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Original Article

Veterinary sanitary assessment of mutton after application of antihelminth feed additive with albendazole

Avaliação sanitária veterinária de carneiro após aplicação de aditivo anti-helmíntico com albendazol

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Abstract

This study assessed the anthelminthic feed additive albendazole effect on the main indicators of the quality of sheep meat obtained from infected and deworming animals. A total of 20 heads of Akzhaik meat and wool sheep (i.e. 2 years of age, of different sex) were used in a 20-day experiment and 2 groups of 10 heads were formed (n = 4). The sheep were fed with the basic diet (i.e. control, group CON), without adding anything, and the second group was fed the basic diet orally with the addition of a dose of 1.2 g / head (an experimental group). At the end of the experiment, a control slaughter was carried out from each group in order to study the biochemical composition of meat and its quality. The anthelmintic feed additive albendazole did not have a significant effect on the indicators (organoleptic and physicochemical) of meat quality (P> 0.04). However, the ratio of fat and ash in the meat of the control group has differences in indicators and is reduced by 24.81% and 0.03%, respectively. The drug had a significant effect on the biological value of meat in the experimental group, where there is a higher content of essential amino acids (P = 0.06), nonessential (P = 0.05) concentrations in comparison with the CON groups. The results obtained show that the meat of the experimental groups of sheep, when using the anthelminthic feed additive albendazole, did not have a significant effect on organoleptic parameters, but significantly positively influenced the metabolism, live weight gain and biological value of meat.

Keywords: veterinary and sanitary examination of mutton, anthelminthic feed additive albendazole, quality of meat, sheep, mixed infestations.

Resumo

Este estudo avaliou o efeito do aditivo anti-helmíntico albendazol sobre os principais indicadores de qualidade da carne ovina obtida de animais infectados e desparasitados. Um total de 20 cabeças de carne Akzhaik e ovelhas de lã (ou seja, 2 anos de idade, de sexo diferente) foi usado em um experimento de 20 dias e dois grupos de 10 cabeças foram formados (n = 4). As ovelhas foram alimentadas com dieta básica (ou seja, controle, grupo CON), sem adicionar nada, e o segundo grupo foi alimentado com dieta básica por via oral com a adição de uma dose de 1,2 g / cabeça (um grupo experimental). Ao final do experimento, foi realizado um abate controle de cada grupo para estudar a composição bioquímica da carne e sua qualidade. O aditivo anti-helmíntico albendazol não teve efeito significativo sobre os indicadores (organolépticos e físico-químicos) de qualidade da carne (P > 0,04). No entanto, a proporção de gordura e cinzas na carne do grupo de controle tem diferenças nos indicadores e é reduzida em 24,81% e 0,03%, respectivamente. A droga teve efeito significativo sobre o valor biológico da carne no grupo experimental, onde há maior teor de aminoácidos essenciais (P = 0,06), concentrações não essenciais (P = 0,05) em comparação com os grupos CON. Os resultados obtidos mostram que a carne dos grupos experimentais de ovinos, ao utilizar o aditivo anti-helmíntico albendazol, não teve efeito significativo nos parâmetros organolépticos, mas influenciou positivamente de forma significativa no metabolismo, ganho de peso vivo e valor biológico da carne.

Palavras-chave: exame veterinário e sanitário de carneiro, aditivo anti-helmíntico albendazol, qualidade da carne, ovinos, infestações mistas.

1. Introduction

In modern conditions, the quality and environmental friendliness of food are of great importance. The production of young lamb is one of the reserves that can stabilize the development of sheep breeding and bring it out of the crisis, regardless of the direction of productivity. Sheep meat or mutton is a valuable food product recognized by

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all world regions. The nutritional value of meat is known by the content of biologically complete and easily assimilated proteins by the human body (Smagulov et al., 2016). Meat is a good source of B vitamins, certain minerals (phosphorus, potassium, sodium, selenium, zinc and magnesium) and essential fatty acids. According to the Food and Agricultural Organization (FAO), mutton accounts for 2.6% of the total volume of meat production in the country (FAO, 2017), but in some regions, it plays a dominant role (The Dairy News, 2018).

