

STUDY ON QUANTITATIVE INDICATORS FOR RAW SKIN OF MALE CALVES OF BEEF BREEDS

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Abstract

The changes made in the composition and structure of beef cattle breeding in Bulgaria, impose along with research in the field of nutrition, technology and meat productivity to study the skin as a raw material for various branches of light industry. The relative weight, the percentage of the living mass of skin, the sizes, the thickness of skin in different areas were studied and skin area in fattened male Simmental, Limousine, Hereford and Aberdeen Angus calves slaughtered at 15 months of age. There are significant differences in the studied quality indicators of raw skin. The highest is the relative weight of the raw skin of calves of the Simmental breed, which showed the heaviest 38.9 kg and thick skin-6.94 mm at point "O" and 6.71mm at point "H".

Key words: area, beef breeds, calves, skin, weight.

INTRODUCTION

The changes made in cattle breed composition in Bulgaria in recent years, suggest not only to study meat productivity and growth ability but also to conduct studies on the skin as a raw material. Raw cattle skin is a major component of the footwear, leather, fur and haberdashery industries (Balabanov, 1975; Gaidar, 2010; Kibkalo et al., 2014; Gergovska and Panayotova, 2016).

The skin is associated with fundamental vital functions in the body: protective, regulatory and excretory. The condition and shine of the hairy cover give information about the general health of the cattle. The skin makes up about 7-9% of the animal's live weight (Sinivirski & Petkov, 1986; Hamid et al., 2000; Kibkalo and Gersbilov, 2009; Badahov, 2011; Panin, 2015; Belkov and Panin, 2017).

Beef breeds show a large live weight and heavy and dense skin, as a rule they reach about 35-40 kg, relative weight and thickness in the controlled areas from 5.6 to 7 mm (Badahov, 2011; Irgashev & Kosilov, 2014; Kibkalo et al., 2014; Kozyr, 2018; Lonegau et al., 2019).

Weight, surface area, smoothness and skin defects in cattle depend on the species, genetic capabilities of the breed, sex, age and live weight, as well as thickness and density, containing

different amounts of moisture, salts and aggravators, as well as feeding, technology and the environment (Maddox & Jakson, 1988; Besedov, 2007; Herring, 2014; Nezavitiin et al., 2015; Adzinova & Mambetov, 2018; Popsuy et al., 2020). The objective of the present study was to examine the quantitative indicators: weight, percentage of live weight, size, surface area in dm² and thickness of raw skin in certain body sections of Simmental, Limousine, Hereford and Aberdeen Angus beef calves slaughtered at 15 months of age.

MATERIALS AND METHODS

This is the fourth paragraph from Materials and Methods that should be replaced with your content. It only contains example text and proper formatting. The experiment was conducted with calves from the farm of the Experimental Base of RIMSA-Troyan and small farms from the region in 2019 and the winter of 2020. The objective of the study were male purebred calves, which were fattened up to 15 months of age. Raw skins were studied of slaughtered animals of breed, such as: Simmental, Limousine, Hereford and Aberdeen Angus with different live weight, 10 raw skins of male calves per breed. The animals were kept under the same conditions, free-boxing

and fed traditionally. The slaughter and skinning took place in Meat Factory - Troyan. The skins were removed in two stages: by manual skinning of individual areas and final mechanical skinning.

Instrumental methods and technical measuring instruments were used. Live weight was determined by weighing with an electronic scale to the nearest 0.01 kg. The carcass weight of the calves and the relative weight of the raw skins were determined immediately after slaughter and cleaning from aggravators using an electronic scale accurate to 0.01 kg. The dimensions were taken by the help of a standard roulette.

