

SPECIAL FEATURES OF BULLS SKIN OF FAST- AND LONG-GROWING BEEF CATTLE BREEDS

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The leather industry of Ukraine feels a sharp shortage of skins of animals, especially cattle, which differ in massiveness, size, thickness and durability. The skins of the experimental bulls according to the accepted classification belong to the large leather raw material the "bull" category (over 25 kg) already at one-year age. From such hides, they get footwear for the bottom (from it are made soles and insoles and for top footwear, footwear and foam). With the age of animals consistently changing and qualitative indicators of skins. Compared with the 12-month-old age, the skin of the Aberdeen Angus and Charolais has increased by weight in the 18-month period by 1.5–1.7 times, and by 1.8–2.0 times in 30 months. Their area and thickness at standard points, elasticity and strength also increase significantly. Taking into account the fact that bulls habitus of Charolais is far superior to the size of the body of the Aberdeen Angus; the size of their hides is much larger. In well-fed cattle, the difference is considerably higher.

Given the peculiarities of the studied genotypes, their growth energy, and technological parameters of leather raw material the slaughter of Aberdeen-Angus breed bulls at the age of 18–20 months, and Charolais in 30 or more months would be optimal. This is consistent with the slaughter indices of these breeds in the conditions of their ecological and genetic origin (UK, France). Based on our studies it can be concluded that intensive fattening of as fast-growing Aberdeen-Angus bulls, and so long-time matured Charolais bulls in the steppe zone of Ukraine can to reduce the shortage of leather raw materials.

Keywords: BEEF CATTLE, ABERDEEN ANGUS, CHAROLAIS, SKIN, LEATHER

ОСОБЛИВОСТІ ШКІР БУГАЙЦІВ СКОРОСПІЛИХ І ДОВГОРОСЛИХ М'ЯСНИХ ПОРІД

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Шкіряна промисловість України відчуває гострий дефіцит шкур тварин, особливо великої рогатої худоби, які відрізняються масивністю, розмірами, товщиною і міцністю. Шкури піддослідних бугайців за прийнятою класифікацією належать до великої шкіряної сировини категорії «бугай» (понад 25 кг) вже у річному віці. З таких шкур отримують взуттєву шкіру для низу (з неї виготовляють підошви і устілки) і для верху взуття (юфт і опойок). З віком тварин послідовно змінюються і якісні показники шкур. Порівняно з 12-місячним віком, шкури абердино-ангусів і шароле вже у 18 місяців збільшуються за масою, відповідно, в 1,5–1,7 разу, а в 30 місяців — в 1,8–2 рази. Їх площа і товщина у стандартних точках, пружність і міцність також помітно зростає. Враховуючи те, що габітус бугайців шароле набагато перевершує розміри тіла абердин-ангусів, величина їх шкур також значно більша. У відгоддованих тварин усі показники набагато вищі.

З огляду на породні особливості досліджуваних генотипів, їх енергію росту і технологічні показники шкіряної сировини, отриманої від них, бугайців абердин-ангуської породи доцільно забивати у віці 18–20 місяців, а шароле — у 30 і більше місяців. Це узгоджується з забійними показниками даних порід в умовах їх еколого-генетичного походження (Великобританія, Франція).

На підставі проведених досліджень можна зробити висновок, що за інтенсивної відгодівлі бугайців скоростиглої абердин-ангуської і довгорослої шаролеської порід в умовах степової зони України можливе значне скорочення дефіциту важкої шкіряної сировини у країні.

