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GENETIC CHARACTERISTICS OF POLTAVSKE SRIBLO RABBITS BY MYOSTATIN AND PROGESTERONE RECEPTOR GENE AND SELECTION INDICES

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Background. Rabbit breeding is a branch of animal husbandry that produces cheap and high-quality meat products in a short period of time. Productive, maternal, reproductive and technological characteristics determine the economic efficiency of rabbit breeding under the conditions of full realization of the genetic potential of animals and a good fodder base. The main factor in the development of rabbit breeding is the increase in the number of animals, which is supported by improved maintenance, veterinary support and breeding practices.

Materials and Methods. The experiment was conducted on a population of rabbits (200 heads) of the Poltavske sriblo breed. After weaning at 45 days of age, the young were separated by sex and kept 3–4 animals in a cage. 3-month-old males were placed in individual cages until they reached the age of breeding use – 150–160 days. Rabbits were fed granulated compound feed: concentrated fodder, grass meal, feed additives of animal origin, minerals and premixes. Blood was taken from the ear vein. DNA was isolated using a standard commercial kit “DNA-sorb B” with some modifications.

Wright’s F-statistic, including several F-coefficients of inbreeding, was used to assess the genetic differentiation of populations. Testing of the population according to the studied genes for Hardy–Weinberg genetic equilibrium was carried out using the Pearson χ2 test. To determine Poltavske sriblo rabbits’ breeding value, indices were calculated based

on economic and beneficial traits, including genetic and economic values of individual traits. As a genetic parameter, the heredity coefficient of rabbits was used, and the economic one was the cost of the products produced.

Results. The results of the peculiarities of Poltavske sriblo rabbits genetic structure analysis by the distribution of allelic variants of the myostatin gene and progesterone receptor in the context of genealogical lines are presented. It was found that the greatest frequency of the C allele by the myostatin gene was in the descendants of the male Cooper (0.551). The frequency of the T allele in this sample of animals was 0.449, respectively. For Snowball's line rabbits, higher values of the G allele by progesterone receptor gene (0.488) were noted due to the advantage of homozygous animals. The highest value of the effective number of alleles by the myostatin gene was characteristic of Cooper's rabbit line (0.500), and the lowest – of Bach's lines (0.215) and Barry's lines (0.230). According to the progesterone receptor gene, the highest values of Ne were for the Cooper (0.500), Snowball (0.507), and Mini (0.511) rabbits, and the lowest values were for Fox (0.307).

The influence of the rabbit genotype on the manifestation of economic and beneficial traits – average daily growth and fertility – has also been established. The use of the breeding value evaluation of the Poltavske sriblo breed rabbits according to the selection and genetic index according to the productivity of daughters, made it possible to single out the main males among the group, as fertilizers. Male fertilizers included Snowball, Long, and Mini.

Conclusions. The obtained data can be used for selective and breeding practices in rabbit breeding with the aim of selecting breeders for the improvement of the meat productivity and reproductive ability of rabbits.

Keywords: rabbits, DNA markers, myostatin, progesterone receptor, meat production, reproductive capacity, index score

INTRODUCTION

A significant role in providing humanity with food, fur products, and rabbit wool raw materials is attributed to rabbit breeding (Bashchenko *et al*., 2018; Vakulenko, 2008; Shevchenko & Honchar, 2011; Lebas *et al*., 1986). It refers to such a segment of livestock breeding, which has great potential for increasing the production of relatively cheap and high-quality meat products in a short time (Bilyi, 1990; Vakulenko & Ochkovska, 2007; Luchyn, 2022).

