STUDY ON QUANTITATIVE INDICATORS OF RAWHIDE IN SELECTED BEEF COWS AND COMBINED CATTLE BREEDS

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Abstract

The structural changes made in the cattle breed composition during the last 30 years in Bulgaria, along with studies on milk and meat productivity, have required the study of hides as a strategic raw material for the light industry. The relative weight, percentage of hide from the live weight, size, surface area, and thickness in certain sections of cull cows excluded from breeding for various reasons, from the following breeds were studied: Limousin, Galloway, Normande cattle, Bulgarian Red Cattle. Significant breed differences were observed in the examined hide parameters. The best represented in the space, as a spread of the configuration, was the raw hides obtained from Normande cattle (498.29 dm^2), followed by Bulgarian Red Cattle (461.23 dm^2). The worst indicators were found in Galloway (388.75 dm^2) (p <005)

Key words: cows, combined breeds, hide, thickness, surface area, weight.

INTRODUCTION

People have used animal hides for various purposes since the Paleolithic period. The production of leather goods is a century-old industry. Once the skin is torn from the animal's body, it is highly susceptible to microbial agents because it is rich in proteins and lipids (Nadal-Molero et al., 2023)

Cattle hide skinned from the animal is the main raw material for the leather, fur, and footwear industries, as well as for the production of souvenirs.

Cattle hide is the most common material of animal origin. It accounts for about 65% of the world leather market, as a waste product of the meat processing industry. Hides are limited in size, their quality is highly variable, the supply chain is low margin, with a highly fragmented value chain, and the production time is very long (Tubb, 2022).

The changes made in the cattle breed composition in Bulgaria in recent years suggest studying not only milk and meat productivity but also conducting studies on hides as raw material.

Skin performs basic vital functions in the body, such as protective, regulatory, and excretory. According to its condition and the shine of its hair coat, it is possible to predict the health status of cattle. The skin makes up about 7-9% of the live weight of the animal (Kibkalo & Zhersbilov, 2009; Badakhov, 2011).

Combined cattle breeds, which have a relatively large live weight and heavy and thick skin, usually reach about 35 kg skin weight and more, with thickness in the controlled areas from 4 to 4.5 mm (Badakhov, 2011; Kibkalo et al., 2014; Kozyr, 2018).

To characterize the hide qualities in various live cattle in practice, and in particular in adult cows, after the third calving and older, before slaughter are examined: the thickness of the skin fold of the front left hocks and the thickness of the skin in the middle on the last rib. The data obtained from seasonal measurements show that in Simmental breed the type, constitution, and season of production are essential for the quality of the hide (Panin, 2015; Nezavitin, 2015).

According to Adzinova & Mambetov (2018), the weight, surface area, sameness, and defects of cattle hide depend on sex, age, breed, and live weight, as well as on feeding conditions and technological parameters of rearing.

The objective of the present study was to examine, compare, and analyze the quantitative indicators of raw hides, such as weight,

percentage of live weight, size, surface area in dm² and thickness in certain body parts in cull cows from Limousin, Galloway, Normande Cattle and Bulgarian Red Cattle breeds, which had completed their growth and were excluded from breeding for various reasons.

MATERIALS AND METHODS

The experiment was conducted with animals from the farm of Ivan Ivanov - an agricultural producer from the town of Aksakovo; animals from Kastelo Farm in the village of Slivovo Pole; and animals from the farm of the Experimental Base of RIMSA-Troyan in the late autumn of 2022 and the winter of 2023. The objective of the study was cows excluded from breeding for various reasons at the age of 5-10 years, which had completed their growth. The raw hides were studied of slaughtered cows from the following breeds: Limousin, Galloway, Normande cattle, and Bulgarian Red Cattle, at different ages and live weights, owned by the farms of agricultural producers, farmers, and the Research Institute of Mountain Stockbreeding and Agriculture. Five hides were studied from each breed. The cows were raised in identical conditions, in a free-stall housing system, and fed traditionally, a circumstance that contributed to the manifestation of their productive qualities. The slaughter and skinning took place in the Meat Factory of Svishtov, Meat Factory of Aksakovo, and Meat Factory of Slivovo Pole.

The weight and surface area of raw hides were determined after slaughter and cleaning using an electronic scale to the nearest of 0.01 kg. The sizes were measured by a retractable tape measure. The surface area of the hide was determined by the method of sum of squares in dm² by a measuring tape, and the thickness with a caliper at two specific points: at standard point 'O' in the hide of the withers and at standard point 'H' in the area of the sacrum according to the Arzumanyan method (1962).