Ключові слова: М'ЯСНІ ПОРОДИ ВРХ, АБЕРДИН-АНГУС, ШАРОЛЕ, ШКІРА, ШКІРЯНА СИРОВИНА

ОСОБЕННОСТИ ШКУР БЫЧКОВ СКОРОСПЕЛЫХ И ДОЛГОРОСЛЫХ МЯСНЫХ ПОРОД

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Кожевенная промышленность Украины ощущает острый дефицит шкур животных, особенно крупного рогатого скота, которые отличаются массивностью, размерами, толщиной и прочностью. Шкуры подопытных бычков по принятой классификации относятся к крупному кожевенному сырью категории «бугай» (более 25 кг) уже в годичном возрасте. Из таких шкур получают обувную кожу для низа (из нее изготавливают подошвы и стельки) и для верха обуви (юфт и опоек). С возрастом животных последовательно изменяются и качественные показатели шкур. По сравнению с 12-месячным возрастом шкуры абердино-ангусов и шароле уже в 18 месяцев увеличиваются по массе, соответственно, в 1,5–1,7 раза, а в 30 месяцев — в 1,8–2 раза. Их площадь и толщина в стандартных точках, упругость и прочность также заметно растут. В связи с тем, что габитус бычков шароле намного превосходит размеры тела абердин-ангусов, то и величина их шкур значительно больше. У откормленных животных все показатели намного выше.

Учитывая породные особенности исследуемых генотипов, их энергию роста и технологические показатели кожевенного сырья, полученного от них, бычков абердино-ангусской породы целесообразно забивать в возрасте 18–20 месяцев, а шароле — 30 и более месяцев. Это согласуется с убойными показателями данных пород в условиях их эколого-генетического происхождения (Великобритания, Франция).

На основании проведенных исследований можно заключить, что при интенсивном откорме бычков скороспелой абердин-ангусской и долгорослой шаролевской пород в условиях степной зоны Украины возможно значительное сокращение дефицита тяжелого кожевенного сырья в стране.

Ключевые слова: МЯСНЫЕ ПОРОДЫ КРС, АБЕРДИН-АНГУС, ШАРОЛЕ, ШКУРЫ, КОЖЕВЕННОЕ СЫРЬЕ

As a by-product, the supply of hides and skins depends primarily on the meat production amounts. By far the most important leather raw materials in terms of volume and economic value are bovine skins [1, 2]. Therefore, beef cattle provide us not only meat products, but also high quality leather raw materials. About 65 % of all leather comes from bovine material. Production of heavy rawhide is of great economic importance [3, 4]. This trend is expected to continue [2]. The need for bovine leather raw material is almost 3 times higher than its harvest. However, in total sum of production, the heavy rawhide skins are less than 5 %. Consequently, the leather industry needs to increase supplying of quality raw materials and cattle hides especially [8]. Researches in this area, raw material choosing and development of technologies are of extreme importance [2, 10]. For the skins industry, in addition to skins measurements (length, width, and area) their thickness is particularly important [6], because for severe plantar skin thickness plays a primary role. Puri-

fied severe skin belongs to a “shoes” class — its use not just for making soles, insoles and other parts of the bottom of shoes, but also for its top. When cutting heavy hides 78 % of the area is used to obtain heavy sole and 22 % — for light sole. Skins quality researches had performed previously by numerous researchers. However, comparative characteristic of skins of fast growing Aberdeen Angus and long-time growing Charolais beef cattle breeds in the steppe zone of Ukraine are not sufficiently explored [5]. Therefore, the study of qualitative characteristics of skins from precocious and long growing meat species is very important. In this regard, the aim of our study was to design the qualitative estimation of skins of beef cattle of English and French selection, which are common in Ukraine, including the steppe zone.

Materials and methods

In the state enterprise “Polyvanivka” (Magdalinovka district, Dnipropetrovsk region, Ukraine)

