G.N. Shaltenbay [1,2]*, M.D. Amandykova [1,2], T. Kapassuly [1,2], B.O. Bekmanov [1,2], K.Zh. Dossybayev [1,2] , D.A. Ualiyeva [1,3]

[1] "Institute of Genetics and Physiology" SC MSHE RK, Almaty, Kazakhstan, gufa1992@mail.ru*, makpal_30.01@mail.ru, tilek.kapas@mail.ru, bobekman@rambler.ru, kairat1987_11@mail.ru, daniya.2010@mail.ru*

[2] al-Farabi Kazakh National University, Almaty, Kazakhstan

[3] "Institute of Zoology" SC MSHE RK, Almaty, Kazakhstan

COMPARATIVE ANALYSIS OF THE GENETIC DIVERSITY OF TARAZ AND SHYMKENT CAMEL POPULATIONS ON THE BASIS OF ISSR-PCR MARKERS

Abstract

In this study, we analyzed the genetic characteristics of camels *Camelus dromedarius* and *Camelus bactrianus* from the populations of Shymkent and Taraz in Kazakhstan using ISSR-PCR markers. As a result, fragments of the following sizes were identified using the (AG)9C primer: 200, 320, 370, 430, 580, and 700 bp. Based on the (GA)9C primer, the length of the amplicons was 300, 350, and 430 bp. The number of polymorphic loci in the camels of the Shymkent population was 9, and the allelic index of polymorphic loci was 77.78%. The allelic index of polymorphic loci of camels in the Taraz population was 33.3%. The number of observed alleles (Na) averaged 1.38, the effective number of alleles (Ne) was 1.47, the genetic diversity (H) according to Nei was 0.25, and the Shannon index (I) was 0.36. The average allele index of polymorphic loci was 55.56% for both populations. Based on the results obtained, it can be argued that both markers used in this work are informative in assessing the genetic diversity of the studied camel populations. In addition, it was found that the two populations of camels differ from each other in genetic diversity.

Key words: DNA markers, ISSR-PCR, camel, *Camelus bactrianus*, *Camelus dromedarius*, genetic diversity

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*E.I. Islamov[1],G.A. Kulmanova[1], B.T. Kulataev[1], D.N. Bekbaeva[1], I.E. Mukhametzharova[2]**

[1]Kazakh national agrarian research university, Almaty, Republic of Kazakhstan, islamov_esenbay@mail.ru, gulzhan_62@mail.ru, bnar@yandex.ru, bdn@mail.ru

*[2]S. Seifullin Kazakh agro technical research university, Astana, Republic of Kazakhstan, ilmira_pvl@mail.ru**

FEATURES OF WOOL QUALITIES AND FORMATION OF SKIN COVER OF YOUNG SHEEP OF THE SOUTH KAZAKH MERINO BREED IN ZHAMBYL REGION CONDITIONS

Abstract

Until 2030, 17 key areas were selected, the implementation of which could potentially lead the country to the sustainable development of all major spheres of life and the solution of global problems affecting every person in this world. The article reflects and presents scientific research data, objective characteristics of wool qualities and age-related changes signs of the structure of the skin of young South Kazakh merino sheep, as well as studies of the morphological parameters of the skin tissue in the age aspect (from birth to 18 months), and an analysis of their connection with the commercial properties and quality of the semi-finished product obtained from sheep of this breed is given. Productive qualities were studied in a flock of sheep of the South Kazakh Merino breed in “Batay-Shu” LLP. Sheep have a high live weight, shearing and yield of pure wool; rams have a fairly high live weight for the breed; component depending on age from 100-106 kg, and high wool

productivity both in physical weight and in washed fiber - 10.3-6.6 kg, with an average output of washed wool of 64.5% thickness, with corresponding development epidermis (0.97-1.3% of the total skin thickness), a well-developed pilar layer (up to 67.7% of the total skin thickness) and relatively weak development of the reticular layer (about 33% of the total skin thickness). The density of hair follicles per 1 mm2 at 18 months of age is 52-60 units, and the secondary follicles/ primary follicles ratio is 12.17-12.77. After weaning and up to 7.5 months, buck lambs experience a noticeable increase in skin within 200 μm. During the same period, a slight increase in skin tissue occurs in ewe hoggs.

Keywords: *fine wool, fineness, skin cover, shearing of wool, skin thickness, sheepskin, epidermis, pylar layer, dermis, follicles.*

Introduction

The process of implementing and achieving the SDGs (Sustainable Development Goals) is constantly monitored by both UN (United Nations) representatives and the Government of the Republic of Kazakhstan. In order to effectively achieve the SDGs, the Inter-Agency and Expert Group on Indicators for Achieving the Sustainable Development Goals (IAEG - SDGs) has developed a system of global indicators, with the possibility for each UN Member State to nationalize these indicators.

Today, Kazakhstan's monitoring system for achieving the SDGs includes 280 indicators, of which 205 are global and 75 are national indicators.

Relevance of the topic.

The issue of studying the patterns of development of the productive and biological characteristics of sheep and identifying the nature of the formation of the most important economically useful properties of animals is very closely interconnected with food production and providing industry with raw materials for the production of high-quality products.

In such important issues for Kazakhstan, a special place is occupied by sheep breeding in the agricultural sector. Initially, the driving and favorable factor was the natural climatic features of our homeland, as well as favorable biological features.