The data were processed by the methods of variation statistics using the program Statistica-2010 and presented in tables and figures.

RESULTS AND DISCUSSIONS

The weight, percentage of live weight, size, surface area, and thickness of raw hides in specific sections of cull cows, which had completed their growth, are shown in Table 1.

Table 1. Technological indicators of raw hides of meat and combined (dairy-meat) cows, which had completed their growth, excluded from breeding for various reasons (X ± Sx)

Cattle Breed	n	Technological indicators of rawhide						
		Hide weight		Length, cm	Width, cm	Surface Area, dm²	Thickness at point 'O', mm	Thickness at point 'H', mm
		kg	% of live weight					
Limousin	5	41.37*±1.03	6.8	261.72±1.36	199.53±1.37	522.21±8.34	6.18**±0.26	6.68**±0.30
Galloway	5	39.46±1.24	7.0	234.01±4.23	189.56±2.47	443.57± 8.76	5.88±0.31	6.028*±0.25
Normande Cattle	5	47.23*±1.08	7.3	274.17±3.16	205.74*±1.09	564.70±9.54	7.12**±0.31	8.09**±0.21
Bulgarian Red Cattle	5	44.11*±1.11	7.2	249.97±1.19	198.79±1.32	496.91±10.81	6.47**±0.45	6.83**±0.35

*P<0.05, **P<0.01

The hides of two prospective beef cattle breeds, such as Limousin and Galloway, introduced in Bulgaria, and two combined breeds, such as Normande cattle and Bulgarian Red Cattle, were compared. The hides of different cattle breeds are distinguished by their structure and technological qualities. The weight of rawhide depends primarily on its size, thickness, sameness, and density (Kibkalo & Zhersbilov, 2009; Adzimova & Mambetov, 2018).

The size, thickness, and density of the hide have an impact on the realization of its potential. The steady increase in the weight of rawhide is not of the same character in different cattle breeds. The differences in the relative weight of the hide among the combined Normande cattle breed and meat breeds, such as Limousin and Galloway are clearly outlined, as it is 5.86 kg for the first breed and 7.77 kg for the second one, or 6.8% and 7.0% respectively.

There is a significant difference in the domestic combined breed Bulgarian Red Cattle with 3.12 kg or 7.2% respectively (P<0.05). In our opinion, the long-term use of Normande cattle in a combined productivity trend and the selected good meat, rounded forms, had an impact on the weight of its rawhide, which became higher, compared to previous studies.
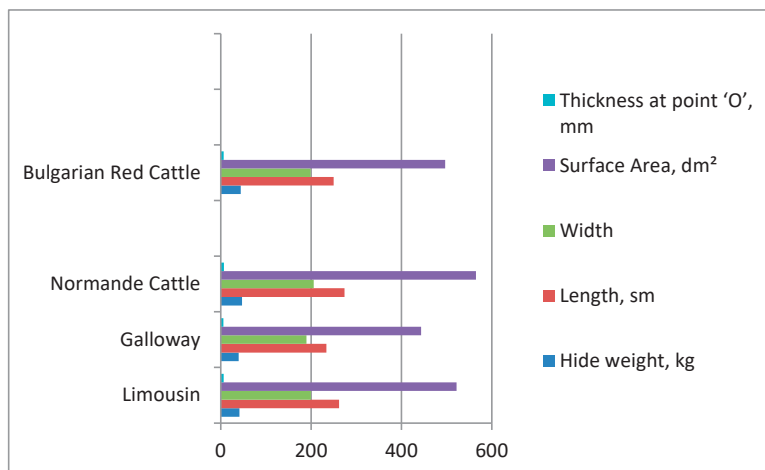

Figure 1. Graphical representation of technological indicators of raw hides from cows of meat and combined breeds, excluded from breeding for various reasons

The highest percentage of rawhide from the animal weight is registered for the Normande cattle breed with 7.3%, followed quite closely by the Bulgarian Red cattle breed with 7.2%, Galloway with 7.0% and Limousin with 6.9%. The value of hide in processing is determined by its surface area and thickness. The best represented in the space, in terms of spread, are the raw hides obtained from female animals of Normande cattle breed with 564.70 dm², followed by the Limousin breed with 522.21 dm², the hides of Bulgarian red cattle with 496.91 dm² and hides from Galloway breed with 443.57 dm², or differences of 42.49 dm², 67.79 dm² and 121.13 dm² (P<0.05). The differences among breeds on this indicator are not significant (P<0.05).

