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Comparative analysis of the exterior and constitutional traits of ewes bred in the farms of Almaty region

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Abstract

Background and Aim. Evaluating the exterior and constitutional traits of ewes is essential for improving breeding practices and enhancing animal productivity. The aim of this study was to analyze the exterior traits and constitution of ewes bred on farms in the Almaty region of the Re-public of Kazakhstan.

Materials and Methods. The study was conducted on ewes of Kazakh fine-wool breed, Ka-zakh meat-wool breed and non-purebred sheep. Body measurements including height at the withers and sacrum, diagonal body length, chest and pastern girth, and rump width were taken, and confor-mation indices were calculated. The data were processed using biometric methods.

Results. The experimental ewes demonstrated good constitutional development based on height measurements (height at the withers and sacrum, as well as the oblique body length). In terms of measurements that characterize compactness of body structure and meat conformation (chest depth and width, chest and pastern girth, width at the rump), the animals corresponded to the desirable type. Overall, Kazakh meat-wool sheep of the desirable type are characterized by short stature, a large chest volume, rounded thighs, and broad withers and sacrum, indicating well-developed meat qualities.

Conclusion. The analysis of body measurements and conformation indices provides a com-prehensive characterization of the animals' exterior and enables predictions about their offspring's productivity. These findings can be applied to breeding programs aimed at improving the economi-cally significant traits of Kazakh fine wool and Kazakh meat-wool sheep breeds under the condi-tions of the Almaty region.

Keywords: sheep breeding; Kazakh fine wool sheep breed; Kazakh meat-wool breed of sheep; constitutional parameters; exterior traits; body conformation indices.

Introduction

In Kazakhstan, sheep and horses have been integral to traditional husbandry practices, with their presence in the region dating back to the Early Bronze Age [1]. Before the Soviet era, most Kazakh sheep breeds emerged through traditional folk breeding and selection methods. During the period of the Kazakh Soviet Socialist Republic, systematic efforts to develop new sheep breeds were conducted on state farms [2]. Today, sheep husbandry remains a vital sector of Kazakhstan's economy.

The Kazakh fine-wool sheep is the most common breed in Kazakhstan, predominantly raised in the semi-desert and desert regions of the country's southeast. Under relatively favorable conditions, the fertility rate of Kazakh fine-wool sheep reaches 126-144%, indicating a significant proportion of individuals within this breed capable of producing multiple offspring over their life-time (Figure 1).

Figure 1 – Kazakh fine-wool sheep breed typical animals

Sheep husbandry, particularly the breeding of Kazakh fine-wool sheep, plays a crucial role in Kazakhstan's agricultural sector. This industry is supported by vast pasturelands and a rich gene pool, cultivated through national breeding initiatives. With continuous advancements in breeding techniques and genetic management, Kazakhstan has substantial potential to emerge as a leading exporter of sheep products. Additionally, the fine wool industry is being evaluated for future expan-sion, with proposals for technical collaboration with countries such as China to elevate industry standards and practices [3]. The creation of competitive flocks is one of the most important tasks, the resolution of which will contribute to the improvement of economically valuable traits and the overall productivity of sheep. Body conformation receives special attention during the breeding evaluation of livestock. It has been established that the exterior traits are closely related to the con-stitutional strength and overall health of the animal, and significantly reflect its productivity poten-tial [4, 5]. Research on the external evaluation of sheep has emphasized various indicators to assess their welfare and productivity. The body condition score (BCS) is recognized as a key measure, with lower values potentially reflecting nutritional deficiencies and reduced welfare [6]. Exterior indicators have also been used to characterize specific breeds, such as Romanov sheep, by examin-ing physique indices and relationships between exterior traits [7].

Recent investigations have explored the physical characteristics of various sheep breeds in different regions. In Ethiopia, native sheep breeds were analyzed to aid sustainable management and conservation initiatives [8]. Research conducted in Jammu and Kashmir highlighted that most sheep had narrow, elongated heads with convex nasal bridges and horns curving backward, forward, or outward [9]. The predominant coat color was white, and the majority of sheep were polled. Morphometric features, including head, ear, and tail length, varied with age. Furthermore, a study on Edilbay sheep across age groups focused on linear body measurements to evaluate their external features [10]. These findings enhance our understanding of the exterior traits of sheep across diverse breeds and regions.