Sheep breeding is interpreted as a distinct branch of livestock production throughout the globe, including Kazakhstan. The existence of huge natural plantations in our state provides sheep keeping and breeding with biological nuances that allow the most effective use of land in mountain and foothill zones, semi-deserts, and deserts.

Proper and cost-effective sheep breeding in Kazakhstan dates back to ancient times and is currently a popular industry development. Our Republic has all the prerequisites for the profitable development of sheep breeding, because 64% of the forage lands are natural vast pasture lands. Improving sheep breeding should develop on knowledge of the breed and its nuances, the specifics of its nature, hereditary information and knowledge of the nature of the bioproductivity of sheep.

Sheep farming is a very productive branch of livestock farming, as it is characterized by a large amount of agricultural raw materials produced, in addition to meat, fat, milk and dairy products; sheep farming is listed as an industry of raw materials for light industry, i.e. wool, sheepskin and much more.

Sheep farming in Kazakhstan producing uniform wool is currently represented by 5 breeds of fine-fleeced sheep: Kazakh fine-fleeced sheep, Kazakh archaromerino, South Kazakh merino, North Kazakh merino, Etti merino, 4 breeds of semi-fine-fleeced sheep (Degeres, Kazakh meat-wool sheep breed, Kazakh semi-fine-fleeced with crossbred wool with its southeastern and eastern types and Akzhaiyk meat and wool with crossbred wool) [1]. The presence of such breed potential of sheep of various directions allows for economic independence in the production of goods from fine and semi-fine wool, which are in high demand in the domestic and international consumer markets. At the same time, the wool processing industry has the greatest need for uniform wool: fine, semi-fine, cross-bred wool. It produces high numbers of fine yarns, which are used to make high-quality suiting and dress fabrics.

Solving problems related to the environmental situation and the final product, the cost and quality of which fully meets the requirements of consumers and determines its competitiveness, are

integral criteria for the successful operation of an enterprise in conditions of fierce market competition.

At the present stage of livestock farming, directed selection, based on knowledge of the patterns of inheritance and variability of quantitative traits under different methods of breeding selection, is of decisive importance [1,2]. The study of the inheritance of traits makes it possible to predict with a high degree of accuracy the effectiveness of certain breeding techniques and create optimal programs for individual herds and entire breeds [3,4].

During the formation of market relations, the technological, selection and organizational and economic foundations for the development of sheep breeding were largely violated, which led to a deep crisis in the industry and a reduction in the number of sheep and production by 8-10 times. The market conditions for sheep products dictate the need for scientific support for the production of lamb, wool and sheepskin. And they are determined by methods of breeding work, technological methods and organizational and economic measures aimed at the effective, rational and sustainable development of the industry [5,6].

Of significant importance in breeding work is the study of the relationship between individual selection traits, which make it possible to assess in what direction other productive traits associated with them will change [7,8].

Therefore, the development of methods for the targeted improvement of fine-wooled sheep, research to determine the inheritance and variability of economically useful traits are of great scientific and industrial importance.

Purpose and objectives of the research. The purpose of the work is to study the quality of wool and the morphology of the skin, as well as the histological features of the skin and hair, to give a laboratory assessment of wool and the commercial properties of fur semi-finished products.

Methods and materials

In “Batay-Shu” LLP, as in most farms in the Zhambyl region, sheep are kept on pasture throughout the year. Moreover, unlike some other farms, here summer mountain pastures are used for sheep here in the summer, and during the year they are on foothill pastures. During the winter and early spring periods, the grass stand on pastures deteriorates sharply, then it is necessary to feed the animals with hay and concentrated feed.

Scientific and production experience was carried out at “Batai-Shu” LLP in Shu district of Zhambyl region. The research material was the wool and skin of young South Kazakh Merino sheep. Samples of wool and skin in the context of gender and age groups from experimental animals were taken during the spring shearing period.

The physical, mechanical and technological properties of wool were studied in the wool testing laboratory during grading according to the method of All-Union Research Institute of Sheep and Goat Breeding (1984), GOST 17514-93, GOST 28491-90. The wool natural length was determined using a millimeter ruler during grading for each animal individually. Measurements were made with an accuracy of 0.5 cm. The determination of the true length of wool was carried out in laboratory conditions using the FM-04 device using samples taken from the sides of 10 animals from each experimental group. New touch control unit for the DS-L3 microscope manufactured by Nikon.

The topography of the length and fineness of the wool was carried out in 6 sections of the fleece. The research was carried out in three directions: the morphological characteristics of the skin and hair of young South Kazakh merino sheep, the quality of wool and the commercial properties of fur sheepskins obtained from sheep of this breed, as well as the formation of morphological characteristics and their influence on the commercial properties.

The fineness of the wool was determined by the high-speed method using an OFDA-2000 wool analyzer (Australia), the strength of the wool was determined by breaking tufts of fibers on a DSh-3M dynamometer 20 tufts of wool, pre-washed in aviation gasoline and combed in parallel, weighing 4-5 mg and 25 mm long. Strength indicators were calculated using a special formula in kilometers of breaking length.

Skin samples were taken by biopsy from the back, side and cowy. During the day, the skin was fixed with 10% formaldehyde, and then transferred to a 5% solution before the study. After fixation

and washing in running water, the samples were subjected to wiring. Hair density was determined by counting mature and immature hair follicles and their total number on horizontal sections of skin taken at the level of the sebaceous glands.