Meat production in carcass weight in 2019 increased by 5.8% and amounted to 1.1 million tons in the territory of the Republic of Kazakhstan (RK). The increase in meat production is due to an increase in the livestock of farm animals. According to the RK Ministry of Agriculture (Karimova, 2020), over the past 5 years, the number of cattle increased by 23.3% and amounted to 7.4 million heads, for small ruminants, the number was 19.1 million heads, an increase of 6.6%, horses 2, 8 million heads an increase of 45.8%. Kazakhstan ranks third in meat production after Russia and Ukraine. The world leaders in mutton production are China, Pakistan, and Iran, and the main suppliers are Australia and New Zealand (Mavrot et al., 2016; Rskeldiev et al., 2017).

Infection of small ruminants with gastrointestinal nematode (GIN) parasites is a significant problem with crucial impact on meat and milk production (Arsenopoulos et al., 2017). At present, the issues of saturating the market with domestically produced meat products, improving quality, increasing competitiveness, and expanding the range are becoming increasingly important. The prerequisites for this are a steady annual growth in the livestock population, an increase in its productivity, and meat production.

In the production of mutton, parasitic diseases and mixed helminthiases (i.e. nematodiasis or moniliasis) greatly influence this. At the same time, the significant economic damage is inflicted on sheep breeding, which consists of losses from the mass mortality of young animals (up to 85%), a decrease in growth (live weight of small ruminants during the grazing period decreases on average 5-10 kg), as well as mass culling of internal organs, carcasses and sheepskin (Sapabekov, 2019). For the treatment and prevention of animals infected with helminths, today there are a large number of drugs, both domestic and foreign production (Adebayo, 2015). Albendazole, which has an anthelmintic effect, can cause a variety of diseases in the host. Albendazole was first discovered in 1972 at SmithKline Animal Health Laboratories (Kimaro et al., 2019). Preference is given mainly to drugs with a broad spectrum of action, which includes a drug based on albendazole - Alvet suspension 10%. Small micronucleuses indicate a decrease in potential cell viability (Marzanov et al., 2020). The drug is safe for warm-blooded animals, does not possess cumulative and embryotoxic effects. The authors evaluated the effect of replacing mixed grass hay with hay on blood metabolites, carcass characteristics and intramuscular composition of fatty acids in lambs (Zhang et al., 2021).

The variety of natural and economic conditions of the Republic of Kazakhstan, and countries far and near abroad requires the use of various technological schemes for obtaining high-quality meat products from sheep. The problem of stabilizing and reviving domestic sheep breeding and increasing the production of the industry is an important task in preserving the food and raw material base of Kazakhstan (Simonova et al., 2020).

As Mravčáková et al. (2020b) notes, herbal treatment can act on the host for a longer period, reducing intestinal parasitic infestation in sheep. Maintaining the pH limit in meat is very important because of its connection with the quality, color and shelf life of meat. Parvar et al. (2018) It was stated that feed additives, such as essential oils, did not have a significant effect on the final pH of meat 24 hours after slaughter. The data from her results show that the use of wormwood and mallow as food additives does not have a sufficient effect on lambs (Mravčáková et al., 2019). Taking into account the positive effect of herbal preparations, we have developed the drug 'Anthelmintic feed additive with albendazole'. The veterinary drug 'Anthelmintic feed additive with albendazole' contained wormwood herb, pumpkin seeds, tansy flowers, garlic bulbs, St. John's wort, root and rhizome of burnet. Tests on the preparation 'Anthelminthic feed additive with albendazole' were carried out on sheep infested with moniesia and gastrointestinal helminths.

There is a wide range of feed additives deliberately designed to be used in sheep diets that can improve production performance. Whereas herbal supplementation is gaining popularity not only for improving sheep productivity and mutton quality but also for safe application without any harmful residual effects (Redoy et al., 2020).

2. The study's Purpose

was to evaluate the effect of the anthelmintic feed additive albendazole on the chemical composition and nutritional value of lamb.

3. Materials and Methods

The research was carried out in a pilot production farm 'Akzhaiyk' in the Taskalinsky district of the West Kazakhstan region of the Republic of Kazakhstan. In this farm, semi-bed keeping is practiced with year-round use of pastures, winter and early spring feeding of sheep with hay. For research, 20 heads of Akzhaik meat and wool sheep were selected (2 years of age, up to a year of different sex) and formed 2 groups of 10 heads. Experiments to determine the effect of the drug 'Anthelminthic feed additive with albendazole' containing wormwood herb, pumpkin seeds, tansy flowers, and garlic bulbs. For the manufacture of an anthelmintic therapeutic drug, 0.15 g of albendazole powder, 20 g of wormwood herb, 10 g of pumpkin seeds, 2 g of tansy flowers, 2 g of St.-John's wort, 2 g of burnet rhizome, as well as 2 g of dried garlic, the anthelmintic preparation obtained in this way forms a powdery feed additive. The first control group consisted of 5 ewes and lambs did not receive any anthelminthic medicinal substance; the second experimental group included 10 animals received