Different rabbit breeds and the anatomical location of muscles may also affect the nutritional profile and physicochemical properties of rabbit meat (Kumar *et al*., 2023)

The main components determining the economic efficiency of rabbit breeding with the full realization of the genetic potential of animals and a good feed base are their productive, maternal, reproductive, and technological characteristics, which are necessary components of breeding work aimed at the improvement of parental forms. To stabilize and increase this indicator, it is necessary to establish a set of measures to improve the maintenance, as well as to carry out constant control of the veterinary support of the industry and conduct selective and breeding work with the rabbit breeding herd (Luchyn, 2022; Bolet *et al*., 2000; Lesyk *et al*., 2021).

Using the sequencing method, a number of loci were genetically characterized, which are involved in the formation of the European rabbit (*Oryctolagus cuniculus*) coat

color and contribute to its variability in different domestic breeds (Utzeri *et al*., 2021; Demars *et al*., 2018).

It should be noted that an important link in breeding programs to increase the productivity of rabbits is the use of a system for assessing the breeding value of animals (Shevchenko & Honchar, 2020; Baselga, 2004). The genetic improvement of the next generation and the population as a whole depends on its objectivity and accuracy. The main objective in this respect is to use genetic control of the origin of animals, assessment of the genetic structure of the population by DNA markers, and index assessment with the purpose of increasing the efficiency of breeding methods (Honchar & Shevchenko, 2018; Gonchar & Shevchenko, 2019; Baschenko *et al*., 2016; Goddard & Hayes, 2009). Assessment of the breeding value of different rabbit breeds is also necessary for the correct translation of the quality of the hereditary component into a numerical expression. DNA markers are used for in-depth genetic evaluation of breeding material, taking into account the mechanisms that determine the differences in animal performance. This is achieved by analyzing the genotype of the breeders by genotyping them. The myostatin gene (associated with meat performance) (Baselga, 2004; Fontanessi *et al*., 2008; Markowska *et al*., 2010; Rafayova *et al*., 2009) and the progesterone receptor gene (associated with reproductive capacity) are among the most common DNA markers used for genotyping (Argente *et al*., 2010; Peiro *et al*., 2008).

Today, it is quite difficult to accurately predict the true characteristics of quantitative and qualitative traits of animals according to the data on their association with polygenic influence. So far, the use of phenotypic indicators of animals, in particular rabbits from the population, is the only possibility of forecasting their genetic potential. This necessitates the development of appropriate statistical methods that, based on their productivity (phenotype), allow us to conclude the genetic predisposition to certain productivity (breeding value) (Havrysh, 2020; Lesyk *et al*., 2021).

Thus, it is obvious that it is necessary to analyze the genetic structure of different rabbit breeds both at the individual and population levels by DNA markers and indices to intensify the breeding process.

MATERIALS AND METHODS

Research conditions.The studies were carried out at the experimental rabbit farm of the Cherkasy Research Station of Bioresources of the NAAS on the livestock of the Poltavske sriblo breed rabbits amounting to 200 animals. Experimental animals were kept in cages-batteries. The breeding herd and the young stock were kept separately. The cages were equipped with suspended hopper feeders for granulated feed. The animals were watered through automatic drinking bowls. After 45 days, the growing stock was separated by sex and kept in cages with 3–4 animals in a cage. Males at the age of 3 months after selection by live weight were seated in individual cages until reaching the age of pedigree use – 150–160 days. Rabbits were fed taking into account the need for nutrients according to the live weight, age, sex, and productivity of the animals. The granulated feed was used for feeding rabbits on the farm all year around, which contained: concentrated feed, grass flour, animal feed additives, minerals, and premixes. The optimal microclimate parameters (temperature, relative humidity, air velocity) were maintained on the premises of the rabbit farm. The lighting was artificial with a duration of 16 hours.

