IRSTI 65.59.03

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https://doi.org/10.55956/ZEKY9877

ANALYSIS AND QUALITY ASSESSMENT OF BEEF, BEEF BREEDS OF CATTLE IN KAZAKHSTAN

Abstract. The article considers the quality of beef carcasses from cattle of Kazakh white-headed and Kalmyk breeds, bred mainly in Kazakhstan, as well as the results of the study of chemical composition of meat cuts, yield and meat index of beef cuts on the bone and boneless, allocated in accordance with the international standard UNECE. The chemical composition of cuts was determined: moisture, fat, protein. Methods of moisture determination – according to "GOST 9793-2016 Meat and meat products. Methods of moisture determination". Methods of determination of fat – according to "GOST 23042-2015 Meat and meat products. Methods of determination of fat". Mass fraction of protein was determined by the Kjeldahl method.

The analysis of the obtained results allowed us to conclude that bulls of Kazakh white-headed and Kalmyk breed have high slaughter qualities and differed insignificantly. There were no significant differences between the breeds in the content of total protein and chemical composition of cut flesh.

Keywords: beef, breed, standard, market, export, evaluation, quality, grade, classification, index.

Oraz G.T. Analysis and quality assessment of beef, beef breeds of cattle in Kazakhstan // Mechanics and Technology / Scientific journal. – 2024. – No.3(85). – P.182-187. https://doi.org/10.55956/ZEKY9877

Introduction. Standards of different countries are developed taking into account many interrelated factors: traceability of products, national tastes and traditions, price policy, etc.

Domestic and international experience shows that in order to increase the interest of commodity producers, the standards for slaughtering livestock and for the products obtained after slaughtering (beef and veal) should be interrelated.

The GOSTs for cutting beef, pork and mutton for retail trade that are in force in our country do not create conditions for the realization of meat taking into account the needs of the consumer. Thus, according to the standard for beef cutting to the first grade include hip, lumbar, back, shoulder, shoulder and breast cuts, i.e. 88% of the whole carcass, which does not meet modern requirements to the technology of carcass cutting. This confirms the need to develop new approaches to the carcass cutting scheme, taking into account the latest achievements of science and practice, as well as its unification with international requirements [1,2].

The requirements of international trade are best met by UNECE standards (international standards), which provide a single principle of carcass evaluation and grading, as well as a unified classification for the convenience of trade and are of great practical importance in the increasing volume of international trade in meat. However, international standards generally do not take into account all regional and breed specificities of slaughter animals.

In recent years, there has been an increasing trend in the consumption of meat in natural form in Kazakhstan. Effective trade in meat depends not only on the quality of meat raw materials, but also on the principles of sorting and cutting of carcasses. Correct cutting of carcasses and sorting of meat is, first of all, the possibility of its rational use and organization of differentiated pricing policy. Practically no developed country sells meat in carcasses and pays great attention to the differentiated cutting of carcasses for trade. Carcass cutting has economic and social importance, so each country has its own schemes. National carcass cutting schemes and standards have been developed, which differ significantly from each other, including the RoK.

Analyzing the schemes of commercial cutting of beef carcasses, operating in foreign countries, it is necessary to state that along with the differences due to national peculiarities, traditions of meat consumption and the range of products produced in each country, there are general principles, namely: the allocation of the best parts of the carcass in terms of nutritional value for sale to the public in kind; industrial preparation of some cuts for sale and culinary use; production of boneless meat or cuts with partial removal of bones and removal of superfluous bones and bones.

The current national schemes of cutting carcasses of slaughtered animals, using the principle of differentiation of meat by quality with appropriate prices for meat, will best contribute to meeting the needs of buyers and increasing the efficiency of its production. In this regard, the purpose of our work was to assess the quality of beef obtained from young stock of the most common in Kazakhstan breeds of cattle.