Counting was carried out in 10 fields of view of the microscope, the average values of which were recalculated per 1 mm^2. On the same sections, the diameter of hair follicles, wool fibers, as well as the diameter of sebaceous and sweat glands was determined.

We also calculated the number of primary and secondary hair follicles and their ratio. Skin preparations were studied and photographed using an MS 300 microscope with a camera and adapter and Micromed Imaqes software. The research results obtained were processed biometrically according to N.A. Plokhinsky and E.K. Merkuryeva using computer programs.

Results and discussion

Analyzing the world experience of sheep breeding development, it can be concluded that the high competitiveness and economic efficiency of the industry can be ensured primarily by increasing its meat productivity. Of great theoretical and practical interest is the use of Australian Merino breeds such as "Strong" and "Polvars" to improve wool productivity, the distinctive feature of which is a high level of wool productivity and satisfactory meat productivity. The use of the method of introductory cross breeding with Australian breeds in a number of regions of our country has shown its high efficiency. However, it is not necessary to belittle the importance of wool productivity, the improvement of which has been paid great attention by many domestic and foreign scientists and which brings a certain income.

In this regard, the improvement of domestic breeds of merino sheep remains an important task. The reorientation of the industry to the wool-meat and meat-wool direction of productivity can contribute to the restoration of domestic sheep breeding. When creating highly productive flocks of sheep of the South Kazakh merino in order to ensure competitiveness and increase their wool productivity, improve wool qualities, it is necessary to use Australian merinos in the order of blood transfusion in the flocks of the South Kazakh merino, since the shearing of the original wool increases on average by 0.30-0.35 kg, washed by 0.18-0.02 kg or by 10.9-11.2%, the yield of washed wool is 10.8%, the length and strength of wool are 15.0 and 14.4%, respectively. In general, wool acquires a more pronounced merino character and has comparatively better physical, mechanical and technological properties.

The methodological basis was the scientific works of domestic and foreign scientists who studied the factors affecting the productivity of sheep of fine-wool breeds, as well as breeding achievements to improve the productive qualities of animals of other species [9,10].

During the work, general methods of scientific cognition were used: comparison, generalization and analysis; experimental methods: observation and comparison; special methods: zootechnical and biochemical, as well as economic and statistical analysis. The experimental data were processed in Microsoft Excel using biometric and mathematical methods of analysis.

The importance of providing the country with fine merino wool is due to its unique technological characteristics, which together surpass all synthetic materials.

The volume of production of this type of raw material is largely determined by the level of demand for its processing industry.

The analysis of the current state of the wool market indicates the activation of worsted enterprises and the support of wool producers from the state. This situation sets scientists and breeders the task of creating fine-wooled sheep that combine high wool and meat productivity.

The obtained research results have scientific and practical importance and make it possible to use them for an objective assessment and improvement of the quality of wool products and conducting purposeful breeding work to increase the level of productivity and technological properties of wool and to assess the intensity of the formation of indicators of the structure of the dermis of fur raw materials obtained from sheep of South Kazakh merinos, and also give the opportunity to choose the most favorable period for slaughtering animals in order to obtain higher quality fur raw materials.

Productive qualities were studied in a flock of sheep of the breed of South Kazakh merinos in "Batay-Shu" LLP.

Table 1 - Productivity of sheep of different gender and age groups

Groups	n	Live weight, kg	Cutun washed wool, kg	Output of washed wool, %	Shearing of washed wool, %
Rams 3 years old	11	106,2 ± 0,42	10,3± 0,11	64,5	6,6± 0,02
Ewes 3 years old	32	50,5 ± 0,46	5,8± 0,09	65,3	3,8± 0,06
Ewe hoggs	3	45,2 ± 0,04	5,1± 0,05	89,9	3,1± 0,06

From the data in Table 1, it can be seen that sheep have a high live weight, shearing and yield of pure wool, rams were distinguished by a sufficiently high live weight for the breed; the component, depending on age, is from 100-106 kg, and high wool productivity both in physical weight and in washed fiber - 10.3-6.6 kg, when washed wool averages 64.5%.

Physical and mechanical properties of wool. Sheep breeding has always been and remains an important branch of the world's productive animal husbandry, and plays an important role in providing the world's population with food and raw materials.

Wool is a fiber obtained from the skin of various animals. In the textile industry, sheep, goat, camel wool is mainly used for the production of fabrics, carpets and knitwear. Wool has a whole complex of characteristics that characterize its physical and, consequently, technological properties.

The formation and growth of wool is a complex biological process caused by three sequential processes occurring in the hair follicles: proliferation, synthesis and keratinization. Under normal physiological conditions, these processes are in dynamic equilibrium, which ensures the formation and growth of high quality wool. Violation of these conditions causes a change in the ratio of these processes, which ultimately negatively affects the growth of wool and its quality. The latter, as is known, depends on many factors, which, according to the nature of their impact, can be divided into selection and technological [7,8].

Sheep wool is valued for its complex of useful properties: it absorbs and retains moisture better than all fibers, has high heat-shielding properties, transmits ultraviolet rays necessary for human health, firmly holds dyes, is equal in strength to iron wire of the same cross-section, does not catch fire, and is a good insulator from noise and electricity.

