

STUDY OF THE SKIN HISTOLOGICAL STRUCTURE IN EWES FROM STAROPLANINSKA AND THOROUGHBRED TSIGAI**

D. Genkovski*, G. Gerchev

Research Institute of Mountain Stockbreeding and Agriculture
Troyan 5600, Bulgaria

*Corresponding author diana_todorova_777@yahoo.co.uk

**Original scientific paper

Abstract: Study of the skin histological structure in ewes from Staroplaninski and Thoroughbred Tsigai (Introduced Tsigai – Priazovski type) was conducted. The origin of the ewes from Staroplaninski Tsigai was from reproductive breed herds for Northern Bulgaria – Goliama Zheliazna, Vranilovtsi, Mramoren, Malinovo and Borovtsi. The Thoroughbred Tsigai was imported from sovkhos 'Roza Lyuksemburg' and was reared in the Experimental base of RIMSA-Troyan. The animals from Staroplaninski Tsigai were bought as lambs at 3-months age and were reared till 5.5-years age in one herd together with Thoroughbred Tsigai. The results of the study showed that the ewes from the farms in RIMSA-Troyan and Malinovo had the largest total skin thickness and its layers, respectively 2994.7 μm and 2862.3 μm , and the thinnest was from Mramoren – 2703.5 μm . In similar way were the groups regarding to depth and width of primary and secondary bulb fibres. The width of fibre roots and follicles of the in animals from the farms in RIMSA-Troyan and Malinovo was the largest and in those from Mramoren the smallest. The density of fibre roots was the largest in animals from the farm in Mramoren – 4.15 $\text{bp}/\mu\text{m}^2$ and the smallest in those from Goliama Zheliazna – 3.64 $\text{bp}/\mu\text{m}^2$.

Key words: structure, Tsigai breed, skin, epidermis, follicles, collagen fascicles

Introduction

The basic properties of skin both in most animals and in ewes are its

solidity and density. These properties depend mainly on structure and position of the mechanical structures – collagens and elastins in it and their correlation with the mechanical structural elements – epidermis, fibre roots, sweat glands, vessels and nerves and different types of cell elements.

The studies of skin histological structure in Tsigai ewes were conducted in the period of crossbreeding from *Balevska (1970)*, *Dokov (1970)*, *Dokov (1976)*, *Nedelchev (1983)*, *Nedelchev (1983)*, *Nedelchev (1994)*, *Slavov (1990)*.

The aim of this study was the values of microstructure indices of skin in ewes from Staroplaninski and Thoroughbred Tsigai (Introduced Tsigai – Priazovski type) to be defined.

Materials and methods

Study of newly created breed Staroplaninski Tsigai was conducted in the Experimental base in RIMSA-Troyan. The origin of the animals was from reproductive breed farms for the region of Northern Bulgaria. 5 trial groups were formed from the newly created Staroplaninski Tsigai and one group from Thoroughbred Tsigai (Introduced Tsigai – Priazovski type). All the animals were at equal conditions of nutrition and rearing – in one herd. From each group of 15 animals at 3.5 years age, 15 samples from the shoulder were taken for study of the skin histological structure. The following indices were tested: thickness of skin and its layers, number and size of primary and secondary follicles, density of fibre roots per one mm², size of skin glands.

Results and discussion

The total skin thickness varied in wide limits – from 2703.1 µm for ewes from the farms in Borovtsi to 2994.7 µm for those from RIMSA-Troyan (Table 1). The differences between the mentioned groups were mathematically proved at $P < 0.001$. The percentage of epidermis was from 0.65 % for ewes from Borovtsi to 0.71 % for those from the farms in Vranilovtsi and RIMSA-Troyan. The papillary layer was from 67.24 % for ewes from the farm in Goliama Zheliazna to 68.77 % for those in RIMSA-Troyan and the reticulum layer respectively – 30.49 % for ewes from Malinovo and RIMSA-Troyan and 32.08 % for the animals from Goliama Zheliazna.

The results of mean skin thickness of the included Tsigai ewes were

lower than those in *Balevska (1970)* and near to the values announced by *Dokov (1976)* and *Nedelchev (1980)*.