DNA isolation. Blood was taken from the ear vein with a disposable syringe of at least 10 mL or with a Vacutainer-type vacuum system with ethylenediaminetetraacetic

acid (EDTA) or sodium citrate. When taken into a syringe, the blood from it was carefully (without foam formation) transferred to a disposable tube with an anticoagulant (3.8% sodium citrate solution in a ratio of 1:9 or 6% ethylenediaminetetraacetic acid solution in a ratio of 1:19). The tube was closed with a stopper and inverted several times (for mixing with an anticoagulant). Before the study, the blood tube was stored in the refrigerator at a temperature of (+4 °C) for up to 5 hours. For long-term storage, blood was frozen at (-20 °C). DNA isolation was carried out using a standard commercial kit "DNA-sorb B" with some modifications. The lysing solution and the washing solution 1 (if stored at 2–8 °C) were heated at 65 °C until the crystals were completely dissolved. 300 µL of the lysing solution was added to each tube in labeled tubes. 100 µL of samples were added to tubes with a lysis solution. Samples were thoroughly stirred on vortex and warmed up for 15 min at a temperature of 65 °C. Centrifuged 5 min at 12,000 rpm on microcentrifuge. Microcentrifuge up to 14,000 rpm. for 1.5 mL tubes (Eppendorf 5804R, Germany). The supernatant was transferred to a new tube. The sorbent was thoroughly resuspended on the vortex. 25 µL of resuspended sorbent was added to each tube with a separate tip, then stirred in a vortex; after 2 min this operation was repeated and left in a rack for 5 min. The sorbent was precipitated in tubes by centrifugation at 5,000 rpm for 60 s. The supernatant was taken using a separate tip for each sample. 300 µL of washing solution 1 was added to the samples and stirred in a vortex until the sorbent was completely resuspended. The sorbent was precipitated by centrifugation at 5,000 rpm on a microcentrifuge for 60 s. The supernatant was removed using a separate tip for each sample. 500 µL of washing solution 2 were added to the samples, stirred in vortex until the sorbent was completely resuspended, and centrifuged for 60 s at 10,000 rpm on a microcentrifuge. The supernatant was removed using a separate tip for each sample. Tubes were placed in a thermostat at a temperature of 65 °C for 5–10 min to dry the sorbent. The caps of the tubes were open. 50 µL of TE buffer for DNA elution was added to the tubes and stirred in vortex. Samples were placed in a thermostat at a temperature of 65 °C for 5 min, periodically shaking on a vortex. Tubes were centrifuged at 12,000 rpm for 1 min on microcentrifuge. The supernatant contained purified DNA and the samples were ready for polymerase chain reaction. The purified DNA was stored at 2–8 °C (one week) and at -20 °C (one year).

Gene amplification.To amplify the rabbit myostatin gene, the primers specified in the papers (Fontanessi *et al*., 2008; Markowska *et al*., 2010) (**Table 1, 2**) were used, and to amplify the rabbit progesterone receptor gene, the primers specified in the paper (Peiro *et al*., 2008) (**Table 3**) were used.

Table 1. **Primers for amplification of the rabbit myostatin gene** (Fontanessi *et al*., 2008)

MSTN
5′-AATTTTGCTTGCCATTACTGA-3′
5′-TCAGCAGAACTGTTGACATACAC-3′
5′-TGCATGCATTATCCCAATAGA-3′
5′-TCGGTAGTTGTTTCCCACTTT-3′
5′-AAAGGTATTCCAAGCAAAATGA-3′
5′-GGGGAAGACCTTCCATGTTT-3′
5′TAACTGAAAAGAACCCTCTAGTAGC3′
5′TCGGTAGTTGTTTCCCACTTT3

Table 2. **Primers for amplification of the rabbit myostatin gene** (Markowska *et al*., 2010)

5′TAACTGAAAAGAACCCTCTAGTAGC3′
5′TCGGTAGTTGTTTCCCACTTT3

Table 3. **Primers used for DNA amplification (a), sequencing (s), and genotyping (g) of the progesterone receptor gene** (Peiro *et al*., 2008)

