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Muscle and Marbling Development in Kazakh White-Headed Breed.

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ABSTRACT

An experiment was conducted to determine development of muscle and marbling in Kazakh white-headed breed by feeding cake and fuzz of pumpkin seeds.For experiment were formed 3 groups at 10 calves age of 10 months. The experiment lasted 8 months. Calves of control group received basic feed, I group – at the basic die t enhance by 180 g of cattle cake, II – 180 g fuzz of pumpkin seeds. The nutritional value of feed for testing calves was calculated to receive an average daily gain of live weight on the level of 1100-1200 g. The basic feed for testing calves depending on their age consisted from 2.0 to 3.5 kg hay of cereal and pulses, 9.0-15.0 kg of haylage, 3.1-4.0 kg compound feed and 0.4 kg molasses beet. For development marble beef technology was carried evaluation of exterior and dynamics the daily gain of animals. There were assessing varietal composition of carcass, the deposition, localization, and quality of adipose tissue.Analysis of the data has revealed that introduction into feed the cattle cake and fuzz of pumpkin seeds allows to increase by 29.8 kg gain and obtain the beef of A3 category by standard B.M.S. (Beef Marbling standard).Using cake and fuzz of pumpkin seeds allows enhance development muscle and formation marbling in beef of Kazakh white-headed breed.

Keywords: marble beef, beef, PUFA, cake of pumpkin seeds, fuzz of pumpkin seeds

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INTRODUCTION

It's no secret that the marbled beef worldwide recognized royal dish: sweet taste of this meat is provided by a special technology of livestock, which allows to reach the tenders' meat scraps. And in this issue, each country and even each manufacturer, its secrets: some watered periodically steers special beers, others spend massage courses for the cattle, and others without interruption "twist" to his overtures gobies Bach and Chopin, and all this that would get better in the future marble beef, which later becomes refined dish. However, the name "marbled beef" got this kind of meat because in appearance it is very similar to marble: small and thin veins plexus fatty layers resemble marble. These unpretentious veins in the beef produced in the muscle tissue of young bulls by special and difficult growing technology. It is through such blotches minor fatty layers meat Beef has unique delicate taste that is appreciated by many connoisseurs worldwide.

The food industry development has subordinated the beef production to the laws of economic benefits. In meat stock farming, the herbal fattening complements the cereals [6]. Cattle that are raised on grain will have more marbling than grass-fed beef. This is fairly intuitive since you can imagine how difficult it would be to get fat by eating grass. By grain feeding, can get premium beef "marbled meat", but such raw material contains a lot of saturated fatty acids. The grains, which mainly contains omega-6, not a natural food for herbivores, and leads to skewed omega-3 to omega-6, the molecule which is stable and harmful in large quantities, causing a variety of inflammation, leads to thickening of blood, development allergies, blood clots, narrowing of blood vessels, diabetes and cancer. The grass-fed beef contains less external and internal fat and has the perfect ratio of omega-3 to omega-6 which should be from 1:1 to 1:4. Therefore, the development beef marble technology high quality is an urgent task and has a high practical value.

MATERIALS AND METHODS

Animal care

The experimental procedure was approved by the All-Russia Research Institute of Meat Cattle Breeding (№28561).

Diet and feeding

The experiment was by 3 groups of 10 calves Kazakh white-headed breed (Zavolzhskiy type) in the age of ten months. The duration of experiment was being 8 months [5, 7]. Control animals were fed by basic feed, I group – in additional received 180 g cake of pumpkin seeds, II group – 180 g fuzz of pumpkin seeds. The studied animals were kept on a leash. The nutritional value of feed strategy designed for a daily average gain of the live mass at least 1100-1200 g. The main feed was differentiated in accordance with age-related needs. The basic feed during the experiment consisted of 2.0-3.5 kg of green grass-legume hay, 9.0-15.0 kg of haylage, 3.1-4.0 kg compound feed, 0.4 kg sugar beet molasses, and essential mineral premixes.

pH was determined 24 h post-mortem (pH24) in LT between the 9th and 10th rib using a Radiometer pHM201 pH meter with a insertion-electrode ME 6.0226.100 (Metrohm, Herisau, Switzerland). Temperature was measured at the same location using a Testo 110 digital thermometer. Calibration of the pH meter was performed at the same temperature as the internal temperature of LT at 24 h postmortem [3].