Rollability, hygroscopicity, elasticity and resilience are most fully combined only in wool fibers. Therefore, the production of wool, especially fine and semi-fine, is of great national economic importance.

To do this, the ewes had a comprehensive assessment of the runes on a scale that included the following indicators of wool properties: shearing and yield of pure wool, fineness and length of wool, the amount of wool fat and sweat (Table 2).

The study of the physical and mechanical properties of wool was carried out by instrumental measurements on the following indicators: the percentage of output of washed wool, fineness, strength, fat and sweat content. The percentage of output of washed wool was determined by washing 200-gram samples of wool in soap-soda solutions and drying in air-conditioned devices to a permanently dry mass at a temperature of 105-110^{0}C with subsequent calculation of the percentage of output and shearing of washed wool.

The studied parameters of the histostructure of the skin included: determination of the number of follicles per 1 mm^2, the ratio of secondary follicles/primary follicles, the diameter of the primary and secondary follicles, the total thickness of the skin and its layers, as well as the depth of occurrence of the primary and secondary follicles. According to the results of a comprehensive assessment of the runes of ewes, three experimental groups were formed. The first group included ewes who received a score from 42 to 52 points, the second – 31-41 points and the third – 22-30 points. Indicators of a comprehensive assessment of the rune and histostructure of the skin of experienced ewes (n = 90) are shown in Table 2.

A comprehensive assessment of the fleece of ewes, including shearing, the yield of pure wool, its fineness, length, amount of wool fat and sweat, established the following distribution of animals: those rated "excellent"- 45%, "good" - 36%, "satisfactory" - 19%. In conditions of unstable agricultural production and idle processing industries, the search for ways to increase production in combination with the rational use of wool raw materials becomes particularly relevant. At the same

time, it is necessary to focus on an integrated approach to the production and processing of wool, as a single, unbroken process.

Table 2 - Indicators of a comprehensive assessment of the rune and histostructure of the skin of experimental ewes

Indicators	Group I	Group II	Group III	Average
Comprehensive assessment of the rune, points	52–42	41–31	30–22	
Cut of pure wool, kg	4,19±0,17*	3,30±0,19**	2,61±0,12*	3,37±0,10
Output of pure wool, %	58,32±2,02*	55,83±2,00*	44,00±1,65*	65,3±1,56
Fineness, microns	22,78±0,57	23,78±0,43	24,03±0,63	23,27±0,33
Length, cm	9,40±0,74	8,90±0,74	8,50±0,61	8,60±0,15
Total density per mm^2, pcs.	87,06±5,34*	72,89±4,30	67,18±4,01*	75,82±4,68
Secondary follicles/Primary follicles ratio	12.40±0,19*	10,76±0,40	10,32±0,66	11,49±0,66
Diameter, microns:				
Secondary follicles	64,91±3,02	65,31±3,12	67,31±3,82	65,80±3,53
Secondary fibers	32,86±1,92	33,12±2,01	33,22±2,02	33,07±1,89
Primary follicles	68,78±2,95	70,16±3,56	72,86±3,76	70,59±2,97
Primary fibers	38,38±1,02	38,62±1,10	38,84±1,15	38,61±1,02

Note. The statistical significance of the differences (at P<0.001, P<0.01**) with the average level of development of the trait is indicated**

The solution of these tasks is possible only with the most detailed and objective data on the quality indicators of wool. A detailed and comprehensive study of the physical, mechanical and technological properties of fine wool is of great importance not only for clarifying and correcting the breeding process in sheep breeding, but also will help to find optimal technological modes of rational use of this valuable raw material, which is also an actual task.

Histological structure of the skin. South Kazakh merinos are characterized by relatively dense skin tissue of medium thickness, with the corresponding development of the epidermis (0.97-1.3% of the total thickness of the skin), a well-developed pilar layer (up to 67.7% of the total thickness of the skin) and relatively weak development of the reticular layer (about 33% of the total thickness of the skin). South Kazakh merino are characterized by a dense arrangement of histostructure. The density of hair follicles per 1 mm^2 at 18 months of age is 52-60 units, and the ratio of secondary follicles/primary follicles is equal to 12.17-12.77.

Therefore, a very important aspect is to study the morphological parameters of the skin and hair in order to establish the patterns of histogenesis of the skin and its derivatives in the following age periods: at birth; 1; 2; 4,5; 7,5; 12 and 18 months, as well as the influence of morphological characteristics on certain commodity and consumer properties of fur sheepskin products.

Behind the seemingly simple structure of the skin and hair of sheep are the complexity and diversity of its functions. Their range extends from participation in the regulation of body temperature and water balance, protection of the body from environmental actions to the production of chemical signals that affect the behavior and physiological state of animals.

The skin is a system of organs where all the main types of tissues are represented in close interaction. The skin itself, as a component of this system, is the largest organ of the body. It consists of diverse and highly specialized cells and non-cellular formations.

The mammalian skin is formed by the skin (epidermis, dermis, subcutaneous tissue) and various derivatives of the epidermis, which include hair, glands, horns, hooves, etc. Nerve elements, blood and lymphatic vessels, and muscle fibers are located in the skin. Depending on the species of mammals and their way of life, the skin can significantly change its structure, thus representing one of the most diverse body systems in structure. In different systematic groups of mammals, certain skin derivatives may be absent. The thickness of the skin varies greatly, depending on the species (from 112 to 250 microns); many species have a large topographic and seasonal variability in skin thickness.