Primer	Sequence 59/39	Use
PGRP-F	GAAGCAGGTCATGTCGATTGGAG	a, s, g
PGRP-R	CTGCCCCTCTCTCTAGCACTCTG	a, s
PGRA-F	AGACCAGTGTGGCCCGCTGTAG	a, s
PGRA-R	GGAAGGTCGGGGCCAAACAG	s
PGRB-F	ACAGTGTCCTCGACACGCTCCT	s
PGRB-R	CTTCCCCGGGTCTGGACGAG	a, s
PGRE1-F	CGCAGGTCTACACGCCCTATCTC	a, s
PGRE4-F	AAAAAGTTCAATAAAGTCAGAGTCATG	s
PGRE8-R	TCCTGACCAAAACGAAAGACATACC	a, s
PGR-59-UTR	CGCCTCTGGTGCCAAGTCTC	g

Electrophoresis. Electrophoretic separation of restriction DNA fragments was carried out in 2% and 3% agarose gel in a tris-borate electrophoresis buffer (TEE: 0.0879 M Tris, 0.089 M, boric acid, 0.002 M EDTA pH 8.0). To apply samples to the gel, a buffer of the following composition was used: 0.25% bromophenol blue, 0.25% xylol cyanol, and 30% glycerol. Electrophoresis was carried out for 1–3 hours at a voltage of 2 V/cm of the gel. Gels were stained with ethidium bromide (0.5 μg/mL) for 10 minutes, followed by repeated washing in distilled water. Visualization was performed on a transilluminator in ultraviolet light at a wavelength of 300 nm after staining the gel with ethidium bromide. DNA sizes obtained in the polymerase chain reaction or as a result of restriction of amplification products were detected using the molecular weight marker: O'GeneRulerTM DNA Ladder Mix, # SM1173, (Fermentas, Lithuania). Detection of the results was carried out by photographing the gels with a digital camera.

Genetic differentiation. Wright F-statistics were used to assess the genetic differentiation of the populations under study, including several F-coefficients of inbreeding (Sacharczuk *et al*., 2005; Williams, 2005). Testing of the population by the studied genes for compliance with the Hardy–Weinberg genetic equilibrium was carried out using the Pearson χ2 criterion (Plokhynskyi, 1969).

Breeding value determining. To determine Poltavske sriblo rabbits' breeding value, indices were calculated based on economic and beneficial traits, including genetic and economic values of individual traits. As a genetic parameter, the heredity coefficient of rabbits was used, and the economic one was the cost of the products produced.

The final version of the male selection index formula using economic parameters is as follows:

$$Is = 2.268 \cdot Mn - 0.135 \cdot Mfc + 0.05 \cdot (Mpcw - 2.5 \cdot Mbslw)$$

where Mn is the average daily increase in the live weight of the offspring received from the male under study within the period of 45–90 days; Mfc – the amount of feed costs per unit of increase in offspring received from the male under study within the period of 45–90 days; Mpcw – the average weight of paired carcass of young obtained from the males under study at the age of 90 days; Mbslw – the average indicator of pre-slaughter live weight for the group of offspring from the male under study.

The selection index using genetic parameters is as follows:

$$I = 0.36\ Mn - 0.37\ Mfc + 0.29\ Mpcw$$

where the numbers are the coefficients of inheritance for these features.

MS Excel software of Microsoft Office 2010, STATISTICA 10.0, and GenAlEx 6.0 were used for calculations (Goddard & Hayes, 2009; Williams, 2005).

RESULTS AND DISCUSSION

Based on the assessment of the genotypes of rabbits females and males (nucleus) from the Snowball, Long, and Mini breeders, mating of animals was carried out to study different types of selection by the breeding value index.

It was determined that the pairing of parents by the principle of 60×60 gave the most productive descendants in comparison with animals obtained by homogeneous selection by indices 50 and 40. Thus, the difference in the growth of live weight was significant ($P < 0.95$) and amounted to 2.2 g (9.2%, $P \leq 0.99$) compared to the offspring in the selection of 50×50, and from the selection of 40×40 – 4.5 g ($P \leq 0.99$), by weight of the paired carcass – 0.07 kg.

