials increased [10].

Mink grow poorly on rations with a high content of grain feed (more than 30...35 % of the energy of the rations), as their stomach produces more pepsin - an enzyme that breaks down proteins, so feed carbohydrates are simply not digested and animals do not get enough energy. The optimal supply of carbohydrates to minks - within 15...30 % of the caloric content of the ration. According to the feeding norms of foxes and arctic foxes,



Table 2 – The ratio of digestible nutrients in the rations of minks of domestic and Scandinavian breeds

Mink breeds	Protein (g)			Fat (g)			Carbohydrates (g)		
	min	norm	ME, %	min	norm	ME, %	min	norm	ME, %
Domestic	9...10	9.5	42.7	4...4.8	4.4	40.9	3.2...4.8	4	16.4
Denmark	10...11	10.5	50...54	4.4...5.2	4.8	39...41	2.0...2.4	2,2	10.5...11

carbohydrates should not exceed 35 % of metabolic energy (ME), i.e. 8.5 g/100 KCal, but it is not recommended to reduce the supply of carbohydrates below 15 % of the rations, i.e. 3.7 g/100 KCal, as the growth rate of animals decreases and the quality of fur deteriorates [13, 14].

The recommended ratio of digestible nutrients in the rations of minks of domestic and Scandinavian breeds, per 100 KCal of metabolic energy is presented in table. 2 [19].

In winter, Danish breeders recommend a higher content of the digestible protein in the diets of fur animals, at least 50 % ME, in our country this figure is about 43 % [19].

The rations of fur-bearing animals in the summer are enriched with fat, which has a positive effect on the growth of animals, the quality and size of their fur. Adjust the fat content per 100 KCal of mink feed - 5.3 g, foxes - up to 4.8 g, arctic foxes s - 5.0 g. In Ukraine, the level of feeding mink in this period is reduced from 200 to 160, foxes - from 400 to 350 KCal. With a decrease in energy nutrition, the amount of digestible protein in the diet of mink is increased to 25 g, and foxes and arctic foxes - 30 g [13, 14].

Per 100 kJ of dietary energy, adult minks need 0.7...0.8 g, foxes - 0.7...1.1 g, arctic foxes - 0.7...1.1 g of digestible fat depending on the season (less in winter, more in summer). In the absence of fat in the diet of females there is a decrease in the yield of young and the birth of non-viable offspring, as well as an increase in the cost of digestible protein. Per 100 kJ of metabolic energy, adult minks need 0.6...1.9 g, foxes - 0.9...2.2 g, arctic foxes - 0.9...2.2 g of digestible carbohydrates depending on the season [15].

The rations of fur-bearing animals should contain the required amount of amino acids, vitamins, minerals (namely calcium and phosphorus, the ratio of which should be 1:1...1.7:1). Calcium and phosphorus deficiency are most often experienced by young animals, pregnant and lactating females. The need of young and lactating females in calcium is 0.15...0.25 g, in phosphorus - 0.12...0.18 g per 100 KCal of feed. During lactation in multiparous females may be dehydration and gastric secretion disorders due to lack of sodium and chlorine, so it is recommended during this period to add salt to the feed at the rate of 0.2...0.3 g per 100 KCal ME.

The need of fur animals for protein depends on its biological value, ie the amount and ratio of essential amino acids contained in feed. An imbalance of methionine, cystine, tryptophan and lysine in the diets of mink leads to a decrease in feed intake, growth inhibition, reduced immunity. The minimum amount of essential amino acids in the diets of mink according to Danish data are given in table. 3 [19].

Predatory fur-bearing animals are not able to synthesize vitamins, but must receive them from the out-

side with food. Recommendations of Scandinavian breeders for the introduction into the feed mixture (per 1 kg of feed) of essential vitamins are given in table. 4 [19].

Among the various species of farm animals, the largest amount of feed in the world is produced for poultry - more than 65 %, while the share of feed for fur animals is about 3 %.

Low percentage of feed production for animal farms is associated with unstable demand for feed for fur animals, imperfection of domestic feed recipes, shortcomings of feed production technology, high electricity costs for feed production, high cost of finished feed, so it is necessary to improve the production of domestic balanced feed for fur animals.