Body measurements play a vital role in evaluating sheep traits and estimating body weight. Numerous studies have demonstrated strong relationships between different body measurements and weight across various sheep breeds. Among these, chest circumference consistently stands out as the most reliable indicator of body weight [11, 12, 13]

In modern animal husbandry, the study of the exterior features is regarded as the science of the external forms of livestock in connection with their biological characteristics and economically useful traits, as well as the science of evaluating animals based on their phenotypic features.

N.P. Chirvinsky, E.A. Bogdanov, P.N. Kuleshov, M.F. Ivanov, E.F. Liskun and others made a great contribution to the study of the exterior of livestock [14, 15, 16, 17, 18]. P.N. Kuleshov under-scored the necessity of developing a specialized framework for assessing the exterior traits for each type of animal following their productivity [16]. Based on Darwin's law of comparative develop-ment, he studied in detail the proportions of an animal's body. He established the characteristic fea-tures in the structure of the whole organism associated with a certain type of productivity.

M.F. Ivanov wrote: "Modern animal science, apart from considering the exterior as the only decisive factor in determining the productivity and usefulness of an animal, nevertheless attaches great importance to it along with other factors" [19].

Extensive research on the exterior traits of agricultural animals was conducted by *N.P. Chirvinsky,* who observed that at different stages of development, individual skeletal bones grow at different rates, leading to changes in an animal's exterior as it ages [14]. The most intensive growth was noted in chest girth and body length measurements.

At birth, due to the intensive growth of peripheral skeleton bones during the embryonic period, height measurements reach maximum development. Conversely, during the post-embryonic period, the axial skeleton bones grow more intensively, resulting in a marked increase in width and chest depth measurements, while height at the withers increases less significantly.

Under the framework of Kazakhstan's sheep breeding development program, particular attention is paid to advancing sheep breeding across farms of various ownership types to more effectively utilize the genetic potential of sheep for the production of cost-effective products, primarily meat (lamb and mutton), as well as fine and semi-fine wool.

Sheep breeding holds a leading position in the agricultural sector of Kazakhstan. Currently, improving the efficiency and competitiveness of sheep breeding is linked to more comprehensive utilization of the meat productivity of sheep. Specialization in mutton production requires breeds characterized by traits such as high meat yield and early maturity. These traits are appropriate to fine and semifine wool sheep breeds and their various hybrids.

The primary method for breeding pedigree sheep is purebred breeding, which enhances the genetic and productive qualities of both the breed as a whole and specific genetic groups through intrabreed selection. Genetic groups of fine and semi-fine wool sheep in different regions of Kazakhstan show significant differences in their constitutional and productive characteristics. Selecting the most effective sheep type for a specific breeding zone can only be achieved through comparative evaluation, taking into account the animals' productive and biological traits.

Identifying and widely disseminating the most adaptable, highly productive, and economically viable types of sheep is an acute issue. Comparative evaluations of sheep from different constitutional and productive categories in specific conditions are of great importance for both the theo-ry and practice of sheep breeding.

The existence of multiple genetic types within a breed ensures genetic diversity and the structure of the herd, enabling the continuous improvement of the breed's genetic and productive traits. Incorporating the most adaptable, high-performing, and economically efficient sheep geno-types into breeding programs to improve their meat-wool characteristics under specific farming conditions holds both scientific and practical significance.

Materials and Methods

Sheep from Kazakh fine-wool and Kazakh meat-wool breeds, as well as non-purebreed sheep, were used to study the constitutional and exterior characteristics of livestock. The research was conducted on farms in the Almaty region, specifically in the Karasai and Zhambyl districts. The study included the following farms: "Kokkainar" farm (n=100) and LLP "Aksunkar" (n=100), both specializing in Kazakh fine-wool sheep breeding; "Kuatzhan" farm (n=100) and "Dukeyev" farm (n=100) are engaged in purebred breeding of Kazakh meat-wool breeds of multiple and Aksenger types; "Musabekov. B" farm (n=100), where breed transformation is conducted using Kazakh meat-wool rams, and in the LLP Scientific and Production Enterprise "Antigen", where fine wool ewes are crossed with rams from meat and fat-tailed breeds) (Figure 2).