Tests of pairs by the index were carried out according to the productivity of offspring obtained in different mating variants. During the heterogeneous selection (the index of the male was higher than the index of the female), a significant advantage of offspring obtained from the pairing of parents on the principle of 60×50 was noted compared with other types of this selection. The advantage in terms of live weight gain was 9.3–9.8% ($P > 0.99$), and in terms of feed costs – 11.3–14.2% ($P > 0.99$). In the heterogeneous reciprocal variant of tupping in terms of the offspring productivity (the index of the female was higher than the index of the male), all three types of tupping were distinguished (**Table 4**). In comparison with the heterogeneous variant of the selection of parents 60×40 and 50×40, an advantage was established in terms of the live weight gain by 7.9–13.5% ($P < 0.95$), in terms of feed costs –by 8.2–17.9% ($P > 0.99$), in terms of the complex of features – 7.9–14.9% ($P < 0.95$).

Table 4. **Scheme of tupping rabbits of the breed Poltavske sriblo by size selection and genetic index (nucleus)**

Male index value (units)	Female index value (units)		
	60	50	40
60	60×60	50×60	40×60
50	50×60	50×50	40×50
40	40×60	40×50	40×40

In general, it should be assumed that the selection of pairs with a high level of genetic and economic selection indices ensures the receipt of offspring with significantly higher productivity. The results of the studies show that the descendants of Snowball, Long, and Mini males had a significantly higher index values (by genotype) compared to the average values for the herd (**Table 5**).

Table 5. **Index estimation of breeding value of Poltavske sriblo breed male rabbits**

Names of male breeders	Number of dughters (heads)	Average daily weight gain (g M±m)	Feed costs per 1 kg increase (60–120 days) (units)	Weight of paired carcass (kg M±m)	Index (units)	
					Genetic	Economic
Snowball	50	32.2±2.2	3.49	1.69±0.05	9.8±0.7*	62.2±4.0**
Long	45	30.9±2.2	2.97	1.53±0.03	9.9±0.8*	61.5±4.8*
Mini	63	30.8± 2.2	3.44	1.65±0.06	9.5±0.3**	60.7±1.6**
Bach	54	30.4±0.7*	4.06	1.63±0.04	9.4±0.4	60.4±2.4
Cooper	41	29.7±1.1	3.94	1.78±0.05	8.9±0.4	59.1±2.8
Fox	66	29.5±1.7	3.53	1.61±0.05	8.7±0.6	57.8±3.8
Barry	49	28.5±1.2	3.37	1.70±0.03	8.8±0.8	56.8±2.9
Dexter	52	28.9±1.4	4.08	1.67±0.06	8.3±0.5	55.7±2.1
Rocks	55	28.4±2.2	3.90	1.68±0.05	7.2±0.4	55.4±2.5
Demi	39	28.6±1.8	3.64	1.66±0.05	7.5±0.6	49.5±2.9
Nazar	41	27.8±1.9	3.72	1.52±0.04	7.3±0.4	51.1±2.8
Pasha	54	27.3±1.5	3.92	1.65±0.06	8.2±0.3	48.8±2.9
Snowball	46	26.9±1.3	3.47	1.62±0.05	6.5±0.6*	46.8±2.7
Stepan	53	26.3±2.0	4.14	1.52±0.03	7.5±0.5	50.1±2.8

According to the results of the molecular genetic evaluation of Poltavske sriblo rabbits by myostatin (MSTN) and progesterone receptor (PGR) genes, the following data were obtained. According to the data of allelic profiles of individual genealogical lines of Poltavske sriblo rabbits by polymorphic variants of the MSTN gene and PGR, the indicators of genetic distance and the Nei genetic similarity index were calculated. Its highest value for the myostatin gene was in animals of Barry's and Long's lines, and the lowest was in that of Fox's. It should be emphasized that according to polymorphic variants of the myostatin gene, the genetic distances were in the range of 0.00 (Cooper-Fox's line and Demi-Bach's line) – 0.50 (Emperor-Snowball's line) in the population of

the Poltavske sriblo breed rabbits. Genetic similarity indices were the highest between Snowball-Cooper's lines and lowest between Mini-Barry's and Bach-Fox's lines.