The ewes from RIMSA-Troyan were with largest depth of setting of primary and secondary fibre follicles and also with the largest width, respectively 1735.8 μm , 1142.0 μm and 119.4 μm and 81.0 μm , followed by those from the farm in Malinovo and with the lowest were those in Mramoren – 1706.1 μm , 1095.0 μm and 104.2 μm , 74.7 μm (Table 2). The differences between the mentioned groups were mathematically proved at $P < 0.001$.

The higher values of skin size, its layers, hair bulbs in ewes from RIMSA-Troyan and Malinovo could be explained with the breed creation process of Tsigai breed. The introduced Tsigai reared in Rimasa-Troyan was imported from sovkhos 'R. Lyuksenburg'. Breed Romni Marsh took place in the process of breed creation. For mother base at the breed creation in Malinovo were used local rough wool sheep and elite rams with wool quality 46-48, from the thoroughbred Tsigai herd reared in RIMSA-Troyan. The lower values of the mentioned indices in ewes from Mramoren could be explained with including in the breed creation process of ewes – fine-fleeced crossbreeds.

The number of primary fibre roots per 1 μm^2 varied from 3.64 μm^2 for the animals from Vranilovtsi to 4.15 μm^2 for those from Mramoren (Table 4). The differences in the mentioned groups were mathematically proved at $P < 0.001$. The secondary and total number of fibre roots were with the highest values in ewes from Mramoren and with the lowest in those from Vranilovtsi but the differences between the groups are mathematically proved at $P < 0.001$.

The ratio of secondary towards primary fibre roots was the largest in ewes from Mramoren 1.47 and the lowest in those from Vranilovtsi 1.36.

In size of fat and sweat glands (Table 5), the differences between the groups were minimal and mathematically unproved. *разликите между групите са минимални и математически недоказани*. In these indices the ewes from the farms in Malinovo and RIMSA-Troyan exceeded the animals from Mramoren.

There were not large differences between the groups in the defined values for diameter of collagen fascicles. The mean width of the collagen fascicles in the middle of the netlike layer were nearly equal to those announced by *Nedelchev (1983)* in Tsigai ewes. This diameter of collagen fascicles was wished for the leather and furrier industry and gave velours of good quality (*Nedelchev, 1983*).

Table 1. Skin thickness and its layers (μm)

Farm	n	Total skin thickness				Epidermis depth				Papillary layer depth				Reticulum layer depth			
		\bar{X}	Sx	C	%	\bar{X}	Sx	C	%	\bar{X}	Sx	C	%	\bar{X}	Sx	C	%
Staroplaninski Tsigai																	
G.Zheliazna	15	2764.6	24.2	13.3	100	18.5	0.2	16.4	0.6	1859.0	15.2	12.1	67.2	887.1	15.1	22.4	32.7
Malinovo	15	2862.3	23.1	12.3	100	20.2	0.2	14.3	0.6	1969.1	15.8	11.4	67.1	873.0	14.4	21.3	32.3
Borovtsi	15	2725.1	22.4	14.5	100	17.8	0.1	12.2	0.6	1861.3	12.3	8.6	68.3	846.0	16.2	19.4	31.0
Vranilovtsi	15	2728.3	21.3	16.3	100	19.4	0.1	11.4	0.7	1845.2	10.4	18.4	67.6	863.7	17.4	18.8	31.6
Mramoren	15	2703.5	22.6	16.2	100	17.2	0.2	12.6	0.6	1835.0	22.0	21.1	67.6	851.3	13.3	23.1	31.6
Thoroughbred (Introduced) Tsigai																	
RIMSA-Troyan	15	2994.7	20.4	15.5	100	21.3	0.1	14.4	0.6	2060.3	21.30	11.4	67.6	913.1	12.1	22.2	31.6

Table 2. Depth of setting of primary and secondary hair bulbs and width of hair bulbs