Table 2. The surface area of raw hides of different breeds in dm²

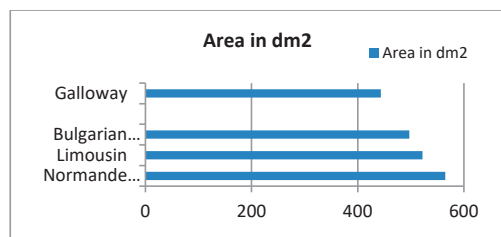| Cattle	Number (n = 5)	Area in dm²	Area in dm² per 1 kg live weight
Normande cattle	5	564.70±3.44	0.903
Limousin	5	522.21±5.31	0.830
Bulgarian Red Cattle	5	496.91±12.81	0.831
Galloway	5	443.57±7.43	0.765

P<0.05

Figure 2. The surface area of raw hides of different breeds in dm²

The largest surface area of 564.70 dm² and 0.903 square decimeters per 1 kg of live weight was obtained from the representatives of Normande cattle breed, followed by Bulgarian Red cattle breed with 496.91 dm² and 0.831 square decimeters per 1 kg live weight, and Limousin with 522.21 dm² and 0.830 square decimeters per 1 kg live weight. The lowest results were obtained by the representatives of Galloway with 443.57 dm² and 0.765 square

decimeters per 1 kg of live weight. The differences are explained by the rougher constitution and morphological structure of the Galloway breed.

The rawhide of adult animals is rougher and with uneven thickness in different sections. The thickest raw hides in the examined sections (point 'O' and point 'H') were measured in Normande cattle breed with 7.12 cm and 8.09 cm, followed by Bulgarian Red Cattle with 6.47 cm and 6.83 cm respectively, followed by Limousin breed with 6.18 cm and 6.68 cm respectively, whereas the thinnest hides were measured in the representatives of Galloway with 5.88 cm and 6.028 cm. The obtained results are significant at ($P<0.01$).

The data in the present study are close and correspond to the results of Sinivirski & Petkov, 1985; Kibkalo et al., 2014; Panin, 2015; Kozyr, 2018.

CONCLUSIONS

Cattle of different breeds and productivity trends, reared and fed under identical conditions, at approximately the same age and of the same sex, give raw hides different in relative weight and quality. The weight of the rawhide depends on the size, thickness, sameness, and density, and the quality depends on the spread, nutrition, and method of skinning.

Cattle breeds acclimatized in Bulgaria, both meat and dual-purpose, exhibit good qualitative and quantitative parameters of the resulting raw hides.

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REFERENCES

Adzinova, Z. & Mambetov, M. (2018). *Evaluation of the qualities of raw hides of bulls and castrates of different breeds of cattle in the extended production cycle.* Cherkasy State Agricultural Academy, Department of Veterinary Medicine, Krasnodar, p.1-4.

Arzumanyan, E. (1962). Methods of lifelong determination of the thickness, area, and forecasts for the weight of the skin of cattle. *Reports TSHA*, 78, 12.

Badakhov, K. (2011). *Impact of different technologies in rearing cull cows on meat productivity and quality of rawhide*. Dissertation, p. 87-90. https://doi.org /10.1016/j.syarm.2023.126421

Kibkalo, L., & Zherbilov, N. (2009). The quality of cattle skins. *Magazine of the Kursk State Agrarian Academy*, 4, 63-69.

Kibkalo, L., Groshevskaya, T.N. Goncharo, N., Sidorov, N., & Tkacheva, N. (2014). Characteristics of skins from test bulls. *Journal of the Kursk State Agricultural Academy*, 7, 51-52.

Kozyr, V. (2018). The Quality of calf Leather of beef Dual Purpose breeds in the Steppe zone of Ukraine. *Animal Breeding and Genetics*, 51, 73-78.

Nadal-Molero, F., Campos-Lopes, A., Tur-Moja, J., & Belen-Martin-Cuadrodo, A. (2023). Microbial community on industrial silty hides: From the slaughterhouse and salting systematic. *Applied Microbiology, 46*(4), 126-421.

Nezavitin, A. (2015). *Production of ecologically safe beef and raw hides in Siberia*. Monograph, p.297-301. Novosibirsk, RU: Novosibirsk State Agrarian University Publishing House.

Panin, S. (2015). *Improvement of cattle breeds, Peculiarities of the skin of Simmental cows of different constitutional types*. Moscow, RU: Kolos Publishing House, p. 42-56 (Ru).

Tubb, C. (2022). *New skin in the game! Consequences of adopting next-generation leather faster than expected*. https://planet-tracker.org/new-skin-in-the-game-consequences-of-adopting-next-generation-leather-faster-than-expected/