Cooper's rabbits line was characterized by the highest value of the effective number of alleles by the myostatin gene, and the lowest index was for Bach's and Barry's lines.

The highest values of Ne by the progesterone receptor gene were for Cooper's, Snowball's, and Mini's rabbit lines, while the lowest values were noted for Fox's line rabbits.

The high level of actual heterozygosity (Ho), which prevailed over the expected heterozygosity (He), according to the C34T polymorphism of the MSTN gene of of Poltavske sriblo rabbits, was characteristic of Barry's line (0.414 and 0.230, respectively); it was less significant (0.465 and 0.431, respectively) for Long's line. Differences between estimates of the actual and expected heterozygosity were insignificant for Snowball's line (0.480 and 0.477, respectively).

Insignificant differences were observed between estimates of the actual and expected heterozygosity for the G2464A progesterone receptor (PGR) gene polymorphism in Barry's line (0.450 and 0.411, respectively); somewhat larger – along Bach's line (0.494 and 0.402, respectively); the largest – along Fox's line (0.493 and 0.307, respectively). Excess heterozygosity and negative fixation index values were not noted.

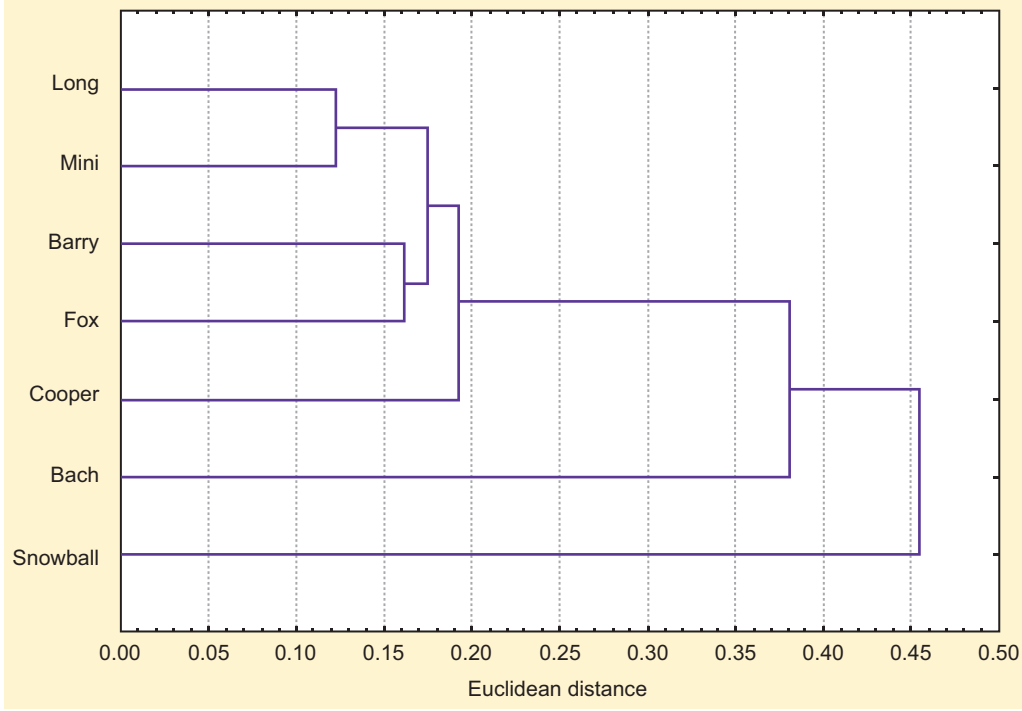
Low values of the Fis index for the MSTN gene and PGR (0.100 and 0.01), as the Wright fixation index, which reflects the level of inbreeding of the sample relative to the population, indicate a weak genetic differentiation between the lines of rabbits of the Poltavske sriblo breed (**Table 6**).