Figure 2 – Kazakh meat-wool sheep breed typical animals

The study of the exterior traits plays a critical role in evaluating the body structure of sheep, as it is closely linked to constitutional strength and, to some extent, reflects productivity levels. Therefore, body measurements were taken on adult ewes. When determining the productive traits of animals, alongside the evaluation of live weight, significant importance is given to external forms, which are studied through body measurements and the calculation of body conformation indices. The results were processed using biometric methods in Microsoft Excel 2007.

Results and Discussion

In our experiment, we assessed the exterior by measuring eight key body parameters, the results of which are presented in Table 1. From the data in the table, which displays the main exterior indicators, it is evident that Kazakh fine-wool sheep, Kazakh meat-wool sheep and their crossbreeds exhibit both similarities and differences in body structure. To gain a more detailed understanding of body conformation, we calculated the body conformation indices of ewes from various genotypes. These indices reflect the ratios of anatomically related body measurements and were derived from the average measurements of the experimental animals. The results are presented in Table 2. Our experiment demonstrates that assessing the body conformation indices of ewes, which allows for a more accurate determination of productivity, holds particular significance. Given current market trends and increasing focus on mutton production, the analysis primarily emphasizes key body conformation indices that characterize meat productivity.

Table 1 – Body measurements of ewes, cm

	Height		Obligue body length	Chest		Rump width	girth	
	withers	sacrum		depth	Width		Chest	Pastern
“Kokkainar” farm, Kazakh fine-wool breed								
M ±m	64.20 ±0.16	66.86 ±0.11	66.09 ±0.11	45.77 ±0.10	27.94 ±0.13	31.97 ±0.09	101.86 ±1.57	8.46 ±0.05
G	1.65	1.10	1.12	1.04	1.31	0.91	15.67	0.52
CV	2.56	1.65	1.70	2.28	4.70	2.84	15.38	6.16
“Kuatzhan” farm, Kazakh meat-wool breed								
M ±m	61.55 ±0.48	62.48 ±0.45	72.48 ±0.57	46.68 ±0.40	24.64 ±0.54	25.04 ±0.34	111.93 ±0.80	11.74 ±0.13
G	4.76	4.52	5.67	4.05	5.43	3.39	7.99	1.28
CV	7.74	7.23	7.82	8.67	22.01	13.53	7.13	10.88
“Dukeyev” farm, Kazakh meat-wool breed								
M ±m	59.81 ±0.57	61.87 ±0.52	73.44 ±0.44	47.38 ±0.45	24.03 ±0.45	22.57 ±0.25	113.43 ±0.92	11.48 ±0.10

Continuation of table 1

G	5.66	5.25	4.37	4.49	4.52	2.54	9.16	1.01
CV	9.47	8.48	5.95	9.48	18.81	11.27	8.08	8.80
"Musabekov. B" farm, non-purebreed								
M ±m	64.96 ±0.51	66.47 ±0.49	73.89 ±0.51	45.99 ±0.29	25.03 ±0.31	23.74 ±0.32	117.13 ±0.61	13.23 ±0.18
G	5.14	4.92	5.07	2.90	3.13	3.19	6.09	1.79
CV	7.91	7.40	6.87	6.31	12.52	13.45	5.20	13.50
LLP "Aksunkar", Kazakh fine-wool breed								
M ±m	67.45 ±0.30	65.94 ±0.44	65.28 ±0.38	33.52 ±0.19	19.86 ±0.13	23.765 ±0.13	121.96 ±0.63	13.12 ±0.12
G	2.99	4.40	3.80	1.91	1.28	1.26	6.35	1.22
CV	4.44	6.67	5.82	5.71	6.44	5.31	5.20	9.34
LLP (Scientific and production enterprise) "Antigen", non-purebreed								
M ±m	66.28 ±0.29	66.87 ±0.25	67.17 ±0.30	32.03 ±0.12	20.13 ±0.11	22.37 ±0.11	121.69 ±0.30	12.5 ±0.11
G	2.85	2.54	2.98	1.18	1.09	1.05	3.04	1.11
CV	4.30	3.79	4.44	3.70	5.41	4.70	2.50	8.84