the 'Anthelmintic feed additive with albendazole' drug at a dose of 1.2 g. The helminthic feed additive was given individually, orally once. The therapeutic drug effectiveness was carried out in 14 days. During the experiment, no clinical changes in animals were observed. At the age of 2 and up to a year, a controlled slaughter was carried out from each group to study the biochemical composition of meat and its quality (Aitpayeva et al., 2019).

At the end of the deworming period, experimental and control slaughter was carried out on the 20th day, and 24 hours later organoleptic, physico-chemical and biochemical studies of meat were carried out in accordance with the technical regulations of the Customs Union "On the safety of meat and meat products" (TR CU 034/2013) (CCIS, 2013).

Slaughter for veterinary and sanitary examination was carried out at the slaughter site following the 'Instructions for the processing and slaughter of animals in the meat-processing industry' (Niyazbekova, 2017).

Sampling and organoleptic studies of mutton were carried out by GOST 7269-2015 (Russiangost, 2015c). The organoleptic method provides for the determination of appearance and color; - consistency; smell; fat conditions; condition of tendons, transparency, and aroma of the broth. The study of the physicochemical parameters of sheep meat was carried out per the current standards: GOST R 51478-99 (pH of meat) (Russiangost, 1999), GOST 33319-15 (mass fraction of moisture) (Russiangost, 2015b), GOST. 25011-2017 (mass fraction of protein) (Russiangost, 2017a), GOST 23042-2015 (mass fraction of fat) (Russiangost, 2015a), GOST 31727-2012 (mass fraction of ash) (Russiangost, 2012). From the physicochemical parameters of sheep meat, the following were determined water, protein, fats, ash, qualitative reactions of meat to freshness (reaction to primary products of protein breakdown, reaction to peroxidase, amino-ammonia nitrogen, mg in 10 ml of extract, broth) (Russiangost, 2017b; Rustandard, 2011).

3.1. The control method of hydrogen ions concentration (pH)

Samples of mutton samples in an amount of 200 grams are ground by passing twice through a meat grinder and mixed. After that, a meat extract is prepared in a ratio of 1: 100 and measurements on a pH meter are carried out, which allows measurements to be made with an allowable error of ± 0.05 pH units.

3.2. The fat determination method

The method is based on multiple extraction of fat with a solvent from a dried analyzed sample in a Soxhlet extraction device, followed by removal of the solvent and drying of the separated fat to constant weight.

3.3. The total ash mass fraction method

The method is based on drying, charring, ashing at a temperature of (550 ± 25) ° C of a sample for testing and subsequent determination of the mass fraction of total ash.

To determine the nutritional value of sheep meat in the research laboratory, food quality and safety assessments (SRI BP) were carried out in accordance with GOST ISO/IEC 17025 (ISO/IEC, 2019), a quantitative analysis of non-essential and essential amino acids was carried out. The amino acid composition of mutton was determined in the Kapel-105 M capillary electrophoresis system using the Elforan program. The studies were carried out in accordance with the electrical directives of the European Community 73/23/EEC and 89/336/EC (EU, 2014). With the help of capillary electrophoresis, a qualitative comparison of lamb infected and deworming with the drug 'Anthelminthic feed additive with albendazole' was made for the content of the ratio of nonessential and essential amino acids. The obtained digital material was processed by the method of variation statistics using the MICROSOFT EXCEL 2007 program.

4. Research Results and Discussion

In the external examination of animals of the control and experimental groups, carried out by us, post-mortem changes did not have significant differences and visible morphological changes. The carcasses of the experimental groups were well bled and had a drying crust of dark cherry color. The muscle tissue is well developed, of elastic consistency (when pressed with a finger, the appearing fossa was leveled within 45 seconds). The muscles in the section had the color characteristic of the given type of meat. When the sample was boiled, the broth was transparent with a pleasant aroma.

Organoleptic indicators of the study are presented in Table 1 (as shown in Table 1).

In animals of the control group, incomplete exsanguination and tissue hydration were noted. The smell of meat was peculiar for lamb.