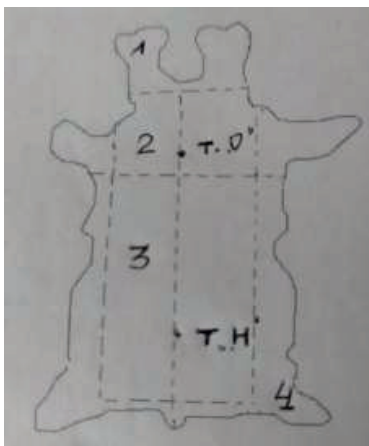


Figure 1. Topographic characteristics of fresh bull skin: 1. Head; 2. Nesk; 3. Central part; 4. Rear part; 5. t "O"; 6. t. "H"

The area of the skin was determined by the method of total squares in dm², according to a scheme, using a wooden meter divided into dm, and the thickness with a caliper at two specific points: at a standard point "O" in the area of the withers and a standard point "H" in the skin area of the sacrum according to the method of Arzumanyan with an accuracy of 0.1 mm (1962).

The data were processed by the methods of variation statistics with the help of "Statistica-2000" program and presented in tables.

RESULTS AND DISCUSSIONS

Raw skin is the skin removed from the carcass of an animal after slaughter and skinning. Used mainly as a term for operating production data. There is no globally accepted unit of measurement for the production, marketing or use of skin data. Data are usually presented differently in statistical information in terms of number or weight, while information on leather products is presented in terms of surface area or weight (FAO, 1994).

The skins of different cattle breeds differ in their structure and technological qualities. The weight of raw skin depends primarily on its size, thickness and density (Adzimova & Mambetov, 2018).

The relative weight, percentage of live weight, size, area and thickness of raw skin in certain areas of fattened calves of the studied breeds are shown in Table 1.

Table 1. Indicators of raw skins of fattened, meat-producing calves slaughtered at 15 months of age ($X \pm Sx$)

Breed ♂	n	Qualitative indicators of raw skin						
		Skin weight		Length cm	Width cm	Surface area, dm ²	Thickness at point "O", mm	Thickness at point "H", mm
		kg	% of live weight					
Simmental	10	38.90*±1.03	8.69	180.72±1.73	194.53±2.47	369.29±6.88	6.94**±0.26	6.71**±0.30
Limousin	10	36.24*±1.31	8.27	174.17±3.71	188.74±2.05	347.46±10.66	6.48**±0.23	5.91**±0.17
Hereford	10	34.48*±1.19	8.07	165.33±2.17	176.08±2.43	299.57±22.28	6.17*±0.35	5.65**±0.25
Aberdeen-Angus	10	30.44*±1.21	7.48	161.24±1.44	171.94±2.27	285.23±11.24	5.17**±0.23	4.86**±0.19

*P<0.05, P<0.001**, P<0.001***

The skin weight is determined by the structure of the collagen fibers. Raw skins obtained from cattle are subdivided into light skins weighing up to 25 kg and heavy skins weighing from 26

to 60 kg. The technological cycle with a duration of 450 days allowed us to get heavy skins with a relative weight of 30.44-38.90 kg.

The relative skin weight was measured immediately after skinning and removing dirt and manure from it. Significant differences in the relative skin weight of the studied male calves were observed. Simmental breed showed heavier raw skin by 8.46 kg compared to the Aberdeen Angus breed, by 4.42 kg compared to Hereford breed and by 2.66 kg compared to Limousine breed, or 21.7% respectively, 11.36% and 6.84% more ($P < 0.05$). It is noteworthy that at 15 months of age the raw skins of experimental animals are heavy and meet the requirements for relative weight (Sinivirski and Petkov, 1985; Kibkalo et al., 2014).

By percentage of raw skins in relation to animal weight, the ranking is led by the raw skins of Simmental calves with 8.69%, followed by those of the Limousine breed with 8.27% and those of Hereford breed with 8.07%. The lowest in value, but within the normal range are the results obtained by calves of Aberdeen Angus breed 7.48%. The skin size is an important indicator of its technological qualities. The highest values are measured in Simmental - length 180.72 cm and width 194.53 cm, and the lowest values in Aberdeen Angus - length 161.24 cm and width 171.94 cm, or differences of 19.48 cm for length and 22.59 cm for width.