In terms of withers height, livestock from the "Dukeyev" farm, of the Kazakh meat-wool breed, were shorter than the ewes from the "Kokkainar" farm, of the Kazakh fine-wool breed, by 4.39 cm or 7.34%; shorter than those from LLP "Aksunkar" Kazakh fine-wool breed, by 7.64 cm or 12.77%; shorter than those from the "Kuatzhan" farm, of the Kazakh meat-wool breed, by 1.74 cm or 2.91%; shorter than those from "Musabekov. B" farm, of non-purebred origin, by 5.15 cm or 8.61%; and shorter than those from the LLP Scientific and Production Enterprise "Antigen" of non-purebred origin, by 6.47 cm or 10.82%. Regarding sacrum height, the livestock from the "Dukeyev" farm, of the Kazakh meat-wool breed, were shorter than the ewes from the "Kokkainar" farm, of the Kazakh fine-wool breed, by 4.99 cm or 8.07%; shorter than those from LLP "Aksunkar", of the Kazakh fine wool breed, by 4.07 cm or 6.58%; shorter than those from the "Kuatzhan" farm,of the Kazakh meat-wool breed, by 0.61 cm or 0.99%; shorter than those from "Musabekov. B" farm, of non-purebred origin, by 4.60 cm or 7.43%; and shorter than those from the LLP Scientific and Pro-duction Enterprise "Antigen" of non-purebred origin, by 5.0 cm or 8.08%.

Livestock from LLP "Aksunkar", of the Kazakh fine wool breed, had a shorter oblique body length compared to ewes from the "Kokkainar" farm, also of the Kazakh fine-wool breed, by 0.81 cm (1.24%); compared to those from the "Kuatzhan" farm, of the Kazakh meat-wool breed, by 7.2 cm (11.03%); compared to the "Dukeyev" farm, of the Kazakh meat-wool breed, by 8.16 cm (12.5%); compared to the "Musabekov. B" farm, of non-purebred origin, by 8.61 cm (13.19%); and compared to the LLP Scientific and Production Enterprise "Antigen" of non-purebred origin, by 1.89 cm (2.9%). Livestock from the LLP Scientific and Production Enterprise "Antigen" of non-purebred origin, had a smaller chest depth compared to ewes from the "Kokkainar" farm, of the Ka-zakh fine wool breed, by 13.74 cm (42.9%); compared to those from LLP "Aksunkar" , of the Ka-zakh fine wool breed, by 1.49 cm (4.65%); compared to the "Kuatzhan" farm, of the Kazakh meat-wool breed, by 14.65 cm (45.74%); compared to the "Dukeyev" farm, of the Kazakh meat-wool breed, by 15.35 cm (47.92%); and compared to the "Musabekov. B" farm, of non-purebred origin, by 13.96 cm (43.58%). Ewes from LLP "Aksunkar", of the Kazakh fine-wool breed, demonstrated a narrower chest width compared to ewes from the "Kokkainar" farm, of the Kazakh fine-wool breed, by 8.08 cm (40.68%); compared to those from the "Kuatzhan" farm, of the Kazakh meat-wool breed, by 4.78 cm (24.07%); compared to the "Dukeyev" farm, of the Kazakh meat-wool breed, by 4.17 cm (21.0%); compared to the "Musabekov. B" farm, of non-purebred origin, by 5.17 cm (26.03%); and compared to the LLP Scientific and Production Enterprise "Antigen", of non-purebred origin, by 0.27 cm (1.36%).

Livestock from the LLP Scientific and Production Enterprise "Antigen" , of non-purebred origin, had a narrower rump width compared to ewes from the "Kokkainar" farm, of the Kazakh fine-wool breed, by 9.6 cm (42.91%); compared to LLP "Aksunkar", of the Kazakh fine-wool breed, by 1.4 cm (6.24%); compared to the "Kuatzhan" farm,of the Kazakh meat-wool breed, by 2.67 cm (11.94%);