Farm	n	Depth of setting of primary hair bulbs			Depth of setting of secondary hair bulbs				Width of setting of primary hair bulbs			Width of setting of secondary hair bulbs			Spec. width	
		\bar{X}	Sx	C	\bar{X}	Sx	C	PF/SF	\bar{X}	Sx	C	\bar{X}	Sx	C	PF/SF	
Staroplaninski Tsigai																
G.Zheliazna	15	1708.3	11.42	11.3	1115.6	8.11	16.4	1.53	111.5	0.91	13.3	76.3	0.68	14.4	1.39	
Malinovo	15	1721.2	10.12	10.3	1125.0	9.09	12.3	1.51	114.4	0.88	12.4	78.2	0.66	17.3	1.51	
Borovtsi	15	1695.4	11.40	12.2	1103.4	9.03	11.6	1.53	109.3	0.94	11.2	76.1	0.71	12.8	1.53	
Vranilovtsi	15	1712.5	10.44	14.3	1117.7	10.44	16.3	1.53	107.5	0.91	10.4	75.9	0.60	14.2	1.36	
Mramoren	15	1706.1	12.12	11.6	1095.0	9.28	12.8	1.52	104.2	0.81	12.8	74.7	0.80	15.3	1.47	
Thoroughbred (Introduced) Tsigai																
RIMSA-Troyan	15	1735.8	14.11	10.16	1142.0	8.18	17.4	1.54	119.4	0.88	11.1	81.0	0.74	11.3	1.46	

Table 3. Width of fibre roots and follicles in microns

Farm	n	Width PFR			Width SFR			Width PFF			Width SFF		
		\bar{X}	Sx	C	\bar{X}	Sx	C	\bar{X}	Sx	C	\bar{X}	Sx	C
Staroplaninski Tsigai													
G.Zheliazna	15	38.52	0.30	11.6	25.20	0.17	12.8	86.22	0.80	12.8	69.23	0.80	14.2
Malinovo	15	39.24	0.28	12.3	25.30	0.16	11.4	91.14	0.69	11.6	68.92	0.42	13.8
Borovtsi	15	37.82	0.30	11.4	24.80	0.17	12.2	83.14	0.81	12.2	69.84	0.56	11.4
Vranilovtsi	15	37.24	0.22	16.3	24.90	0.17	11.4	87.15	0.84	12.4	68.11	0.52	9.3
Mramoren	15	36.80	0.28	12.7	25.80	0.18	12.2	84.11	0.77	10.8	67.04	0.48	16.2
Thoroughbred (Introduced) Tsigai													
RIMSA-Troyan	15	39.28	0.25	12.7	25.10	0.16	14.3	89.90	0.22	9.1	69.24	0.54	12.3

Table 4. Density of fibre roots per 1 mm²

Farm	n	Number of PFR			Number of SFR			Number of FR			Ratio SFR/PFR		
		\bar{X}	Sx	C	\bar{X}	Sx	C	\bar{X}	Sx	C	\bar{X}	Sx	C
Staroplaninski Tsigai													
G.Zheliазna	15	3.94	0.15	22.2	25.13	0.80	20.3	29.07	1.17	21.4	6.37	0.10	19.8
Malinovo	15	3.80	0.15	20.4	25.11	0.68	19.8	28.91	1.04	19.7	6.60	0.12	19.7
Borovtsi	15	3.78	0.17	16.3	26.21	0.78	17.4	29.99	0.98	16.9	6.93	0.14	16.9
Vranilovtsi	15	3.74	0.18	24.1	26.10	0.75	22.4	29.84	0.94	23.1	6.97	0.11	22.8
Mramoren	15	4.15	0.16	20.4	34.16	0.69	24.1	33.65	0.90	22.2	8.23	0.15	22.6
Thoroughbred (Introduced) Tsigai													
RIMSA-Troyan	15	3.69	0.12	24.2	25.40	0.84	20.2	29.04	1.23	20.4	6.88	0.12	19.8

Table 5. Size of skin glands and diameter of collagen fascicles

Farm	n	Fat glands						Sweat glands					
		Depth			Width			Width of secretion compartment			Diameter of collagen fascicles		
		\bar{X}	Sx	C	\bar{X}	Sx	C	\bar{X}	Sx	C	\bar{X}	Sx	C
Staroplaninski Tsigai													
G.Zheliазna	15	220.2	2.84	21.4	93.9	1.584	20.4	115.4	1.45	22.3	7.4	0.06	24.2
Malinovo	15	226.4	2.65	22.5	94.2	1.49	21.3	123.6	1.29	21.4	7.3	0.08	21.5
Borovtsi	15	217.5	3.11	24.3	90.5	1.36	19.6	119.3	1.53	22.8	7.9	0.08	20.3
Vranilovtsi	15	223.4	3.24	20.1	91.7	1.25	22.8	121.1	1.56	23.1	7.6	0.07	19.4
Mramoren	15	219.5	3.65	19.6	90.4	1.45	19.4	118.1	1.44	24.5	7.3	0.09	20.2
Thoroughbred (Introduced) Tsigai													
RIMSA-Troyan	15	228.4	2.95	21.3	95.1	1.44	21.5	124.4	1.49	20.3	8.35	0.06	26.3