When examining the internal organs of the control group animals, changes were found in the places of localization of parasites (like hyperemia and edema). Analysis of the chemical composition of meat showed differences in the content of the main components in the muscle tissue of the control and experimental groups (as shown in Table 2).

As can be seen from Table 2, the water content is 3.05% more than in the control group. The ratio of protein in the meat of both groups is optimal, there are no significant differences. But the ratio of fat and ash in the meat of the control group has differences in indicators and is reduced, respectively, by 24.81% and 0.03% due to the pathogenic effect of the waste products of helminths.

After the use of the drug 'Anthelminthic feed additive with albendazole', the picture improved somewhat and approached the norm (Redoy et al., 2020), as indicated by the differences in the energy value of meat of 1442.43 kJ. The high level of fat in the meat of the animals of the experimental group can be attributed to the activation of their synthesis and slowing down the rate of decomposition under the influence of antioxidants, which was reflected in the caloric content of the meat

The data of physicochemical and biochemical studies are presented as shown in Table 3 and 4.

When carrying out physicochemical studies of meat samples, it can be seen that the indicators of the experimental group varied in the middle range. This

Table 1. Organoleptic results of fresh lamb.

Indicators	Animal group and criteria evaluation	
	Control group	Experimental group
Appearance	incomplete exsanguination and tissue hydration	slightly damp surface, well bled
Colour	drying crust dark cherry, solid light yellow fat	drying crust dark cherry, solid light yellow fat
Consistency	Elastic	Elastic
Smell	Peculiar	Peculiar

Table 2. The chemical composition of meat by the content of the main components in the muscle tissue of experimental sheep.

Indicators	According to the standard content per 100 g	Animal group and data	
		Control group	Experimental group
Water, %	67.3	66.78	69.83
Protein, %	15.6	10.18±0.04	8.54±0.13
Fat, %	37	9.70±0.3	34.51±0.5
Ash, %	0.93	0.99±0.02	1.02±0.03
Energy value, kJ	-	535.64	1442.43

Table 3. Physicochemical indicators of sheep.

Indicators	Fresh meat	Animal group and data	
		Control group	Experimental group
Reaction to primary protein breakdown products	-	–	–
Peroxidase reaction	Positive (blue-green color. quickly turning to grayish brown)	+	+
pH	5.7 – 6.2	6.0	6.06
Amino Ammonia nitrogen, mg in 10 ml of extract	Не более 1.26	1.21	1.17
Broth	Transparent	Slight cloudiness of broth	Transparent aromatic broth with large drops of fat

indicates that the meat comes from healthy animals. In the control group, some deviations were noted during the study. In a test tube with a sample of meat from the control group, there was some clouding of the broth, there was much more amino-ammonia nitrogen in them than in the experimental group.

As you know, one of the criteria for the biological value of proteins is the quantitative ratio of amino acids in their composition. Several amino acids such as glycine, alanine, threonine, lysine, leucine, and others are important precursors of meat aroma and flavor. During heat treatment, they undergo various transformations that determine the taste and aroma of meat products. Even though the body of sheep on its own, like the body of any other animals, is not able to synthesize essential amino acids, their lack in some cases is still partially compensated. So, for example, the lack of essential phenylalanine supplied with food can be partially replaced by non-essential tyrosine (Mravčáková et al., 2020a).

We found that the protein part of the muscle tissue in the studied sheep is rich in alanine (0.45-0.78%), glycine (0.61-0.75%), on which the meat freshness parameters depend (as shown in Table 4).

The data obtained in Table 4 indicate an increase in both essential amino acids (by 1.48 mg /% compared with the control) and nonessential (0.52 mg%) in the meat of experimental animals. Also, an increase in the proportion of lysine among essential amino acids by 0.53 mg /% was noted, which significantly influenced the further increase in the productivity of the studied livestock.

The biochemical composition analysis and energy value of meat, which mainly determines its nutritional value,

Table 4. Amino acid composition of sheep, mg,%.