compared to the "Dukeyev" farm, of the Kazakh meat-wool breed, by 0.2 cm (0.89%); and compared to the "Musabekov. B" farm, of non-purebred origin, by 1.37 cm (6.12%). Ewes from the "Kokkainar" farm, of the Kazakh fine-wool breed, had a smaller chest girth behind the shoulder blades compared to those from LLP "Aksunkar", of the Kazakh fine wool breed, by 20.1 cm (19.73%); compared to the "Kuatzhan" farm, of the Kazakh meat-wool breed, by 10.07 cm (9.89%); compared to the "Dukeyev" farm, of the Kazakh meat-wool breed, by 11.57 cm (11.36%); compared to the "Musabekov. B" farm, of non-purebred origin, by 15.27 cm (14.99%); and com-pared to the LLP Scientific and Production Enterprise "Antigen", of non-purebred origin, by 19.83 cm (19.47%). Ewes from the "Kokkainar" farm, of the Kazakh fine-wool breed, had a smaller pas-tern girth compared to livestock from LLP "Aksunkar", of the Kazakh fine-wool breed, by 4.66 cm (55.08%); compared to the "Kuatzhan" farm,of the Kazakh meat-wool breed, by 3.28 cm (38.77%); compared to the "Dukeyev" farm, of the Kazakh meat-wool breed, by 3.02 cm (35.7%); compared to the "Musabekov. B" farm, of non-purebred origin, by 4.77 cm (56.38%); and compared to the LLP Scientific and Production Enterprise “Antigen”, of non-purebred origin, by 4.04 cm (47.75%).

As is well known, evaluating the body structure of sheep based on absolute measurement values is challenging. To fully characterize their conformation, body indices are determined, which allow for an assessment of the overall degree of organism development.

Table 2 – Body conformation indices of animals involved in the study, %

Indices	Leg length	Prolixity	Pelvic-thoracic	Thoracic	Compactness	Overgrowth	Bone	Massiveness
“Kokkainar” farm, Kazakh fine-wool breed								
M ±m	28.66 ±0.24	103.00 ±0.31	87.413 ±0.39	61.075 ±0.32	154.24 ±2.43	104.20 ±0.29	13.192 ±0.09	158.86 ±2.54
G	2.44	3.07	3.86	3.23	24.26	2.91	0.89	25.41
CV	8.51	2.98	4.42	5.30	15.73	2.79	6.76	16.00
“Kuatzhan” farm, Kazakh meat-wool breed								
M ±m	23.79 ±0.80	118.43 ±1.28	100.54 ±2.76	53.25 ±1.30	155.39 ±1.68	101.58 ±0.28	19.204 ±0.27	183.08 ±2.09
G	8.03	12.80	27.62	12.97	16.81	2.75	2.67	20.92
CV	33.73	10.81	27.47	24.35	10.82	2.71	13.92	11.43
“Dukeyev” farm, Kazakh meat-wool breed								
M ±m	20.09 ±1.05	123.96 ±1.47	107.67 ±2.30	51.18 ±1.08	155.00 ±1.57	103.95 ±0.95	19.40 ±0.28	191.30 ±2.33
G	10.52	14.71	22.97	10.81	15.72	9.47	2.83	23.34
CV	52.35	11.87	21.34	21.11	10.14	9.11	14.59	12.20
“Musabekov. B” farm, non-purebreed								
M ±m	28.72 ±0.75	114.47 ±1.23	107.39 ±2.00	54.736 ±0.84	159.27 ±1.39	102.39 ±0.24	20.486 ±0.32	181.44 ±1.73
G	7.53	12.26	19.97	8.38	13.89	2.41	3.16	17.27
CV	26.21	10.71	18.59	15.31	8.72	2.36	15.40	9.52
LLP “Aksunkar”, Kazakh fine-wool breed								
M ±m	50.21 ±0.34	96.85 ±0.52	83.89 ±0.82	59.40 ±0.47	187.42 ±1.43	97.79 ±0.56	19.48 ±0.19	181.14 ±1.21
G	3.43	5.19	8.16	4.69	14.33	5.57	1.95	12.10
CV	6.82	5.36	9.73	7.90	7.65	5.70	10.00	6.68
LLP (Scientific and production enterprise) “Antigen”, non-purebreed								
M ±m	51.59 ±0.26	101.54 ±0.64	90.13 ±0.57	62.92 ±0.40	181.50 ±0.90	100.9 2±0.19	18.90 ±0.20	183.96 ±0.98
G	2.56	6.40	5.73	3.95	8.97	1.89	1.95	9.82
CV	4.96	6.30	6.36	6.29	4.94	1.87	10.33	5.34