Chemical analyses to determine the content of protein, fat, water and minerals (ashes) of processed meat products are carried out to establish the nutritive and economic value of the products. Samples of the meat product are finely ground and weighed accurately for each respective chemical analysis.

The determination of the moisture content (or water content) is done by drying an appropriate amount of the sample. The difference in weight between the fresh and dried samples represents the water content. For rapid determination of moisture content, a microwave oven is useful.

The protein content is determined at laboratory level by using the Kjeldahl method, where meat products are digested by acid to obtain the nitrogen compounds and then distilled and titrated to determine nitrogen quantitatively, with which the protein component can be calculated. In a simplified approach protein

is not chemically determined, but can be calculated (approximately) as the remaining component, after water, fat and ashes content has been determined and subtracted from 100%.

The defatted samples are then used for ash analysis by subjecting it to a temperature of +600 °C in a muffle furnace for two hours. The weight of the ash is used to calculate the minerals content in % (weight of ash, divided by total sample weight, multiplied by 100).

Texture measurements. Frozen samples were thawed overnight and equilibrated to room temperature (25 °C) prior to texture analysis.

Warner-Bratzler shear force was measured on raw and cooked meat after 10 days of ageing post-mortem. Slices were cooked in a water bath at 80 °C until a 75 °C internal temperature was reached, cooled for 45 min in running tap water and stored at 4 °C until analysis. For each animal, shear force measurements of raw and cooked samples were performed on 10 blocks (2 cm in length and 1 cm by 1 cm of cross section), and cut perpendicular to the fibre direction. The maximum force required to shear through the sample using a triangular-shaped Warner-Bratzler shear blade was determined. The blade was mounted on a 1011 Instron machine, running at a crosshead speed of 100 mm/min.

The compression test was carried out on raw meat aged 10 days as described by Campo et al.[1]. Samples, 1 cm^2 in cross section, were cut with muscle fibres parallel to the longitudinal axis of the sample and were analysed using a modified compression device that avoids transversal elongation of the sample. Stress at 80% of maximum compression was assessed using an Instron 4301 machine with a probe speed of 150 mm/min. Compression of raw meat at high strain values can be used to measure the strength of the connective tissue in raw meat [4].

Fat was extracted by the method of Folch, Lees, and Stanley [2] separated into neutral lipid and phospholipid, methylated, separated by GLC and the individual peaks identified and quantified as described in detail by Scollan et al. [8]. Total lipid content, was taken as the sum of the neutral lipid and phospholipid fractions.

The marble scores were carried out by New Beef Marbling Standard from 2008 – JMGA.

Statistical analysis

All data were analyzed by the method of least squares means using the mixed procedure in SAS Software (SAS Institute Inc., Cary, NC, USA). Significant differences between least squares means were evaluated using the option Pdiff, with no corrections due to multiple comparisons. From Proc GLM (SAS), the Manova statement with the Printe option was used to calculate Partial Correlation Coefficients (ρ) from the error SSCP Matrix (error sum of squares and cross-products matrix). Data were considered significantly different if Pb0.05.

RESULTS AND DISCUSSION

Introduction into feed pumpkin oil cake and fuzz had the positive influence on formation physiological parameters of animals. The height at the withers of animals I-st and II-nd groups prevailed above control by 0.7 cm (for the I-th group) and 1.1 cm (II), by the height of highest point sacrum, the advantage was for the I-th group 1.1 cm and 1.5 cm for the II-nd group. The difference in breast width was 1.3 (between I and control) and 1.5 cm (between II and control), depth of chest 2.2 (between I and control) and 2.5 cm (between the II and control), the width of butt to outer corners of Ilium by 1.8 (between I and control) and 2 cm (between the II and control), the width in the hip joints by 0.4 (between I and control) and 0.7 cm (between the II and control), the semi-circumference of the backside by 2.5 (between I and control) and 3.2 cm (between the II and control). Established, index blockiness and massiveness were more from bulls I-st and II-nd experimental groups above control by 3.50 to 3.67 (index blockiness) and by 4.41 and 4.25 (index massiveness).