The skin consists of two tissues of different origin: epithelial and connective. The outer part - the epidermis - is a multilayered keratinizing squamous epithelium that develops from the ectoderm. The deeper part - the dermis is formed by unformed connective tissue of mesenchymal origin.

The epidermis and dermis are functionally closely related. The epidermis, which does not have its own blood supply, is fed through the dermis.

In ontogenesis, the dermis determines which derivatives of the epidermis should be formed, as well as the nature of the distribution of these derivatives over the skin.

Cellular and humoral processes occurring in the dermis throughout the life of a mammal determine the state of the epidermal layers lying on top, and also affect the growth and development of wool.

In sheep, the epidermis consists of epidermal cells and is distributed into several surface layers and one lower, sprout (malpighian, basal). The surface layers are formed by flat, horizontally elongated large cells. The germinal, deepest layer consists of cylindrical cells.

In the cells of the outer layer, keratinization is expressed, leading to the peeling of dead surface cells in the form of scaly keratinized plates. The skin (dermis) consists of two layers: pilar (papillary) and reticular. The pilar layer is up to 70% of the thickness of the entire dermis, consists of loose connective tissue; hair follicles, sweat and sebaceous glands, the endings of sensitive nerves (receptors), blood and lymph vessels are located in it. The reticular layer is formed mainly by the interweaving of bundles of collagen fibers that ensure the density of the dermis.

It was found that in a sheep embryo, follicles in the middle of the flank begin to develop approximately on the 50th day of pregnancy. Although the first part of the body on which hair follicles begin to develop is the crown, the waves of this process quickly spread to other areas and after 10 days the follicles are laid all over the body. Follicles are epidermal formations.

The first stage of their development is the thickening of the cells of the lower layer of the epidermis, and then the retraction of this layer into the underlying layers of the skin. The epidermal cells included in this tubular formation continue to divide; at the same time, in the skin, at the base of the follicular retraction, there is a concentration of connective tissue elements (forming the hair papilla).

According to the number of fibers per unit area of the skin, large fluctuations are observed not only in sheep of different breeds, but also within the same breed. Moreover, the phenomenon of high heritability of this indicator, noted by many researchers, indicates a real possibility to achieve an increase in the density of wool with systematic selection on this basis.

The structure of the skin and its features determine many commodity properties of fur raw materials, semi-finished products and finished products. Therefore, the study of animal skin tissue against the background of the whole organism, taking into account its biological characteristics, is of great theoretical and practical interest to us.

Table 3 - Changes in the thickness of the skin and its layers

Age	Total skin thickness, microns	Including by layers					
		epidermis		pilar		reticular	
		microns	%	microns	%	microns	%
At birth	1170,08	15,21	1,3	644,71	55,1	510,16	43,6
1 month	1485,61	16,81	1,1	993,48	66,9	475,32	32,0
2 months	1769,63	17,70	1,0	1150,26	65,0	601,67	34,0
4,5 months	1787,00	19,68	1,1	1209,72	67,7	557,60	31,2
7,5 months	1975,84	20,91	1,1	1305,60	66,1	649,33	32,8
12 months	1963,80	19,68	1,0	1301,52	66,3	642,60	32,7
18 months	2034,21	21,56	1,1	1332,41	65,5	680,24	33,4

In our studies, the most intensive growth of skin tissue in thickness is observed up to 2 months (Table 3). In buck lambs, skin thickening during this period amounted to 45-51% of the increase, while in the remaining 16 months only 20-23%. In the ewe hoggs, the increase in skin thickness for

the period from birth to 2 months was equal to 39-46%, and the thickening of the skin tissue from 2 months of age to 18 months was 22-28%.

After weaning lambs and up to 7.5 months, the buck lambs have a noticeable increase in skin within 200 microns. During the same period, a slight increase in the skin tissue occurs in the ewe hoggs. This fact is obviously due to the fact that the transition from dairy nutrition to vegetable food was carried out by the buck lambs more successfully than the ewe hoggs.

Table 4 - Growth coefficients of total skin thickness

Age	back	side	cowy
At birth	1,00	1,00	1,00
1 month	1,22	1,27	1,21
2 months	1,47	1,51	1,45
4,5 months	1,48	1,53	1,48
7,5 months	1,63	1,69	1,62
12 months	1,62	1,68	1,60
18 months	1,70	1,74	1,65

The age dynamics of the thickness of the skin and its layers in young South Kazakh merinos shows that the most intensive increase in the thickness of the skin occurs up to 2 months, and then there is a not so significant increase in the rate of skin growth in thickness.

So, in buck lambs by 2 months, skin thickening occurs by 45-51%, and in ewe hoggs by 39-46%. From 2 months to 18 months, the increase in this indicator was only 20-23% in buck lambs and 22-28% in ewe hoggs. According to numerous literature data, the thickness of the epidermis is 0.5-1.5% of the total thickness of the skin.

The purposeful selection and breeding work carried out over a number of years by the specialists of the farm and the staff of the university has shown its sufficiently high efficiency. At the same time, the assessment of wool productivity of animals needs to be improved both in quantity and quality in the direction of increasing its objectivity and complexity.