The leg-length index, reflecting the relative development of leg length, ranged from 23.79% to 51.59% in the experimental ewes. Livestock from the "Dukeyev" farm (Kazakh meat-wool breed) lagged behind ewes from the "Kokkainar" farm (Kazakh fine wool breed) by 8.57%, LLP "Aksunkar" (Kazakh fine wool breed) by 30.1%, the "Kuatzhan" farm (Kazakh meat-wool breed) by 3.7%, the "Musabekov. B" farm (non-purebred) by 8.63%, and LLP Scientific and Production Enterprise "Antigen" (non-purebred) by 31.5%. The prolixity index, which reflects the ratio of body length to withers height, ranged from 96.85% to 123.96% in our study. Livestock from LLP "Aksunkar" (Kazakh fine wool breed) lagged behind ewes from the "Kokkainar" farm (Kazakh fine wool breed) by 6.15%, the "Kuatzhan" farm (Kazakh meat-wool breed) by 21.58%, the "Dukeyev" farm (Kazakh meat-wool breed) by 27.11%, the "Musabekov. B" farm (non-purebred) by 17.62%, and LLP Scientific and Production Enterprise "Antigen" (non-purebred) by 4.69%. The pelvic-thoracic index, which reflects the ratio of chest width behind the shoulder blades to pelvic width at the hip bones, provides insight into the relative width development of the chest. In our study, the index ranged from 83.89% to 107.67%. According to this index, livestock from LLP "Aksunkar" (Kazakh fine wool breed) lagged behind ewes from the "Kokkainar" farm (Kazakh fine wool breed) by 3.52%, the "Kuatzhan" farm (Kazakh meat-wool breed) by 16.65%, the "Dukeyev" farm (Ka-zakh meat-wool breed) by 23.78%, the "Musabekov. B" farm (non-purebred) by 23.5%, and LLP Scientific and Production Enterprise "Antigen" (non-purebred) by 6.24%. The thoracic index indi-cates the overall chest development of the experimental animals. The lowest thoracic index value was observed in ewes from the "Dukeyev" farm (Kazakh meat-wool breed) at 51.18%, while the highest value was recorded in ewes from LLP Scientific and Production Enterprise "Antigen" (non-purebred) at 62.92%. According to this index, livestock from the "Dukeyev" farm lagged behind the ewes from the "Kokkainar" farm (Kazakh fine wool breed) by 9.9%, LLP "Aksunkar" (Kazakh fine-wool breed) by 8.22%, the "Kuatzhan" farm (Kazakh meat-wool breed) by 2.07%, the "Musabekov. B" farm (non-purebred) by 3.56%, and LLP Scientific and Production Enterprise "Antigen" (non-purebred) by 11.74%.

The results of the study indicate that the compactness index, which characterizes body mass development, ranged from 154.24% to 187.42% among the ewes. Based on this index, livestock from the "Kokkainar" farm (Kazakh fine wool breed) was surpassed by ewes from LLP "Aksunkar" (Kazakh fine wool breed) by 33.18%, the "Kuatzhan" farm (Kazakh meat-wool breed) by 1.15%, the "Dukeyev" farm (Kazakh meat-wool breed) by 0.76%, the "Musabekov. B" farm (non-purebred) by 5.03%, and LLP Scientific and Production Enterprise "Antigen" (non-purebred) by 27.26%. The overgrowth index indicates the relative development of rump height compared to the front part and serves as a reliable measure of postnatal growth. In our study, the obtained values ranged from 97.79% to 104.2%. Based on the overgrowth index, livestock from LLP "Aksunkar" (Kazakh fine wool breed) lagged behind ewes from the "Kokkainar" farm (Kazakh fine wool breed) by 6.41%, the "Kuatzhan" farm (Kazakh meat-wool breed) by 3.79%, the "Dukeyev" farm (Kazakh meat-wool breed) by 6.16%, the "Musabekov. B" farm (non-purebred) by 4.6%, and LLP Scientific and Pro-duction Enterprise "Antigen" (non-purebred) by 3.13%. The bone Index reflects the relative devel-opment of the skeletal structure and ranged from 13.19% to 20.48% in the studied animals. Based on the bone Index, the animals from “Kokkainar” farm (Kazakh fine wool breed) were inferior to the ewes from LLP “Aksunkar” (Kazakh fine wool breed) by 6.29%; to “Kuatzhan” farm (Kazakh meat-wool breed) by 6.01%; to “Dukeyev” farm (Kazakh meat-wool breed) by 6.21%; to “Musabekov.B” farm (non-purebreed) by 4.6%; and to LLP Scientific and Production Enterprise “Antigen” (non-purebreed) by 5.71%. The massiveness index, which characterizes overall body de-velopment, ranged from 158.86% to 191.3% in the experimental ewes. Based on the massiveness index, the animals from “Kokkainar” farm (Kazakh fine wool breed) were inferior to the ewes from LLP “Aksunkar” (Kazakh fine wool breed) by 22.28%; to “Kuatzhan” farm (Kazakh meat-wool breed) by 24.22%; to “Dukeyev” farm (Kazakh meat-wool breed) by 32.44%; to “Musabekov. B” farm (non-purebreed) by 22.58%; and to LLP Scientific and Production Enterprise “Antigen” (non-purebreed) by 25.1%. Changes in live weight alone do not provide a comprehensive evaluation of an animal's development, making it necessary to study exterior traits by conducting body measure-ments and calculating conformation indices. While live weight reflects overall growth and devel-opment, it does not indicate the specific direction of an animal’s developmental changes. Conse-quently, data on