Compound feeds for fur animals must be created on the basis of high-quality raw materials and modern formulas intended for feeding throughout the life of the animal. The content of nutrients and biologically active substances must be adapted to the needs of the body of

Table 3 – The minimum content of essential amino acids in the diets of mink according to Danish data

Amino acid	mg / 100 KCal
Methionine	280
Cystine	105
Lysine	470
Tryptophan	105
Arginine	545
Valine	610
Histidine	265
Leucine	875
Isoleucine	455
Tyrosine	315
Theanine	335
Phenylalanine	505

Table 4 – Recommendations for the content of vitamins in the diets of mink in 1 kg of feed

Vitamin	Country	
	Denmark	Finland
A, IU	7000	3500
D ₃ , IU	700	350
E, mg	80	80
B ₁ , mg	25	80
B ₂ , mg	12	6
B ₃ , mg	34.4	4
B ₅ , mg	16	10
B ₆ , mg	8	3
B ₉ , mg	0.7	2
B ₁₂ , mg	0.04	0.02



fur animals, provide rapid growth and better-quality fur, compared with non-specialized feeds that can be used for feeding fur animals [12].

The advantages of using feed for fur animals are improved quality, shine and density of fur, better digestibility, resulting in faster growth of animals, feed for lactating females contribute to the enrichment of animal diets with all necessary nutrients and biologically active substances, which directly affects the quality of offspring.

When developing recipes and producing complete feed and concentrate feed for fur animals, it is necessary to take into account the season of the year, age, physiological condition, housing conditions, purpose of cultivation, live weight and individual characteristics. In the period from June to November, adult minks increase their live weight by 20...30 %. In the cold period, the live weight of minks decreases as a result of a decrease in fatness by 10...20 %, which means that females lose weight by about 2.5 g per day.

The increase in the number of fur-bearing animals in animal farms necessitates the production of compound feeds that could ensure the reproduction of livestock and high-quality fur with minimal feed and manual labor costs [18].

In order to increase the digestibility and efficiency of the use of nutrients in the feeding of fur animals, technological processes of granulation, extrusion and expansion are used.

For fur animals develop recipes for feed with a fat content of 20 % and above, so it is advisable to feed in the form of granules produced by the technology of granulation with the introduction of fat into the press granulator at the set parameters of its work [18]. Granulation of compound feeds takes place with the help of a press-granulator at a vapor pressure of 0.3...0.4 MPa and a temperature of +110...120 °C. The mass fraction of moisture of granulated feed for fur animals should not exceed 14.5 %, the size of the granules with a diameter of 3...4 mm and a length of 5...8 mm deprives the animals to choose individual parts of the feed. The diet of fur-bearing animals should consist of solid dense feed, as they are constantly growing new teeth and there is a need to grind teeth, so use feed in the form of granules [20].

The technological process of extrusion takes place in the extruder at a vapor pressure of 2.0...3.0 MPa and a temperature of +120...130 °C. During the extrusion process, the most significant transformations take place in the carbohydrate-lignin complex, ie the amount of sugars and dextrans increases, anti-nutrient substances of legumes are destroyed, which inhibit the fermentation process of protein, and also adversely affect the health of fur animals, disinfect harmful microflora and increase shelf life [17].

In the production of expanded feed is processed in the expander at a vapor pressure of 5...8 MPa, a temperature of +130...150 °C and an auger speed of 5...7 s⁻¹. This method of production of expanded feed for fur animals allows: to obtain complete feed with high nutritional properties and biological value, to use as raw materials of feed various types of raw materials, to create feed with high nutrition and digestibility, as well as improved sanitation [21].

Most domestic feed mills focus on products for farm animals and poultry and use outdated production technologies, but such technologies are not suitable for feeding fur animals, so in Ukraine it is necessary to develop new recipes for fur animals and reconstruct old feed mills or build new large and small enterprises, which are equipped with modern equipment that will be competitive in the production of feed for fur animals.

Conclusions

Thus, the business of breeding fur animals is popular because of the production of valuable fur, as well as a way to dispose of animal waste generated in the food industry.

The analysis of the state of production of compound feeds for fur animals in Ukraine shows the need to develop modern recipes that take into account the physiological needs of each species of fur animals.

Based on the analysis of production technology, raw material base and efficiency of feed recipes, the need to improve and optimize feed production technologies for fur animals is justified, which will reduce the cost of using domestic raw materials and increase the competitiveness of feed in the market, which will reduce dependence on imported feed.