The purpose of a comprehensive assessment of the fleece is to provide sheep breeders with the necessary materials for breeding improvement of the flock. A comprehensive assessment of the fleece is carried out based on the results of a complete expert-zootechnical study of the fleece, including the measurement of the main properties. Objective (instrumental) measurement is subject to: the cut of unwashed wool, the yield of clean wool, the average diameter of the fiber (side, thigh), natural length, fiber density, the amount of suint, the strength of the wool to tear.

The epidermis of the skin of South Kazakh merino sheep is 1.0-1.3% of the total skin thickness (Table 5), which may indicate its sufficient development and the protective role of the skin tissue in young South Kazakh merinos. The pilar layer occupies up to 70% of the total thickness of the skin in fine-wooled sheep, and sometimes even more.

Table 5 - Changes in the depth and diameter of the follicles

Age	Depth of occurrence, microns		diameter, microns		Primary follicles/Secondary follicles depth ratio	Relationship Primary follicles diameter/Secondary follicles diameter
	Primary follicles	Secondary follicles	Primary follicles	Secondary follicles		
At birth	652,18	431,30	63,50	42,05	1,51	1,51
1 month	1003,68	807,84	73,94	42,74	1,24	1,73
2 month	1170,20	1025,44	80,10	52,64	1,14	1,52
4,5 month	1198,21	1135,20	86,01	60,53	1,06	1,42
7,5month	1248,48	1075,08	83,82	60,84	1,16	1,38
12 months	1305,60	1144,44	84,51	63,54	1,14	1,33
18 months	1319,88	1217,47	85,28	65,41	1,08	1,30

The data showing the ratio of the depth of occurrence and diameters of primary to secondary follicles are interesting material, since hair follicles are the most important component of the skin and hair of sheep.

Of great importance are the growth and development of sebaceous and sweat glands located in the dermis, which are interconnected with the growth and development of primary and secondary hair follicles. For a more complete understanding of the structure of the skin of fur sheepskins, we studied the depth of occurrence and diameters of the sebaceous and sweat glands.

Data on these indicators are given in Table 6. Sebaceous glands almost do not change the depth of occurrence; regardless of age (the exception is only the period from the moment to 2 months, when this indicator increased by 78.5%), the depth of occurrence ranges from 370-432 mkm.

Table 6 - Changes in the depth of occurrence and diameter of the sweat and sebaceous glands

Age	Depth of occurrence				Diameter			
	sweat glands		sebaceous glands		sweat glands		sebaceous glands	
	microns	%	microns	%	microns	%	microns	%
At birth	650,47	100,0	209,05	100,0	12,38	100,0	66,35	100,0
1 month	985,32	151,5	371,28	177,6	15,39	124,3	72,07	108,6
2 months	1097,23	168,7	373,06	178,5	17,10	138,1	81,85	123,4
4,5 months	1193,12	183,4	382,88	183,2	19,97	161,3	91,72	138,2
7,5months	1275,00	196,0	395,76	189,3	18,72	151,2	87,9	132,5
12 months	1301,52	200,0	406,35	194,4	19,55	157,9	90,62	136,6
18 months	1342,32	206,4	426,36	204,0	20,00	161,6	94,74	142,8

Our studies confirm the immutability of the ratio of secondary follicles to primary ones. The data obtained by us indicate a variation of this trait in the range from 11.75 to 13.17. The average for all gender and age groups was 12.39.

The relationship between the main qualitative characteristics of wool and the histological structure of the skin. As noted above, wool productivity of sheep depends on a number of factors: breed, gender, age, feeding and keeping conditions. Even within the same breed, one gender and age group of animals belonging to the same bonitation class, there can be a wide variety of variations in the shearing of wool, depending on individual characteristics. In this regard, the purpose of our study was to determine the relationship of the main qualitative characteristics of wool with the histological parameters of the skin. Wool samples were taken from rams at the age of 1.5 years to study the basic properties of wool.

Experienced rams had a fairly high wool productivity - an average of 6.0-6.6 kg of pure wool for the flock, the fineness averaged 24.2 microns, the average length was 9.5 cm. All the rams were typical of the elite flock. It is known that the breed of South Kazakh merino differs in the light and light cream color of wool fat, which was noted during the selection of samples to determine wool productivity.

In the conducted studies, the previously identified pattern was confirmed: the higher the fat content in wool, the lower the yield of pure fiber.

The thickness of the wool fiber of the buck lambs was in the range from 18.9 to 23.1 microns, which indicates a diversity in the fleece. The thickness of the wool fiber of ewe hoggs was in the range from 20.6 to 22.7 microns, which also indicates some diversity in the fleece, but the coefficient of equalization and the coefficient of variation indicate a fairly high equalization. The results of laboratory studies of wool in the context of gender and age groups of sheep of the South Kazakh merino breed are shown in Table 7.

The strength of wool at break determines its commodity value, which largely depends on the individual, age and gender and age characteristics of sheep, as well as feeding and keeping conditions [2]. We found that the strength of wool in rams was 10.80 km of breaking length, in ewes and ewe hoggs, respectively- 10.49-10.01 km.