variations in linear body measurements are commonly used to gain a more detailed understanding of physical development. Additionally, exterior traits serve as important indicators of an animal's health status and adaptability to the environmental and management conditions of spe-cific regions. The exterior of an animal is closely linked to its constitution. While the exterior can only provide a relative indication of productivity, its significance in this context is considerable. Therefore, the study of exterior traits serves as a valuable complement to other indicators used to assess the productivity and economic usefulness of animals. The exterior refers to an animal's outward appearance and overall physical form. Exterior characteristics provide insights into the animal's development, health status, productivity, breed-specific traits, biological resilience, and adaptability to environmental, climatic, and feeding conditions of specific regions. The experi-mental ewes demonstrated strong constitutional development based on height measurements, in-cluding height at the withers and sacrum, as well as oblique body length. Measurements reflecting compactness of body structure and meat conformation-such as chest depth and width, chest and pastern girth, and rump width-classified the animals as belonging to the desirable type.

In general, Kazakh meat-wool sheep of the desirable type are characterized by a low-set body, a large and voluminous chest, rounded thighs, and broad withers and sacrum, all of which indicate well-developed meat traits. Therefore, the analysis of body measurements and conformation indices not only provides a detailed characterization of the external features of the experimental animals but also serves as a valuable tool for evaluating and predicting the productivity of their offspring. This approach is undoubtedly essential for selective breeding programs aimed at improving fine wool and semi-fine-wool sheep breeds.

Conclusion

In conclusion, the study provides a comprehensive analysis of the exterior and constitutional traits of ewes bred in the Almaty region of Kazakhstan, concentrating on Kazakh fine-wool, meat-wool (semi-fine wool), and non-purebred sheep. The findings indicate that these ewes demonstrate well-developed meat traits and compact body structures, characterized by broad chests, rounded thighs, and large body mass. These features are indicative of strong constitutional development and desirable productivity levels. The analysis of body measurements and body conformation indices provides significant insights into the adaptability and productivity of different Kazakh sheep breeds, making it a valuable tool for selective breeding programs. By using these data, breeders can enhance the economically useful traits of fine wool and semi-fine wool sheep, contributing to the efficiency and competitiveness of Kazakhstan's sheep industry. This research highlights the importance of using detailed exterior evaluations to improve breeding practices and optimize the productivity of livestock in specific regional conditions.

Authors' Contributions

SKh, AI, AB, ShO, BK: Conceptualized and designed the study, conducted a comprehensive literature review, analyzed the collected data, and prepared the manuscript. SKh and AI: Performed final editing and proofreading of the manuscript. All authors read, reviewed, and approved the final version of the manuscript.