Table 6. **Indicators of gene diversity of the Poltavske sriblo breed rabbits of different genotypes by polymorphisms of MSTN gene C34T and PGR GENE G2464A**

Gene	Indicator	Line						
		Cooper	Bach	Snowball	Long	Mini	Fox	Barry
MSTN	Ho	0.345	0.213	0.480	0.465	0.340	0.420	0.414
	He	0.500	0.215	0.477	0.431	0.482	0.450	0.230
	Fis	0.01	0.01	0.250	0.120	0.100	0.126	0.202
PGR	Ho	0.499	0.494	0.494	0.250	0.490	0.493	0.450
	He	0.500	0.402	0.507	0.400	0.511	0.307	0.411
	Fis	0.122	0.105	0.102	0.03	0.04	0.03	0.01

According to the results of clustering genetic distances and genetic similarity indices of different lines of rabbits by the myostatin gene and progesterone receptor, a dendrogram was constructed (**see Figure**).

The obtained dendrogram is represented by a single large cluster, from which branches are separated from groups of rabbits of Snowball's and Bach's lines (Euclidean distance values of 0.45 and 0.38, respectively). The cluster complex is formed by several sub-clusters. The first contains groups of animals of Long's and Snowball's lines, and the second – Barry's, and Fox's lines. A separate cluster branch is formed by a group of animals of Cooper's line.



Genetic relationships of different genealogical lines of Poltavske sriblo rabbits obtained based on the frequency distribution of polymorphic variants of the myostatin gene and progesterone receptor

CONCLUSIONS

The greatest C allele frequency by the myostatin gene was in Cooper's male descendants 0.551 and the T allele frequency was 0.449. For Snowball's rabbits, higher G allele values were noted for the progesterone receptor gene (0.488) due to the advantage of homozygous animals.

The highest value of the effective number of alleles by the myostatin gene was characteristic of Cooper's line rabbits (0.500), and the lowest – of Bach's (0.215) and Barry's lines (0.230).

According to the progesterone receptor gene, the highest values of Ne were for Cooper's (0.500), Snowball's (0.507), and Mini's (0.511) rabbits, and the lowest values were for Fox's (0.307).

The Poltavske sriblo rabbits breeding value was evaluated according to the selection and genetic index for the productivity of daughters, which included several phenotypic characteristics: average daily gain in live weight of the offspring obtained from the studied males within the period of 45–90 days, feed consumption per unit of offspring growth obtained from the studied males within the period of 45–90 days, weight of paired carcass of the offspring obtained from the studied males at the age of 90 days).

The distribution of genealogical structures of the Poltavske sriblo breed rabbit population can be explained by the peculiarities of breeding work on the farm: intensive use of Long's, Fox's, and Barry's lines – to increase the rabbits meat productivity level;

preference for Snowball's, Cooper's, Bach's lines – to improve the reproductive and maternal qualities of rabbits.

Practical application of the results. The results of the research can be used as a basis in industrial rabbit breeding for the selective-genetic evaluation of animals in order to select male breeders for breeding purposes.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Human Rights: The article does not contain any investigations with human subjects.

Animal studies: All international, national and institutional guidelines for the care, maintenance and use of laboratory animals were followed.

AUTHOR CONTRIBUTIONS

Conceptualization, [B.O.]; methodology, [H.O.]; investigation, [S.E.]; data analysis, [L.Ya., G.O.]; writing – original draft preparation, [L.Ya.]; writing – review and editing, [H.O.]; visualization, [L.Ya.]; supervision, [G.O.; S.E.] project administration, [B.O., H.O.]; funding acquisition, [–].