The conducted studies of sheep wool samples from the South Kazakh merino showed that the wool was equalized as in fiber, had a high strength. The wool crimp is clearly expressed throughout

the height of the staple. The fat content of the rams and buck lambs was from white to light cream colors, the suint content is normal, there are clots at the base of the staple. Ewes and ewe hoggs also had suint from white to light cream colors. The contamination zone of the staple in rams ranged from 3.0 cm to 5.5 cm, and the dirt zone ranged from 2.0 cm to 3.5 cm.

Table 7 - Results of laboratory studies of wool by gender and age groups

Gender and age groups	Number of heads	Wool fineness, microns			Comfortfactor, %	Wool length, mm	Number of curls per 1 cm
		X ±m_x, microns	G, microns	Cv, %			
Rams	11	24,2	4,5	18,5	88,4	94,5	4-5
Ewes	32	24,3	4,6	18,8	88,4	99,1	4-5
Buck lambs	6	20,7	4,3	20,6	97,3	89,2	5
Ewe hoggs	3	21,4	4,5	21,3	96,6	95,0	5

Rams of the South Kazakh Merino breed had high wool productivity and a fairly large yield of washed wool (10.3; 64.5). The wool shearing and the yield of washed fiber in the ewes were respectively (5.8; 65.3).

All the studied wool was equalized both in fiber and fleece and had good tensile strength (from 10-10.8). The crimp is clearly expressed along the entire height of the staple. The wool color is white, the condition is normal. Wool fibers are distinguished by their staple fleece structure and softness, elasticity and uniformity in both fineness and length, with a sufficient suint content.

The development of bundles of collagen fibers with age. The quantity and quality of collagen fibers is determined by the gender and age, species and breed characteristics of the animal. We conducted studies of bundles of collagen fibers of the reticular layer of the skin tissue of young South Kazakh merino sheep from birth to 18 months, the data are shown in Table 8.

Table 8 - Age-related changes in the diameter of collagen fiber bundles in the reticular layer of the skin

Age	at birth	1 month	2 months	4,5 months	7,5 months	12 months	18 months
microns	13,3	14,5	15,2	16,1	17,0	16,3	17,5
%	100,0	109,0	114,3	121,1	127,8	122,6	131,6

After studying the histological preparations of the skin of young South Kazakh merinos, we noted that the gender and age differences of the animals left a certain imprint on the structure of the ligature.

Based on scientific and experimental research and practical breeding in a complex of interrelationships, a methodology for choosing a breed of sheep with a higher genetic potential of productive viability in the conditions of the southern region of Kazakhstan has been developed. The data obtained can be an addition to the available information on breeding and selection of breeds in terms of breed zoning, and will also allow us to develop recommendations for the effective breeding of sheep of a particular breed in a specific climatic zone of the southern region of Kazakhstan.

Conclusion

In general, it should be noted that in terms of qualitative and quantitative indicators, the studied fleece samples meet the requirements for fine merino wool according to GOST 28491-90. Sheep have a high live weight, shearing and yield of pure wool; rams have a fairly high live weight for breed; component depending on age from 100-106 kg, and high wool productivity both in physical weight and in washed fiber - 10.3-6.6 kg, with an average output of washed wool of 64.5%. The wool shearing over the years amounted to 6.6 kg of washed fiber for the breeding rams; ewes and ewe hoggs - 3.8 and 3.1; yearling rams - 3.2 kg. In the selection group of ewes, the average weight of washed wool was 4.08 kg. Over the past 15 years, fertility on this farm was 127.3%, business yield was 112.6%

In our studies, the most intensive growth of skin tissue in thickness is observed up to 2 months. In buck lambs, skin thickening during this period amounted to 45-51% of the increase, while in the

remaining 16 months only 20-23%. In the ewe hoggs, the increase in skin thickness for the period from birth to 2 months was equal to 39-46%, and the thickening of the skin tissue from 2 months of age to 18 months was 22-28%.

To objectively characterize the hereditary wool productivity of fine-wooled sheep, especially rams, it is necessary to continue the laboratory study of the qualitative characteristics of wool and histological studies of their skin and hair cover, the results of studies of the histological structure of the skin and hair cover indicate a good development of animals, but at 12 months of age, the rams had a decrease in the total thickness of the pilar layer, which is necessary take into account when growing young animals and obtaining commodity products (wool, fur sheepskins).

The most rational period for obtaining high-quality sheepskins is 18 months of age. South Kazakh merinos are a breed well adapted to the specific conditions of the southern regions of Kazakhstan. But it is necessary to conduct selection and breeding work to obtain animals with a wool cover of 60 and 64 quality, which corresponds to the high commodity and technological properties of fur sheepskins.

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Е.И. Исламов[1], Г.А. Кулманова[1], Б.Т. Құлатаев[1], Д.Н. Бекбаева[1] ,
И.Е. Мухаметжарова[2]*

[1]Қазақ ұлттық аграрлық зерттеу университеті, Алматы, Қазақстан Республикасы, islamov_esenbay@mail.ru, gulzhan_62@mail.ru, bnar@yandex.ru, bdn@mail.ru
*[2] С. Сейфуллин атындағы Қазақ агротехникалық зерттеу университеті, Астана, Қазақстан Республикасы, ilmira_pvl@mail.ru**

ЖАМБЫЛ ОБЛЫСЫ ЖАҒДАЙЫНДА ОҢТҮСТІК ҚАЗАҚ МЕРИНОС ТҰҚЫМЫНЫҢ ЖАС ҚОЙЛАРЫНЫҢ ЖҮН САПАСЫ ЕРЕКШЕЛІКТЕРІ МЕН ТЕРІСІНІҢ ҚАЛЫПТАСУЫ