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Алматы облысының шаруашылықтарында өсірілетін саулық қойлардың экстерьерлік және конституционалдық ерекшеліктерінің салыстырмалы сипаттамасы

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Түйін

Алғышарттар мен мақсат. Саулық қойлардың экстерьері мен конституциялық ерекшеліктерін бағалау селекциялық тәжірибелерді жетілдіру мен малдың өнімділігін арттырудағы маңызды қадам болып табылады. Бұл зерттеудің мақсаты – Қазақстан Республикасының Алматы облысындағы шаруа қожалықтарында өсірілетін саулық қойлардың экстерьерлік ерекшеліктерін және конституциясын зерттеу.

Материалдар мен әдістер. Зерттеу қазақтың биязы жүнді, етті-жүнді және тұқымсыз саулық қойларға жүргізілді. Дене өлшемдері (шоқтық биіктігі мен құйымшақ биіктігі, дененің қиғаш ұзындығы, кеуде және жіліншік орамы, кеуде ені) өлшенді, сонымен қатар дене құрылысының индекстері есептелді. Мәліметтер биометриялық әдістерді пайдалану арқылы өңделді.

Нәтижелер. Тәжірибелік саулықтар дене өлшемдері бойынша жақсы конституциялық даму көрсеткен (шоқтық биіктігі мен құйымшақ биіктігі, дененің қиғаш ұзындығы). Дене құрылысының жинақылығы мен еттілігін сипаттайтын өлшемдер бойынша (кеуде тереңдігі мен ені, кеуде және жіліншік орамы) жануарлар қалаулы типке жатқызылды. Жалпы, қалаулы типтегі қазақтың етті-жүнді қойлары аласа бойлы, кеуде қуысының көлемі үлкен, жамбас бұлшықеттері дөңгеленген, шоқтық пен құйымшақтары кең, бұл олардың жақсы дамыған еттілік қасиеттерін көрсетеді.

Қорытынды. Дене өлшемдерін талдау және дене құрылысының индекстері жануарлардың экстерьерін кешенді сипаттауды қамтамасыз етеді және олардан алынатын төлдердің өнімділігін болжауға мүмкіндік береді. Алынған нәтижелер Алматы облысының жағдайында биязы жүнді және етті-жүнді қойлардың шаруашылыққа пайдалы қасиеттерін жақсартуға бағытталған селекциялық бағдарламаларда қолданылуы мүмкін.

Кілт сөздер: қой шаруашылығы; қазақтың биязы жүнді қой тұқымы; қазақтың етті-жүнді қой тұқымы; конституционалдық көрсеткіштер; экстерьерлік көрсеткіштер; дене құрылысының индекстері.

Сравнительная характеристика экстерьерно-конституциональных особенностей овцематок, разводимых в хозяйствах Алматинской области

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Аннотация

Предпосылки и цель. Оценка экстерьера и конституциональных особенностей овцематок является важным этапом в улучшении селекционных практик и повышении продуктивности животных. Целью данного исследования было изучение экстерьерных особенностей и конституции овцематок, разводимых на фермах Алматинской области Республики Казахстан.

Материалы и методы. Исследование проводилось на овцематках казахской мясо-шерстной, тонкорунной пород и беспородных овцематках. Были выполнены промеры тела (высота в холке и крестце, косая длина туловища, обхват груди и пясти, ширина в маклаках), а также рассчитаны индексы телосложения. Данные обрабатывались с использованием биометрических методов.

Результаты. Экспериментальные овцематки показали хорошее конституциональное развитие по высотным промерам (высота в холке и крестце, косая длина туловища). По промерам, характеризующих компактность телосложения и мясные формы (глубина и ширина груди, обхват груди и пясти, ширина в маклаках), животные относились к желательному типу. В целом, для казахских мясо-шерстных овец желательного типа характерны низкорослость, большой объем грудной клетки, округлость бедер, широкие холка и крестец, что свидетельствует о хорошо развитых мясных качествах.

Заключение. Анализ промеров тела и индексов телосложения обеспечивает комплексную характеристику экстерьера животных и позволяет прогнозировать продуктивность их потомства. Полученные результаты могут быть использованы в селекционных программах, направленных на улучшение хозяйственно-полезных признаков тонкорунных и мясо-шерстных овец в условиях Алматинской области.

Ключевые слова: овцеводство; казахская тонкорунная порода овец, казахская мясо-шерстная порода овец, конституциональные параметры; экстерьерные показатели; индексы телосложения овец.