Conclusions

Results from the study of skin microstructure in ewes from Tsigai breed showed significant varying in the indices.

The ewes from the herd in RIMSA-Troyan, in total skin thickness exceeded those from Goliama Zheliазna with 7.68 %, 4.77 % from Malinovo, 9.00 % from Goliama Zheliазna, 8.88 % from Vranilovtsi and 9.72 % from Mramoren.

The ewes from the farm in Mramoren were with the largest density of fibre roots - 4.15. They were created on the base of ewes – fine-fleece crossbreeds.

Significant differences regarding to the size of fat and sweat glands and width of collagen fascicles were not determined.

ISPITIVANJE HISTOLOŠKE STRUKTURE KOŽE OVACA STAROPLANINSKE I ČISTORASNE CIGAJE

D. Genkovski, G. Gerchev

Rezime

U radu je ispitana histološka struktura kože ovaca staroplaninske I čistorasne cigaje (cigaja – tip priazovske ovce). Ovce staroplaninske cigaje vode poreklo iz reproduktivnih Zapata iz Severne Bugarske - Goliama Želiazna, Vranilovci, Mramoren, Malinovo i Borovci. Čistorasna cigaja je uvežena iz sovhoza 'Roza Luksemburg' i odgajana u eksperimentalnoj stanici Instituta za planinsku poljoprivredu i stočarstvo, Trojan. Životinje rase staroplaninska cigaja su kupljene u uzrastu od 3 meseca i odgajane su do uzrasta od 5.5 godina u jednom stadu zajedno sa ovcama rase cigaja.

Rezultati ispitivanja pokazuju da su ovce odgajane na farmi Instituta za planinsku poljoprivredu i stočarstvo, Trojan i Malinovu imale najveću ukupnu debljinu kože i njenih slojeva, respektivno 2994.7 μm i 2862.3 μm , a najtanju ovce iz Mramorena – 2703.5 μm . Slični rezultati su dobijeni i u pogledu dubine i širine primarnih i sekundarnih vlakana.

Širina korena vlakana i folikula kod životinja odgajanih na farmi instituta i Malinovu je bila veća a kod ovaca odgajanih u Mramoren najmanja.

Gustina korenova vlakana je bila najveća kod ovaca iz Mramorena – 4.15 $\text{bp}/\mu\text{m}^2$ a najmanja kod ovaca odgajanih u Goliama Želiazna – 3.64 $\text{bp}/\mu\text{m}^2$.

References

- BALEVSKA R. (1970): Sheepbreeding, Sofia.
DIMITROVA N, PAPFILOVA E. S. (1960): Methods and studies of sheep hair follicles, Moscow.
DOKOV V., SAVOV T. (1970): Studies on skin morphology of Tsigai, Local mountain cross-breedings, ewes in connection with quality of wool, Animal sciences, 3.
DOKOV V. (1970): Study of skin hairy groups of some sheep breeds in our

country, Animal sciences, 7.

DOKOV V. (1976): Influence of shearing on skin microstructure of sheep crossbred with Tsigai, Animal science, 5.

NEDELICHEV D. (1983): Study of morphology, skin development, bones and some physical qualities of sheep wool in connection with their zootechnical process, Thesis, Sofia.

NEDELICHEV D. (1983): Study of some citometrical characteristics of hairy roots of sheep according to the woolen type, Animal science, 2.

NEDELICHEV D., BLAGOVA S., ALEKSIEV S. (1994): Test of schemes for creation of carpet type wool. Morphological structure and quality of furs, Animal science, 5-6.

SLAVOV R., (1990): Study of the imported in our country breed mountain Coridel and some results from its crossbreeding with Tsigai sheep, Thesis, Stara Zagora.