The live weight of calves at the start the experiment ranged within narrow limits from 284.47 to 283.5 kg. In the age of 14 months, the animals from groups I and II by live weight was superior to control on 10.1 and 15 kg, at the age of 16 months by 15.7 and 22.8 kg, at the age of 18 months by 19.6 and 29.5 kg.

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Calves from experimental groups had a higher growth rate, average daily gain from 10 to 18 months of age in animals of groups I and II were higher compared to the control by 85.5 and 124.3 g. Higher intensity gain of live weight calves from experimental groups confirmed by indicators of absolute and relative gains.

Live weight of young animals selected for slaughter is significantly varied depending on the composition of their feed during feeding. By this indicator animals, from I-st and II-nd experimental groups, prevailed over control by 21.1 kg and 31.4 kg.

By mass carcass meat of animals from I-st and II-nd experimental groups exceeded control by 21.9 kg and 30.2 kg, that affected to yield of carcasses, this was 1.78 and 2.19%. The carcass meat of animals in groups I and II according to the results of control slaughter exceeded the control by 21.9 and 30.2 kg, the yield was higher by 1.8 and 2.2%. By cause of higher fat content into feed of calves, into their body more internal fat relative to control by 3.5 and 7.1 kg. Animals who consumed a feed with cake and fuzz of pumpkin seeds, had higher carcass yield in relation to control by 4.1 and 5.1%, carcass weight by 25.4 and 37.3 kg, a large mass of flesh by 23.3 and 33.1 kg, its yield by 1.7 and 2.5%. The research revealed higher fat content in muscles from experimental animals relative to control by 3.3% and 4.3%.

Study of chemical composition revealed prevalence of animals from experimental groups over individuals from control (figure 1).

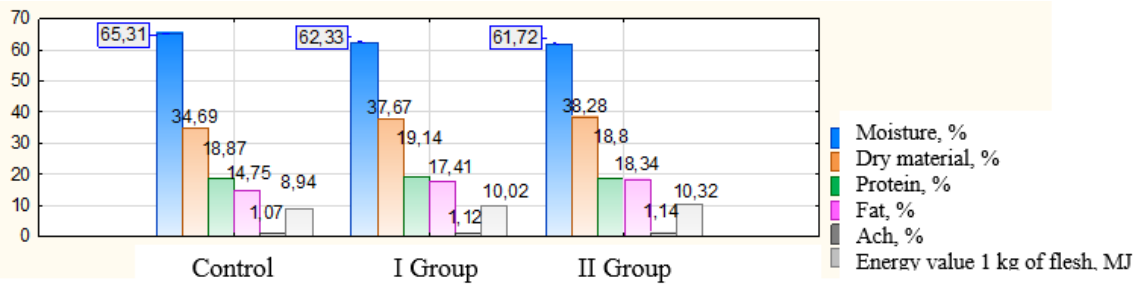

Figure 1: Chemical composition of average sample the raw meat

Determination the degree "marbling" of meat was carried out by B. M. S. (Beef Marbling standard) (figure 2).