REFERENCES

1. Huzyk O.D., Khazin V.I. *Suchasna tekhnolohiia vyroshchuvannya ta systemy utrymannya kroliv i zviriv* // Zbirnyk naukovykh prats (haluzeve mashynobuduvannya, budivnytstvo). 2013. Vyp. 4(39). T.2. S.41-48.
2. Lesley A. Peterson. *Detailed Discussion of Fur Animals and Fur Production* // Animal Legal & Historical Center: [Website]. United States, 2010. URL: <https://www.animallaw.info/article/detailed-discussion-fur-animals-and-fur-production> (date of application: 25.05.2021)
3. *Mink Industry in Canada* // Canada Mink Breeders: [Website]. Canada, 2018. URL: <https://www.canadamink.ca/mink-industry-in-canada/> (date of application: 30.05.2021)
4. *Norkovi fermi prynosiat milionni investytsii, vykonuiuchy vazhlyvu ekolohichnu ta sotsialnu funktsii* // Asotsiatsiia zvirivnykiv Ukrainy: [Veb-sayt]. Sumy, 2019. URL: <https://uffa.org.ua/norkovye-fermy-prinosyat-millionnye-investiczi/> (data zvernennia 01.06.2021)
5. Sharii T.I. *ta in. Imunostymuliuucha diia preparatu "Khutrovit plus"* // Materialy mizhnarodnoho forumu "Osnovy molekuliarno-henetychnoho ozdorovlennia liudyny i dovkillia". Kyiv, 2005. S. 210-211.
6. Reinbakh N. *Vidpovidalne norkivnytstvo* // Asotsiatsiia zvirivnykiv Ukrainy: [Veb-sayt]. Sumy, 2019. URL: <https://uffa.org.ua/otvetsvennoe-norkovodstvo/> (data zvernennia 01.06.2021)
7. Hryshchenko I.M., Danylkovych A.H., Mokrousova O.R. *Rynok khutrovot syrovyny v Ukraini ta sviti* // Lehka promyslovist. 2015. №4. S. 40-42.
8. Blas C., Wiseman J. *Nutrition of the rabbit*. London, 1998. 16 p.
9. Balakirev N.A. *Otbor pushnyih zverey po evolyutsionno nesvoystvennyim vidam kormov i nizkoproteinovomu kormleniyu* // Vestnik VOGiS. 2007. T. 11. #1. S. 212-220.



10. Kravchenko O.O., Melnyk V.O. *Tekhnolohiia ta bezpeka hodivli khutrovyykh zviriv, kroliv, sobak : konspekt lektsii*. Mykolaiv, 2015. 120 s.
11. *Naukovo-doslidna otsinka diialnosti vitchyzniannykh ferm iz vyroshchuvannya norok // Derzhavna ekolohichna akademiia: [Veb-sayt]*. Kyiv, 2019. URL: <http://komekolog.rada.gov.ua/uploads/documents/35853.pdf> (data zvernennia 05.06.2021)
12. TS 1.5 Specific feed safety limits // GMP+ International: [Website]. Netherlands, 2020. URL: <https://www.gmpplus.org/media/do1m2n2d/ts-1-5-specific-feed-safety-limits.pdf> (date of application: 30.06.2021)
13. Shevchuk T.V. *Svizhi yabluchni vychavky u ratsionakh tovarnoho molodniaku sribliasto-chornykh lysyts klitkovoho rozvedennia // Visnyk Sumskoho natsionalnoho aharnoho universytetu*. 2017. Vyp. 5/2 (32). S. 178-183.
14. Bala V.I. *ta in. Tekhnolohiia vyrobnytstva produktsii krolivnytstva i zvirivnytstva*. Pidruchnyk. Vinnytsia, 2009. 272 s.
15. Ibatullin I.I. *ta in. Praktikum z hodivli silskohospodarskykh tvaryn: navchalnyi posibnyk*. Kyiv, 2015. 422 s.
16. Laerke H.N., Hejlesen C., Hedemann M.S. *Physico-chemical properties of different carbohydrate sources in the gut of mink // VIII International Scientific Congress in Fur Animal Production*. 2004. Vol. 28. № 3. P. 110-115.
17. Diachenko L.S., Bomko V.S., Syvyk T.L. *Osnovy tekhnolohii kombikormovoho vyrobnytstva: navch. posibnyk*. Bila Tserkva, 2015. 306 s.
18. Shentsova E.S. *ta dr. Optimizatsiya protsessa granulirovaniya kombikormov dlya pushnykh zverey // Vestnik VGUI*. 2021. T. 83. № 1. S. 240-247.
19. Parkalov I.V. *Rekomendatsii dlya spetsialistov zverovodstva na yanvar 2019 goda // Nauchno-prakticheskii tsentr natsionalnoy akademii nauk Belarusi po mehanizatsii selskogo hozyaystv: [Veb-sayt]*. Belarus, 2019. URL: <https://belagromech.by/articles/rekomendacii-dlja-specialistov-zverovodstva-na-yanvar-2019-goda/> (data zvernennia 05.06.2021)
20. Djuragic O., Sredanovic S., Levic J. *Granulation - an important characteristic of feed quality // Progress of Theoretical and Experimental Physics*. 2003. Vol. 6. Iss. 1-2. P. 44-45.
21. Prestløkken E., Fôrutvikling F. *Expander treatment // HFE 305 Feed Manufacturing Technology: [Website]*. Norway, 2012. URL: http://www.umb.no/statisk/iha/kurs/nova/feed_technology/4.pdf