Аңдатпа

2030 жылға дейін елді барлық негізгі салаларын тұрақты дамытуға және осы әлемдегі әрбір адамға қатысты жаһандық мәселелерді шешуге әкеле алатын17 негізгі бағыт таңдалды. Мақалада ғылыми зерттеулердің деректері көрсетілген және ұсынылған, оңтүстік қазақ меринос жас қойларының жүндік қасиеттерінің объективті сипаттамалары мен тері құрылымының жасқа байланысты өзгерістері, сонымен қатар жастық (туылғаннан 18 айға дейін) тері ұлпасының морфологиялық көрсеткіштерін зерттеу және олардың осы тұқымды қойлардан алынатын жартылай фабрикаттардың тауарлық қасиеттерімен және сапасымен байланысына талдау берілген. Өнімділік қасиеттері «Батай-Шу» ЖШС-дегі оңтүстік қазақ меринос тұқымының қой отарында зерттелді. Қойлардың тірі салмағы, қырқымы және таза жүн шығымы жоғары, қошқарлардың тұқымға тән тірі салмағы айтарлықтай жоғары; жасына қарай 100-106 кг, ал жүн өнімділігі физикалық салмақта да, жуылған талшықта да - 10,3-6,6 кг, жуылған жүннің орташа шығымы 64,5%, эпидермистің сәйкес дамуымен (тері жалпы қалыңдығының 0,97-1,3%). терінің жалпы қалыңдығы), жақсы дамыған пилярлы қабат (тері жалпы қалыңдығының 67,7% дейін) және ретикулярлық қабаттың салыстырмалы түрде әлсіз дамуы (тері жалпы қалыңдығының шамамен 33%). 18 айлығында 1 мм^2 жүн фолликуласының тығыздығы 52-60 бірлік, ал екінші және алғашқы фолликулдардың қатынасы 12,17-12,77. Еркек тоқтыларда қозы бөліктен кейін және 7,5 айлығына дейін 200 микронға дейін тері өседі. Дәл осы кезеңде ұрғашы тоқтыларда да терінің шамалы өсуі байқалады.

Кілт сөздер: биязы жүн, жіңішкелік, тері жабыны, жүн қырқымы, тері қалыңдығы, қой терісі, эпидермис, пилярлы қабат, дерма, фолликулдар, тер бездері

Е.И. Исламов[1], Г.А. Кулманова[1], Б.Т. Кулатаев[1], Д.Н. Бекбаева[1] ,
И.Е. Мухаметжарова[2]*

[1]Казахский национальный аграрный исследовательский университет, Алматы, Республика Казахстан, islamov_esenbay@mail.ru, gulzhan_62@mail.ru, bnar@yandex.ru, bdn@mail.ru
*[2] Казахский агротехнический исследовательский университет им. С. Сейфуллина, Астана, Республика Казахстан, ilmira_pvl@mail.ru**

ОСОБЕННОСТИ ШЕРСТНЫХ КАЧЕСТВ И ФОРМИРОВАНИЕ КОЖНОГО ПОКРОВА МОЛОДНЯКА ОВЕЦ ПОРОДЫ ЮЖНОКАЗАХСКИЙ МЕРИНОС В УСЛОВИЯХ ЖАМБЫЛСКОЙ ОБЛАСТИ

Аннотация

До 2030 года были отобраны 17 ключевых направлений, реализация которых может потенциально привести страну к устойчивому развитию всех основных сфер жизни и решению глобальных проблем, касающихся каждого человека в этом мире. В статье отражены и представлены данные научных исследований,объективные характеристики шерстных качеств и возрастные изменения признаков строения кожного покрова молодняка южноказахских мериносов, а также исследований морфологических параметров кожевой ткани в возрастном аспекте (от рождения до 18 месяцев), и дан анализ их связи с товарными свойствами и качеством полуфабрикатаполучаемого от овец этой породы. В стаде овец породы

южноказахских мериносов в ТОО «Батай-Шу» изучены продуктивные качества. Овцы обладают высокой живой массой, настригом и выходом чистой шерсти, бараны отличались достаточно высокой для породы живой массой; составляющей в зависимости от возраста от 100-106 кг, и высокой шерстной продуктивностью как в физическом весе, так и в мытом волокне-10,3-6,6кг, при выходе мытой шерсти в среднем 64,5%.толщины, с соответствующим развитием эпидермиса (0,97-1,3% общей толщины кожи), хорошо развитым пилярным слоем (до 67,7% общей толщины кожи) и относительно слабым развитием ретикулярного слоя (около 33% общей толщины кожи). Густота волосяных фолликулов на 1 мм^2 в 18 месячном возрасте составляет 52-60 единиц, а отношение ВФ/ПФ равно 12,17-12,77. После отбивки ягнят и до 7,5 месяцев у баранчиков происходит заметный прирост кожи в пределах 200мкм. За этот же период у ярок происходит незначительное увеличение кожевой ткани.

Ключевые слова: тонкая шерсть, тонина, кожный покров, настриг шерсти, толщина кожи,овчины,эпидермис, пилярный слой,дерма, фолликулы, потовые железы.