Figure 2. Skin weight (kg and % of live weight)

The surface area of the skin is an indicator for determining its value. Raw skins obtained from Simmental breed had the best spatial spreading - 369.29 dm², followed by the Limousine breed - 347.46 dm², Hereford breed - 299.57 dm² and

Aberdeen Angus breed - 285.23 dm², or differences of 21.77 dm², 69.72 dm² and 84.06 dm² ($P < 0.05$). Interbreed differences in this indicator are insignificant ($P < 0.05$).

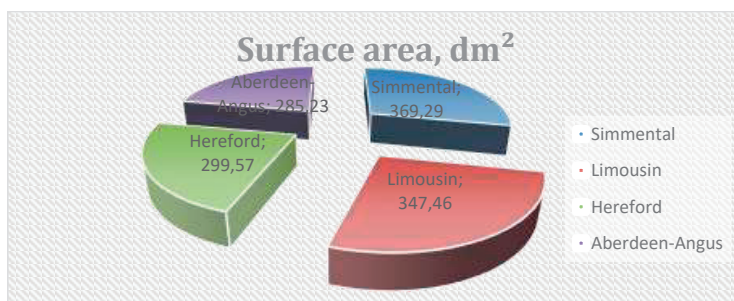


Figure 3. Surface area, dm²

The skin thickness is different and depends on the type, breed, sex, season, as well as the topographic area where the measurement was performed. The thickest skin among the examined raw skins in the specific, studied standard areas (point "O" and point "H") were registered in Simmental 6.94 mm and 6.71 mm,

followed by Limousine, respectively 6.48 mm and 5.91 mm, followed by the representatives of Hereford breed 6.17 mm and 5.65 mm. The thinnest skins were measured in Aberdeen Angus animals with 5.17 mm and 4.86 mm. The obtained results are reliable at ($P < 0.01$).

Table 2. Live and slaughter weight, ratio of 1 dm² skin/1 kg live weight, weight of 1 dm² and reduction of skin area in the transverse and longitudinal direction in % of the examined calves slaughtered at 15 months of age

Breed ♂	Indicators				
	Live weight, kg	Slaughter weight, kg	Ratio 1 dm ² skin / 1 kg live weight	Weight of 1 dm ² skin, g	Reduction of skin area in the transverse and longitudinal direction, %
Simmental	457±0.49	297.05±0.55	0.81	105.34	6.9
Limousin	438±0.90	293.46±0.98	0.79	104.30	7.0
Hereford	417±0.52	262.71±0.88	0.72	115.09	6.7
Aberdeen Angus	407±0.49	248.2±0.78	0.70	106.72	6.5

P<0.05

The highest live and slaughter weight values were registered for Simmental breed, 457 kg and 297.05 kg, respectively, while the lowest values for Aberdeen Angus breed, 407 kg and

248.2 kg, respectively (P<0.05). The analyzed skin ratios in dm² to live weight show the same racial superiority.

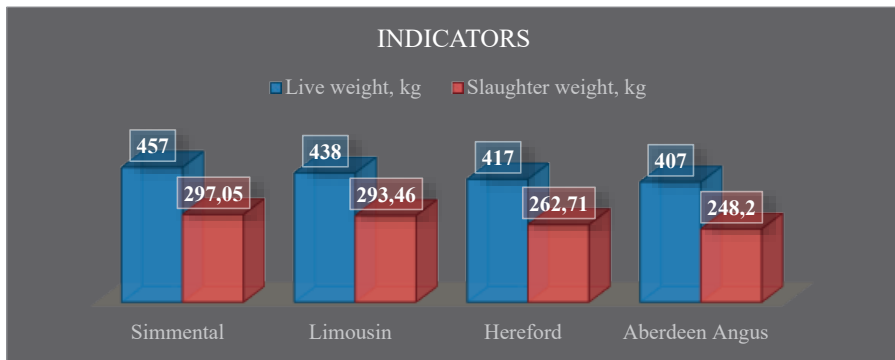


Figure 4. Indicators Live and slaughter weight calves slaughtered at 15 months of age