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ПЕРСПЕКТИВИ РОЗВИТКУ ВИРОБНИЦТВА КОМБІКОРМІВ ДЛЯ ХУТРОВИХ ЗВІРІВ

Анотація

У статті зазначено, що хутрове звірівництво – важлива галузь сільського господарства, що займається розведенням хутрових звірів з метою отримання хутрової продукції. Розглянуто види хутрових звірів, які вирощують в Україні. Проаналізовано обсяги виробництва хутра та чисельність звіроферм в світі та Україні, з яких в трійку лідерів входять Данія, Китай та Польща. Частка у загальному обсязі виробництва хутра в Україні становить лише 1 %. Розглянуто вітчизняні підприємства з вирощування хутрових звірів, які утримують в промислових умовах близько 700 тисяч норок.

Проаналізовано будову шлунково-кишкового тракту м'ясоїдних та рослиноїдних хутрових звірів, споживання ними поживних і біологічно активних речовин кормів. Особливості годівлі хутрових звірів визначаються сезонністю життєвих функцій, яка визначає зміни обміну речовин та поживності кормів. Розглянуто важливість доступу до свіжої питної води у раціонах м'ясоїдних хутрових звірів.

Обґрунтовано необхідність виробництва комбікормів для хутрових звірів, які відповідають нормам годівлі і обмеженням по введенню компонентів.

Наведена потреба хутрових звірів в поживних і біологічно активних речовинах для виготовлення високоякісних поживних комбікормів, для отримання якісного блиску і густоти хутра, кращої засвоюваності організмом. Наведені співвідношення перетравних поживних речовин в раціонах норок вітчизняних і скандинавських порід, наведений відсоток обмінної енергії у різний період годівлі. Обґрунтовано низький відсоток виробництва комбікормів для хутрового звірівництва.

Представлені види комбікормів та їх переваги. Проаналізовано технологічні способи виробництва комбікормів для хутрових звірів такі як екструдкування, експандування та гранулювання з введенням жиру у прес-гранулятор. Готові комбікорми повинні бути твердими і мати розмір гранул 4,5...5 мм для сточування різців, з високими поживними властивостями і біологічною цінністю, та поліпшеним санітарним станом. Завдяки сучасним технологіям знезаражується шкідлива мікрофлора та збільшуються терміни зберігання.



Проаналізовано стан вітчизняних комбікормових заводів для виробництва якісних комбікормів для хутрових звірів. Завдяки появі нових рецептур і дотриманню норм годівлі удосконалюється технологія виробництва комбікормів для хутрового звірівництва.

Ключові слова: хутрові звірі, звірівництво, травлення, комбікорм для хутрових звірів, види комбікормів.