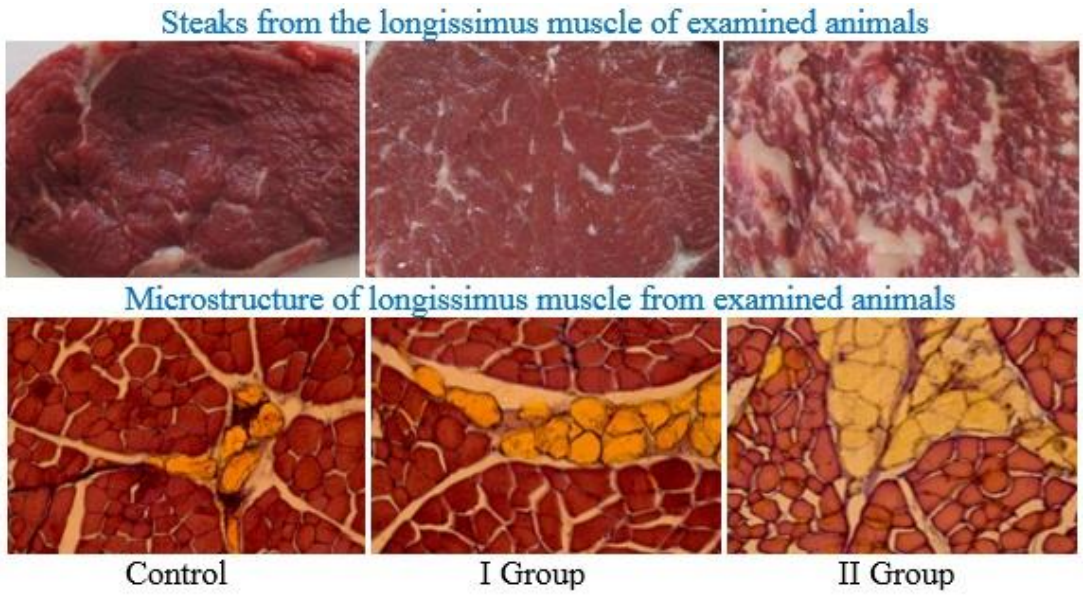

Figure 2: Steaks from longissimus muscle and microstructure

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Marble beef from animals of I group has grade 3, animals of II group has grade 5 (the highest) by Beef Marbling Standard. High-fat content in the longissimus muscle from calves I-st and II-nd experimental groups is reflected in the energy value, the advantage made up 1.31 MJ and 1.54 MJ (table 1).

Table 1: Area of deposition adipose tissue in the studied animals

Indicator	Group					
	Control		I		II	
	Kg	%	Kg	%	Kg	%
Intermuscular adipose tissue	8.08	25.9	9.63	26.3	11.53	26.8
Internal fat	15.72	50.4	19.21	52.5	22.85	53.1
Subcutaneous adipose tissue	7.39	23.7	7.76	21.2	8.65	20.1
Total	31.19	100.0	36.6	100.0	43.03	100.0

CONCLUSIONS

Introduction the oil cake and fuzz pumpkin seeds in feed, promote the growth of live weight of calves at 18 age of months by 21.1 kg and 31.4 kg compared with control.

The experimental animals had characterized by the best indicators of the slaughter qualities, flesh of meat content increased by 23.3 and 33.1 kg, and fat content by 3.3% and 4.3%.

The grade of marble beef by Beef Marbling Standard for I group was 3 and for animals of II group was 5 (the highest).

The calculations revealed that introduction into the feed for calves the oil cake and fuzz of pumpkin seed economically feasible. The absolute gain of animals from experimental groups exceeded the control by 20.5 and 29.8 kg.

CONFLICT OF INTEREST

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

REFERENCES

[1] Campo, M. M., Santolaria, P., Sañudo, C., Lepetit, J., Olleta, J. L., Panea, B., et al. (2000). Assessment of breed type and ageing time effects on beef meat quality using two different texture devices. Meat Science 55: 371-378.

[2] Folch, J., Lees, M., & Stanley, G. H. S. (1957). A simple method for the isolation and purification of lipids from animal tissues. The Journal of Biological Chemistry 226: 497-509.

[3] Karlsson, A.H., & Rosenvold, K. (2002). The calibration temperature of pH-glass electrodes: Significance for meat quality classification. Meat Science 62: 497-501.

[4] Lepetit, J., &Culioli, J. (1994). Mechanical properties of meat. Meat Science 36: 203-237.

[5] Omarov Ruslan, Gorlov Ivan, Zakotin Vladislav, Shlykov Sergei. Development of marble beef technology. In: 16th International Scientific Conference ENGINEERING FOR RURAL DEVELOPMENT, 25-27 May, 2017, Jelgava, Latvia: 956-959.

[6] Omarov Ruslan, Agarkov Alexander, Rastovarov Evgeny, Shlykov Sergei. Modern methods for food. In: 16th International Scientific Conference ENGINEERING FOR RURAL DEVELOPMENT, 25-27 May, 2017, Jelgava, Latvia: 960-963.

[7] Sadovoy, V., Omarov, R., Shlykov, S., Shchedrina, T. (2016). Assessment compliance of qualitative food characteristics to standard requirements. 15th International Scientific Conference on Engineering for Rural Development, May 25-27 2016, Jelgava, Latvia, pp. 360-363.

ISSN: 0975-8585

[8] Scollan, N. D., Choi, N. J., Kurt, E., Fisher, A. V., Enser, M., & Wood, J. D. (2001). Manipulating the fatty acid composition of muscle and adipose tissue in beef cattle. The British Journal of Nutrition 85: 115-124.