Materials and methods. The studies were conducted at the specialized industrial complex for beef production "Shamakhsutov" LLP. Young cattle (steers) of Kazakh white-headed and Kalmyk cattle breeds at the age of 18 months were slaughtered. Slaughtering was carried out according to generally accepted technological schemes. After slaughtering and primary processing paired carcasses were sent for cooling at a temperature of 0...+4℃. Morphological and chemical composition of beef was investigated according to standard methods [4,8] 24 hours after slaughtering and cooling to a temperature not higher than +4℃. The carcass cutting scheme was based on the classification of beef cuts according to the UNECE international standard "BEEF – CARCASSES AND CUTS", 2007 edition. Color indices were determined using Spectron spectrocolorimeter.

Research results and discussion. The results of determining the indicators of morphological and chemical composition of beef on the example of 9 main cuts of the front and back parts for Kazakh white-headed (KB) and Kalmyk (K) breeds are presented in Tables 1, 2 and 3.

According to the results of carcass cutting into 9 cuts of the two breeds, it was found that the greatest specific weight in the carcass structure is occupied by the hip cut (in KB – 28.59±0,90%; in K – 27.93±0,60%), then the shoulder cut (in KB – 14.07±0,16%; K – 14.40±0.26%), thoracolumbar (KB – 13.69±0.75%, K – 13.58±0.91%), spinal-lumbar (KB – 12.58±0.40%, K – 12.52±0.37%), cervical (KB – 12.03±0.20%, K – 11.10±0.65%), anterior shank (KB – 4, 60±0.20%, K –

4.05±0.29%), shank posterior (KB – 5.70±0.12%, K – 5.59±0.31%), paschino (KB – 4.54±0.40%, K – 4.48±0.46%) and subscapular (KB – 4.10±0.11%, K – 4.00±0.15%) (Table 1).

The content of boneless meat and bones varies depending on the anatomical location of the cut. The average boneless meat content in the carcass was 76.68% and 74.30% for KB and K, respectively. The average bone content in the carcass was 23.44% and 22.07% for KB and K, respectively.

Table 1

Yield of bone and boneless cuts

Name of cut	KB cuts			Bone yield % to carcass weight (M±m)	K cuts			Bone yield % to carcass weight (M±m)
	bony	boneless			bony	boneless		
	% of carcass weight (M±m)	% of cut weight on bone (M±m)	% of carcass weight (M±m)		% of carcass weight (M±m)	% of cut weight on bone (M±m)	% of carcass weight (M±m	
Hip	28,49± 0,90	84,60± 0,17	24,38± 0,63	4,41± 0,30	27,93± 0,60	84,48± 0,11	24,01± 0,61	4,18± 0,40
Shovel	14,07± 0,16	73,31± 0,60	10,43± 0,12	3,70± 0,85	14,40± 0,26	73,11± 0,51	10,08± 0,10	3,60± 0,56
Dorsal-lumbar	12,48± 0,40	65,54± 1,50	7,95± 0,90	4,22± 0,25	12,52± 0,37	65,38± 1,53	7,30± 0,88	4,13± 0,31
Thoraco lumbar	13,69± 0,75	68,01± 1,25	9,32± 0,58	4,36± 0,66	13,58± 0,91	67,95± 1,13	8,90± 0,54	4,20± 0,71
Cervical	12,03± 0,20	83,79± 0,74	10,05± 1,27	1,94± 1,02	11,10± 0,65	83,65± 0,63	10,00± 1,22	1,90± 1,00
Sublaparietal	4,50± 0,20	77,59± 0,27	3,10± 0,95	0,92± 0,05	4,00± 0,15	76,93± 0,19	3,01± 0,97	0,89± 0,10
Curl	4,54± 0,40	97,81± 0,33	4,65± 0,51	0,10 ± 0,70	4,01± 0,25	97,68± 0,28	4,48± 0,46	0,10 ± 0,63
Back shank	5,60± 0,12	61,59± 0,95	3,35± 0,19	2,12± 1,31	5,59± 0,31	60,63± 0,87	3,31± 0,18	2,10± 1,29
Front shank	4,60± 0,15	67,60± 2,15	3,44± 1,30	1,60± 0,80	4,05± 0,29	67,32± 2,03	3,21± 1,30	1,60± 0,31