ЛІТЕРАТУРА

1. Гузик О.Д., Хазін В.Й. Сучасна технологія вирощування та системи утримання кролів і звірів // Збірник наукових праць (галузеве машинобудування, будівництво). 2013. Вип. 4(39). Т.2. С.41-48.
2. Lesley A. Peterson. Detailed Discussion of Fur Animals and Fur Production // Animal Legal & Historical Center: [Website]. United States, 2010. URL: <https://www.animallaw.info/article/detailed-discussion-fur-animals-and-fur-production> (date of application: 25.05.2021)
3. Mink Industry in Canada // Canada Mink Breeders: [Website]. Canada, 2018. URL: <https://www.canadamink.ca/mink-industry-in-canada/> (date of application: 30.05.2021)
4. Норкові ферми приносять мільйонні інвестиції, виконуючи важливу екологічну та соціальну функції // Асоціація звірівників України: [Веб-сайт]. Суми, 2019. URL: <https://uffa.org.ua/norkovye-fermy-prinosyat-millionnye-investitsii/> (дата звернення 01.06.2021)
5. Шарій Т.І. та ін. Імуностимулююча дія препарату "Хутровіт плюс" // Матеріали міжнародного форуму "Основи молекулярно-генетичного оздоровлення людини і довкілля". Київ, 2005. С. 210-211.
6. Рейнбах Н. Відповідальне норківництво // Асоціація звірівників України: [Веб-сайт]. Суми, 2019. URL: <https://uffa.org.ua/otvetstvennoe-norkovodstvo/> (дата звернення 01.06.2021)
7. Грищенко І.М., Данилкович А.Г., Мокроусова О.Р. Ринок хутрової сировини в Україні та світі // Легка промисловість. 2015. №4. С. 40-42.
8. Blas C., Wiseman J. Nutrition of the rabbit. London, 1998. 16 p.
9. Балакирев Н.А. Отбор пушных зверей по эволюционно несвойственным видам кормов и низкопротеиновому кормлению // Вестник ВОГиС. 2007. Т. 11. №1. С. 212-220.
10. Кравченко О.О., Мельник В.О. Технологія та безпека годівлі хутрових звірів, кролів, собак : конспект лекцій. Миколаїв, 2015. 120 с.
11. Науково-дослідна оцінка діяльності вітчизняних ферм із вирощування норок // Державна екологічна академія: [Веб-сайт]. Київ, 2019. URL: <http://komekolog.rada.gov.ua/uploads/documents/35853.pdf> (дата звернення 05.06.2021)
12. TS 1.5 Specific feed safety limits // GMP+ International: [Website]. Netherlands, 2020. URL: <https://www.gmpplus.org/media/do1m2n2d/ts-1-5-specific-feed-safety-limits.pdf> (date of application: 30.06.2021)
13. Шевчук Т.В. Свіжі яблучні вичавки у раціонах товарного молодняка сріблясто-чорних лисиць кліткового розведення // Вісник Сумського національного аграрного університету. 2017. Вип. 5/2 (32). С. 178-183.
14. Бала В.І. та ін. Технологія виробництва продукції кролівництва і звірівництва. Підручник. Вінниця, 2009. 272 с.
15. Ібатуллин І.І. та ін. Практикум з годівлі сільськогосподарських тварин: навчальний посібник. Київ, 2015. 422 с.
16. Laerke H.N., Hejlesen C., Hedemann M.S. Physico-chemical properties of different carbohydrate sources in the gut of mink // VIII International Scientific Congress in Fur Animal Production. 2004. Vol. 28. № 3. P. 110-115.
17. Дяченко Л.С., Бомко В.С., Сивик Т.Л. Основи технології комбікормового виробництва: навч. посібник. Біла Церква, 2015. 306 с.
18. Шенцова Е.С. та др. Оптимизация процесса гранулирования комбикормов для пушных зверей // Вестник ВГУИТ. 2021. Т. 83. №. 1. С. 240-247.
19. Паркалов И.В. Рекомендации для специалистов звероводства на январь 2019 года // Научно-практический центр национальной академии наук Беларуси по механизации сельского хозяйства: [Веб-сайт]. Беларусь, 2019. URL: <https://belagromtech.by/articles/rekomendacii-dlja-specialistov-zverovodstva-na-janvar-2019-goda/> (дата звернення 05.06.2021)
20. Djuragic O., Sredanovic S., Levic J. Granulation - an important characteristic of feed quality // Progress of Theoretical and Experimental Physics. 2003. Vol. 6. Iss. 1-2. P. 44-45.
21. Prestløyken E., Fôrutvikling F. Expander treatment // HFE 305 Feed Manufacturing Technology: [Website]. Norway, 2012. URL: http://www.umb.no/statisk/iha/kurs/nova/feed_technology/4.pdf

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