Table 1
Measuring parameters of bulls skin, $\bar{X} \pm S_{\bar{X}}$

Parameters	Breed											
	Aberdeen-Angus, months						Charolais, months					
	12	15	18	24	30	30	12	15	18	24	30	30
Weight, kg	26,4±0,9	30,9±0,9	40,4±1,1	43,0±1,7	480±2,2	480±2,2	29,5±1,0	38,1±0,9	43,3±0,5	47,3±0,6	55,0±0,8	55,0±0,8
Length cm	194±0,2	195±0,7	196±0,1	215±0,1	219±0,3	219±0,3	197±0,2	204±0,3	208±0,2	221±0,4	240±0,6	240±0,6
Width, sm	170±0,1	179±0,8	195±0,1	190±0,1	196±0,4	196±0,4	184±0,9	187±0,8	189±0,9	212±0,6	214±0,7	214±0,7
Area, dm ²	330±2,1	349±0,5	382±2,2	408±2,7	429±2,4	429±2,4	362±0,4	381±0,4	399±0,2	468±0,5	513±0,6	513±0,6
Thickness, mm:												
in the elbow	3,5±0,3	4,0±0,3	4,7±0,2	5,3±0,2	6,6±0,4	6,6±0,4	2,8±0,1	4,1±0,3	5,6±0,3	6,5±0,2	7,3±0,4	7,3±0,4
at the last rib	2,9±0,1	4,1±0,4	4,3±0,3	5,5±0,1	6,0±0,3	6,0±0,3	3,9±0,4	5,5±0,3	5,6±0,4	5,8±0,3	6,4±0,3	6,4±0,3
on the sacrum	5,0±0,3	5,9±0,4	6,8±0,9	8,6±0,8	8,6±0,7	8,6±0,7	5,6±0,2	7,1±0,3	8,1±0,4	8,8±0,5	9,2±0,6	9,2±0,6
Chemical composition, %:												
moisture	71,1±0,4	69,4±0,6	68,7±0,5	66,2±0,7	65,8±0,6	65,8±0,6	74,1±0,7	72,6±0,8	70,4±0,4	68,3±0,6	66,0±0,8	66,0±0,8
protein	23,2±0,1	24,4±0,3	25,8±0,2	26,1±0,3	26,9±0,3	26,9±0,3	22,8±0,3	24,2±0,3	24,5±0,1	26,1±0,1	27,0±0,1	27,0±0,1
fat	1,5±0,1	1,8±0,1	2,3±0,2	2,8±0,2	3,0±0,3	3,0±0,3	1,2±0,1	1,5±0,1	1,8±0,1	2,0±0,4	2,4±0,5	2,4±0,5
ash	0,3±0,01	0,5±0,02	0,7±0,02	0,8±0,03	0,9±0,03	0,9±0,03	0,4±0,5	0,5±0,03	0,6±0,03	0,7±0,03	0,9±0,05	0,9±0,05

Table 2
The cost of raw materials and skins quality for shoe uppers, $\bar{X} \pm S_{\bar{X}}$

Parameters	Unit of measure	Breed	
		Aberdeen-Angus	Charolais
The cost of raw materials for 100 m ² of finished skins	kg	781,4	786,9
Loading:			
on incision	9,8 MPa	23,9±2,9	28,8±3,1
if there are cracks	9,8 MPa	20,4±2,3	22,3±2,7
Elastic limit	9,8 MPa	1,69±004	1,73±009
Stretching	%	59,9	63,5
Resistance to:			
repeated bending	Scores	4	4
wet rubbing	Cycles	729,8±10,7	744±12,4

2 groups of 12-month-old Aberdeen-Angus bull calves (15 animals) (1st group) and Charolais ones (2nd group) were formed. The animals were grown by stall-range technology to 30-months of age. Feeding took part on balanced nutritional areas. When they reached 12, 15, 18, 24 and 30 months, 3 animals were slaughtered from each group. Weight, length, width, area, thickness and chemical composition of skins were studied in the age dynamics.

Results and discussion

The quality of hides depends on breed, the direction of its productivity, sex, age and technology of growing animals [7, 9]. We found that the mass of bull skins of meat breeds are more dependent on live weight and age of the animals than on the level of nutrition. However, the role of the usefulness of the diet cannot be ignored in the skin growth and quality. At the best feeding conditions the animals' skins are heavier and thicker, more evenly sized thickness. At a proper level of animal feeding, the output and quality of the plantar skin is much higher. One of the important parameters that we studied is the weight of steamy skin (table 1). As early as 12 months of age all the skins of both breeds bulls were categorized as heavy — “bull” (over 25 kg).

Because Charolais breed is not only heavier but also larger, the length and breadth of their skins exceed the Aberdeen-Angus peers. The growth rate of the skins length from 12 till 30 months age in both groups was the same — 12 %, but the actual measurements of the 2nd group animals were higher at 12, 15, 18, 24 and 30 months of age by 3, 9, 12, 6 and 21 cm respectively. A similar trend kept at the skins width. At the same growth rate from 12 to 30 months age (15–16 %), actually at 12, 15, 18, 24 and 30 months Charolais bulls' skin width was higher by 14, 8, 4, 22 and 18 cm.