The most complete meat cut of the valuable parts of the carcass is the hip cut. The meat content in it was 84.60% and 84.48%, respectively, for KB and K. The quality of cuts was assessed by the "meatiness index" – meat/weight ratio, characterizing their full-meat content (Table 2).

Table 2

Meat index

Name of cut	Meat content index of cuts KB	Meat content index of cuts K
Hip	6,33	6,30
Shovel	5,25	5,21
Dorsal-lumbar	2,34	2,31
Thoracolumbar	3,23	3,19
Cervical	5,37	5,34
Sublaparietal	2,28	2,25
Curl	3,36	3,33
Back shank	0,98	0,96
Front shank	1,31	1,30

The values of the "meatiness index" shown in Table 2 indicate that the most complete cuts with a favorable ratio of deboned meat and bones from the two breeds are hip, neck and shoulder cuts.

No significant differences were found in the protein content of the cuts (20.47-22.11%). However, the nutritional value of cuts depends on the amino acid composition of cuts and the proportion of connective-tissue proteins. Numerous studies on various breeds of cattle have established that a higher content of connective-tissue proteins is peculiar to pasina, hind and front shanks, rib part, zastomuscle of scapular cut, front and back parts of the breast [5,6].

Analysis of the average values of indicators of the total chemical composition of cuts (Table 3), showed that the moisture content in the flesh was in the range of 69.93-76.80% and is closely related to the presence of fat. The pashina containing the highest amount of fat was characterized by the lowest values of moisture content. High fat content influenced the increase in meat caloric content.

Table 3

Chemical composition of beef cuts flesh

Name of cut	Values for KB				Values for K			
	Moisture, % (M±m)	Fat % (M±m)	Protein, % (M±m)	EC, kcal (M±m)	Moisture, % (M±m)	Fat % (M±m)	Protein, % (M±m)	EC, kcal (M±m)
Hip	75,19± 0,35	2,78± 0,23	21,19± 0,75	110,09	75,01± 0,43	2,57± 0,40	21,00± 0,81	110,00
Shovel	74,85± 0,62	4,12± 0,81	20,47± 0,55	118,81	73,96± 0,54	4,10± 0,77	20,37± 0,63	117,95
Dorsal-lumbar	73,80± 0,15	3,85± 0,70	21,57± 0,30	121,29	73,56± 0,37	3,60± 0,71	21,57± 0,11	121,00
Thoracolumbar	74,15± 0,95	4,65± 0,60	21,15± 0,89	122,90	74,01± 0,70	4,20± 0,97	21,00± 0,84	122,50
Cervical	75,89± 0,80	1,43± 0,30	22,43± 0,20	102,18	75,80± 0,58	1,36± 0,51	21,90± 0,36	101,60
Sublaparietal	73,99± 0,95	3,52± 0,61	21,04± 0,34	115,29	73,96± 0,41	3,40± 0,71	20,09± 0,25	110,70
Sirloin	76,91± 0,60	1,70± 0,36	20,82± 0,45	98,48	76,51± 0,61	1,40± 0,58	20,20± 0,60	97,80
Pashina	69,93± 0,50	8,93± 0,66	20,75± 0,23	162,95	69,80± 0,55	8,57± 0,71	20,10± 0,30	140,20
Calf	74,42± 0,43	3,52± 0,37	22,00± 0,14	118,80	74,00± 0,40	3,47± 0,45	21,70± 0,30	113,60

All cuts from KB were characterized by slightly higher values of fat content, and the following cuts stood out in terms of fat content in both breeds: pasina (8.93%; 8.57%), breast and rib (4.65%; 4.20%), and shoulder (4.12%; 4.10%). In the other cuts, the fat content was below 4%, which is in agreement with other studies [9,10,12].