All authors have read and agreed to the published version of the manuscript.

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ГЕНЕТИЧНА ХАРАКТЕРИСТИКА КРОЛИКІВ ПОРОДИ ПОЛТАВСЬКЕ СРІБЛО ЗА ГЕНОМ МІОСТАТИНУ ТА ПРОГЕСТЕРОНОВОГО РЕЦЕПТОРА І ЗА СЕЛЕКЦІЙНИМИ ІНДЕКСАМИ

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Обґрунтування. Кролівництво – галузь, яка за короткі терміни виробляє дешеву та високоякісну м'ясну продукцію. Продуктивні, материнські, репродуктивні й технологічні ознаки визначають економічну ефективність кролівництва за умови повної реалізації генетичного потенціалу тварин і кормової бази. Основний чинник прискорення розвитку кролівництва – збільшення поголів'я тварин на тлі покращення утримання, ветеринарного забезпечення та селекційно-племінної роботи.

Матеріали та методи. Дослід провели на поголів'ї кролів (200 голів) породи Полтавське срібло. Після відсадження в 45 днів молодняк розділяли за статтю та утримували по 3–4 тварини у клітці. 3-місячних самців розсаджували в індивідуальні клітки до досягнення віку племінного використання – 150–160 днів. Годували кролів гранульованим комбікормом: концентровані корми, трав'яне борошно, кормові добавки тваринного походження, мінеральні речовини та премікси. Кров брали з вушної вени. Виділяли ДНК з використанням стандартного комерційного набору "ДНК-сорб В" з деякими модифікаціями.

Для оцінювання генетичної диференціації популяцій використовували F-статистику Райта, включаючи кілька F-коефіцієнтів інбридингу. Тестування популяції за досліджуваними генами на відповідність генетичній рівновазі Харді–Вайнберга здійснювали за критерієм Пірсона χ2. Для визначення племінної цінності кролів породи Полтавське срібло показники розраховували за господарсько корисними ознаками, зокрема, за генетичними та господарськими цінностями окремих ознак. Як генетичний параметр – коефіцієнт спадковості кролів, а як економічний – собівартість виробленої продукції.

Результати. Представлені результати аналізу особливостей генетичної структури кролів породи Полтавське срібло за розподілом алельних варіантів гена міостатину і прогестеронового рецептора в розрізі генеалогічних ліній. Встановлено, що найбільшу частоту алеля C за геном міостатину мали нащадки самця Купера (0,551). Частота алеля T у цій вибірці тварин становила 0,449 відповідно. Для кролів лінії Сніжка відмічено вищі значення алеля G за геном прогестеронового рецептора (0,488) завдяки перевазі гомозиготних тварин. Найвище значення ефективного числа алелей за геном міостатину мали кролі лінії Купера (0,500), а найнижче – лінії Бача (0,215) та Баррі (0,230). За геном прогестеронового рецептора найвищі значення Ne мали кролі лінії Купера (0,500), Сніжка (0,507) та Міні (0,511), а найнижчі – Фокса (0,307). Також встановлений вплив генотипу кролів за досліджуваними генами на прояв господарсько корисних ознак – середньодобового приросту та багатоплідності. Визначення племінної цінності кролів породи Полтавське срібло за селекційно-генетичним індексом згідно з продуктивністю

дочок дало змогу виділити серед групи самців основних, як плідників. З'ясовано, що найкращі показники племінної цінності за м'ясною продуктивністю мають Сніжок, Лонг та Міні.

Висновки. Отримані результати можуть бути використані для проведення селекційно-племінної роботи у кролівництві з метою виділення плідників для покращення м'ясної продуктивності й відтворної здатності кролів.

Ключові слова: кролі, ДНК-маркери, міостатин, прогестероновий рецептор, м'ясна продуктивність, відтворна здатність, племінна цінність

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