The skins of Charolais bulls were larger compared with Angus peers in the length, width and also in area at 12, 15, 18, 24 and 30 months of age, respectively, by 32, 32, 17, 60 and 84 cm. Extension of skin growth confirms long growing of breed.

In each studied group, skins thickness of animals naturally and consistently increased with age in all standard points: during 18 months (from

12 to 30 months), it increased in the Aberdeen-Angus bulls. At the elbow by 1.9 times and in Charolais by 2.6 times, at the last rib respectively by 2.1 and 1.6 times and at the sacrum by 7.2 and 6.4 times. The thickness of the skin is not the same in different parts of the animal: on the back it is thicker than on the abdomen and the outer sides of the legs are thicker than the inside. Skins weight, its length, width, area and thickness characterize commodity properties but do not define clearly the quality of hides. It is more determined by the density, structure of the dermis and other parameters that depend on the breed and age of the animals.

We have studied the chemical composition of skins, conducted physical and mechanical tests and technological characteristics of bulls at 12 months of age (table 2).

The chemical composition of the bull skins of both experimental groups characterized by stability. However, we mark reduced proportion of moisture in the Aberdeen-Angus bulls' skin by 5, and in Charolais by 8 %. On the amount of the protein, Charolais bulls prevailed the Aberdeen Angus. On the contrary, the fat content in the skin of Aberdeen Angus bulls was some higher. The skins from Charolais bulls withstander more load on the cut and in presence of cracks. The limit of elasticity and the ability to stretch and resistance to repeated bending and wet rubbing was also better. Feedstock costs per unit of area of finished skin were almost identical.

Conclusions

1. The development of specialized beef cattle breeding in the steppe zone of Ukraine will improve the quality of raw materials for the leather industry.

2. To produce different range leather products (footwear and haberdashery) skins of Aberdeen Angus and Charolais breeds are suitable.

Perspectives for further research. In order to improve the economic performance of cattle breeding, it is necessary to take into account not only performance parameters, but also the quality of leather raw materials.

1. Clothier A., Schmél F. Footwear industry and its influence on the world trade. Vienna, United Nations Industrial Development Organization, 2004.

2. Future trends in the world leather and leather products industry and trade. Vienna, United Nations Industrial Development Organization, 2010.

3. Katsy G. D. Mammalian skin: theory and practice. Lugansk, Rus, 2000, 144 p. (in Russian)

4. Koppany J. A geopolitical essay of the leather industry over the past 50 years. *Journal of the American Leather Chemists Association*, 2004, vol. 99, no. 12, pp. 485–493.

5. Liulchenko M. G. Features of the adaptation of the Aberdeen-Angolan and Polissyan-zone type of meat cattle to the present conditions of Polissya. *Animal husbandry of Ukraine*, 2000, no. 7–8, pp. 24–25. (in Ukrainian)

6. Oliynyk S. O. Interspecies features of the development of skin glands of Bulls. *Bulletin of agrarian sciences of the Black Sea region*, Mykolayiv state University, 2009, issue 4 (51), pp. 207–215. (in Ukrainian)

7. Pearson A. M., Dutson T. R. Inedible Meat by-Products. *Advances in Meat Research*, vol. 8, Springer Science & Business Media, 2013, 416 p.

8. Serenko O., Nizamova Z., Kalinin M., Ostrovsky Y., Polukhina L., Muzafarov A. Effect of the Morphology of Leather Surface on the Hydrophobic-Hydrophilic Properties. *Advances in Materials Physics and Chemistry*, vol.4, no.2, 2014, pp. 13–19.

9. Vdovichenko I. V. Influence of maintenance conditions on productivity, quality of mass and skin of pure-bred and dumbbell bulls on fattening. *Sci.-th. Bullet. URIA*, Askania Nova, Kherson, 1986, issue 1, pp. 24–27. (in Russian)

10. World statistical compendium for raw hides and skins, leather and leather footwear. FAO, 2015. Available at: <http://www.fao.org/3/a-i4651e.pdf>.