Meat color is one of the main quality indicators evaluated by the consumer, by which the marketability of the product is judged. The color of meat depends on the concentration of myoglobin in muscle tissue and oxidative transformations of heme pigments to form brown, gray or even green coloring. Meat color is usually associated with freshness, tenderness and good flavor.

In this study, probably due to the same type of cattle, of the same age and sex, no significant differences were found in the color of muscle tissue from the two breeds as well as in the color of different cuts.

Conclusion. The analysis of the results of studying morphological and chemical composition of carcasses gives grounds to conclude that steers of Kazakh white-headed and Kalmyk breed have high slaughtering qualities, and the meat of young stock of both breeds differs insignificantly. There are no significant differences in the general chemical composition, including protein and fat content, of the flesh of cuts.

According to the results of carcass cutting it was found that the yield of the main cuts corresponds to the literature data, the most full-fat part of carcasses is the hip cut. Application of the international scheme of cutting is possible and expedient for beef from breeds, traditional for Kazakhstan, as for their effective use in industrial processing, and for public catering and realization through the trade network. Beef from young cattle of Kazakh white-headed and Kalmyk breeds will serve as a proper factor in providing the population with high-quality products of animal origin.

References

1. UNECE Standard. Bovine Meat – Carcasses and Cuts. – United Nations, New York and Geneva, 2004.
2. Aitpaev A. Reserves for Increasing Beef Production // Dairy and Beef Cattle Farming, 2004. No. 7. P. 18-19.
3. Aitpaev A. Rezervi uvelicheniya proizvodstva govyadini [Reserves for increasing beef production] //Molochnoe i myasnoe skotovodstvo [Dairy and beef cattle breeding], 2004. No. 7. P. 25, [in Russian].
4. Garyaev, U.E. Hozyaistvenno-biologicheskie osobennosti i kachestvennie pokazateli myasa bichkov kalmickoi porodi raznih tipov teloslojeniya [Economic and biological characteristics and quality indicators of meat of Kalmyk bulls of different body types]: dis. … candidate of agricultural sciences: 06.02.10. – Elista, 2015. – P. 110, [in Russian].
5. GOST 23042-2015 Metodi opredeleniya jira. Myaso i myasnie produkti [Methods of Determining Fat. Meat and Meat Products]. – Introduced 01.01.2017. – Moscow: Standartinform, 2015. – 8 p., [in Russian].
6. GOST 25011_2017 Myaso i myasnyye produkty. Metody opredeleniya belka [Meat and Meat Products. Methods for Determining Protein]. – Introduced 01.07.2018. – Moscow: Standartinform, 2018. – 14 p., [in Russian].
7. Hvilya S.I., Pchelkina V.A. Kontrol kachestva myasa gistologicheskie metodi [Meat quality control histological methods] // Metodi ocenki sootvetstviya [Conformity assessment methods], 2013. No. 10. P. 30-34, [in Russian].
8. Kayumov F.G., Dubovskova M.P., Polovinko L.M., Kalashnikov N.A., Golembovskii V.V., Kushch E.D., Shtelmakh A.I., Polyanskii N.D., Panasenko V.D. Kalmyk Breed of Beef Cattle is an Important Reserve for the Development of Breeding Resources in Stavropol // Herald of Beef Cattle Breeding, 2014. Vol. 4 (87). P. 47-52.
9. Serrano E., Pradel P., Jailler R., Dubroeucq H. Young SalersSuckled Bull Production: Effect of Diet on Performance, Carcass and Muscle Characteristics and Meat Quality // Animal, 2007. Vol. 1 (7). P. 1068-1079.
10. Lisitsyn A.B., Ivankin A.N., Vostrikova N.L., Stanova I.A. Study on the Fractional Composition of Meat Proteins during Long-Term Cold Storage // Everything about Meat, 2014. Vol. 2.
11. Antonov, B.I., Fedotova, V.I., Suhaya, N.A. Laboratornie issledovaniya v veterinarii himiko-toksikologicheskie metodi [Laboratory research in veterinary medicine chemical-toxicological methods]. – Moscow, 1989. – 320 p., [in Russian].