The highest weight per 1 dm² of skin in g was measured in Hereford breed 115.09 g, while the lowest values were registered in Limousine breed - 104.30 g. With a decrease in the skin

area in the transverse and longitudinal direction in %, the values obtained are relatively close, as the skins of Limousine breed showed the best results - 7.0%.

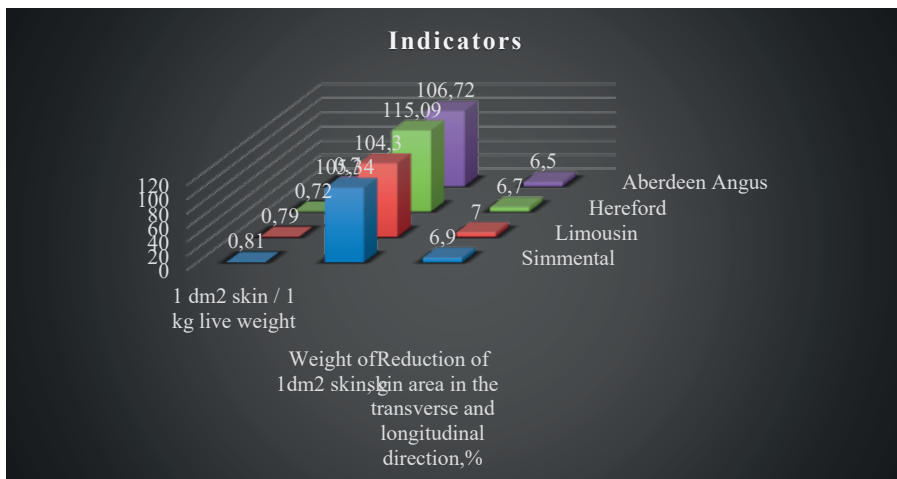


Figure 5. Indicators ratio of 1 dm² skin/1 kg live weight, weight of 1 dm² and reduction of skin area in the transverse and longitudinal direction in % of the examined calves slaughtered at 15 months of age

The data obtained in the present study correspond to the results obtained by Kibkalo et al. (2014), Panin (2015), Lonegau et al. (2019), Popsuy et al. (2020), and in some cases complement them.

CONCLUSIONS

Simmental calves showed heavier raw skin by 8.46 kg compared to Aberdeen Angus calves, with 4.42 kg compared to Hereford calves and 2.66 kg compared to Limousine calves, or 21.75%, 11.36% and 6.84% more ($P < 0.05$). The thickest skins in the defined standard areas (point "O" and point "H") were measured in male animals of Simmental 6.94 mm and 6.71 mm, followed by Limousine breed, respectively 6.48 mm and 5.91 mm, followed by the representatives of Hereford breed 6.17 mm and 5.65 mm and the thinnest skins were measured in animals of Aberdeen Angus breed with 5.17 mm and 4.86 mm. The obtained results are reliable at ($P < 0.05$). The analyzed skin ratios in dm^2 to live weight show the same racial characteristics. The best values for weight per 1 dm^2 of skin in g were measured in the representatives of Hereford breed 115.09 g, while the lowest values were registered in the representatives of Limousine breed - 104.30 g. With a decrease in the skin area in transverse and longitudinal direction in %, the values obtained are relatively close, as the best results were obtained from Limousine breed with 7.0%.

The duration of the technological cycle of 450 days showed an increase in carcass weight, weight and skin area among the studied animals. Calves of beef cattle raised and fed under the same conditions, give raw skins differing in quantitative indicators.

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