12. Pordomingo A.J., García T.P., VolpiLagreca G. Effect of Feeding Treatment during the Backgrounding Phase of Beef Production from Pasture on: II. Longissimus Muscle Proximate Composition, Cholesterol and Fatty Acids // Meat Science, 2012. Vol. 90 (4). P. 47-955.

Material received on 20.09.24.

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ҚАЗАҚСТАНДАҒЫ СИЫР ЕТІНІҢ, ІРІ ҚАРА МАЛДЫҢ ЕТ ТҰҚЫМДАРЫНЫҢ САПАСЫН ТАЛДАУ ЖӘНЕ БАҒАЛАУ

Аңдатпа. Мақалада негізінен Қазақстанда өсірілетін қазақ ақбас және қалмақ тұқымдарының ірі қара малынан алынған сиыр ұшаларының сапасы, сондай-ақ ет кесектерінің химиялық құрамын зерттеу нәтижелері, БҰҰ ЕЭК халықаралық стандартына сәйкес бөлінген сүйектер мен сүйексіз сиыр етінің шығымы мен индексі қарастырылған. Кесектердің химиялық құрамы анықталды: ылғалдылығы, май, ақуыз. Ылғалды анықтау «ГОСТ 9793-2016 Ет және ет өнімдері. Ылғалды анықтау әдістері» бойынша анықталды. Майды анықтау «ГОСТ 23042-2015 Ет және ет өнімдері. Майды анықтау әдістері» сәйкес анықталды. Ақуыздың массалық үлесі Кьельдаль әдісімен анықталды.

Алынған нәтижелерді талдау қазақтың ақбас және қалмақ тұқымдарының бұқалары жоғары сойыс қасиеттеріне ие және шамалы ғана ерекшеленетіндігі туралы қорытынды жасауға мүмкіндік берді. Ақуыздың жалпы мөлшері мен кесілген еттің химиялық құрамы бойынша тұқымдар арасында айтарлықтай айырмашылықтар да жоқ.

Тірек сөздер: сиыр еті, тұқым, стандарт, нарық, экспорт, бағалау, сапа, сорт, жіктеу, индекс.

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АНАЛИЗ И ОЦЕНКА КАЧЕСТВА ГОВЯДИНЫ, МЯСНЫХ ПОРОД КРУПНОГО РОГАТОГО СКОТА В КАЗАХСТАНЕ

Аннотация. В статье рассмотрено качество говяжьих туш от крупного рогатого скота пород Казахская белоголовая и Калмыцкая, разводимых преимущественно в Казахстане, также результаты исследования химического состава отрубов мяса, выход и индекс мясности говяжьих отрубов на кости и бескостных, выделенных в соответствии с международным стандартом ЕЭК ООН. Был определен химический состав отрубов: влага, жир, белок. Методы определения влаги – по “ГОСТ 9793-2016 Мясо и мясные продукты. Методы определения влаги”. Методы определения жира – по “ГОСТ 23042-2015 Мясо и мясные продукты. Методы определения жира”. Массовая доля белка определена по методу Кьельдаля.

Анализ полученных результатов позволил сделать заключение, что бычки казахской белоголовой и калмыцкой породы обладают высокими убойными качествами и отличались незначительно. По содержанию общего белка по химическому составу мякоти отрубов значительных отличий между породами также не установлено.

Ключевые слова: говядина, порода, стандарт, рынок, экспорт, оценка, качества, сорт, классификация, индекс.