Amino acid	Group	
	Experimental (deworming)	Control (invasive)
Cystine	Traces	Traces
Lysine	1.16±0.39	0.63±0.21
Histidine	0.58±0.29	0.48±0.24
Arginine	0.98±0.39	1.46±0.58
Glycine	0.61±0.21	0.75±0.21
Threonine	0.75±0.30	0.80±0.30
Methionine	0.44±0.15	0.48±0.15
Valine	0.89±0.36	0.67±0.36
Proline	1.42±0.37	1.19±0.37
Phenylalanine	0.67±0.20	0.88±0.26
Leucine + Isoleucine	1.42±0.37	1.10±0.28
Tryptophan	Traces	Traces
Total: essential amino acids	11.92±0.03	10.44±0.96
Serine	0.84±0.22	0.54±0.22
Alanin	0.78±0.20	0.45±0.20
Tyrosine	0.62±0.19	0.73±0.22
Total: essential amino acids	2.24±0.61	1.72±0.64
Total	14.16±0.64	13.16±0.60

indicates a decrease in the mass fraction of moisture in infected animals. The moisture content in the animals of the control group was 69.83% and in the experimental group 66.78%, or 3.05% lower. The fat content in the experimental group was 8.54%, in the control one it equaled 10.18%, or 1.6% lower than in the infected animals.

The 'Anthelminthic feed additive with albendazole' drug in comparison with other anthelmintic drugs, reduces the effect of the toxic waste products action and decay of helminths on the quality of meat by simultaneous introduction of albendazole and various medicinal plants (or feed additive). This combination made it possible to accelerate metabolic processes in the body of sheep and reduce the toxic effect of the main active substance of the drug, as well as improve the taste and quality indicators of sheep breeding products.

5. Conclusion

The meat obtained early after deworming sheep with albendazole is a product of reduced quality, which is restored only on day 60 after processing. As noted by Mravčáková (2020) and others, the use of a herbal mixture with a duration of 50 days has a positive effect, where microbial fermentation (i.e. fatty acids, ammonia and pH) was assessed at intervals of 0, 20, 32 and 50 days (Buchter et al., 2020). In our studies, the duration of deworming of ewes by experimental and control slaughter was carried out on day 20. When using the drug 'Anthelminthic feed additive with albendazole' contributed to the improvement of the quality indicators of meat raw materials, which made it possible to reduce the slaughter time to 30 days. Compared to other scientists who have conducted research in this area, for example Zhu et al. (2021), who used garlic as an additive, that only changed the bacterial composition of the rumen by increasing ($P < 0.05$) the relative content of Prevotella, Bulleidia, Howardella and Methanosphaera and decreased ($P < 0.05$) the abundance of Fretibacterium, but did not have a qualitative effect on meat at the biochemical level. Valentin Buchter et al. (2020) and his associates recommend combining albendazole (ABZ) with other drugs, since they are the two most commonly used drugs for the treatment of soil-borne helminthiasis in humans, but their effectiveness is limited due to low solubility and physicochemical properties. Our preparation contains in its composition the active ingredient albendazole in a low concentration of 0.15 g and combines herbal components, as shown by the research results, all this in aggregate did not have a significant effect ($P > 0.04$). When determining the quality of meat, an important indicator is its energy value. Calculations show that the studied indicator in the experimental group (deworming) is higher by 37.1%, respectively, 1442.43 and 535.64 kJ / 100 g.

However, the ratio of fat and ash in the meat of the control group has differences in indicators and is reduced by 24.81% and 0.03%, respectively. The drug had a significant effect on the biological value of meat in the experimental

group, where there is a higher content of essential amino acids (P = 0.06), nonessential (P = 0.05) concentrations in comparison with the CON groups. The total level of amino acids in the meat of the Akzhaik meat and wool sheep of the experimental group was 26.08 ± 0.67%, while in the control it was below 2.48% (23.6 ± 1.56). Such essential amino acids as leucine, lysine, valine, and isoleucine predominate, their total amount in the meat of the experimental group reaches 3.47% of the total amount of amino acids. Noteworthy is the rather high content of the most deficient amino acids, i.e. tyrosine and alanine (1.4 g /%). The nonessential amino acids analysis shows that alanine and serine dominate in quantity. Thus, according to all the studied parameters, the advantage was on the side of the animals of the experimental group, or those deworming with the drug 'Anthelminthic feed additive with albendazole'.

In addition, it allowed to accelerate metabolic processes in the body of sheep and reduce the toxic effect of the main active ingredient of the drug, as well as improve the taste and quality indicators of mutton.

After restorative therapy for mixed helminthiasis with the use of a feed additive in combination with albendazole, the increase in live weight of sheep was 17.39% higher than that of those deworming with one anthelmintic agent, which made it possible to obtain an additional 1.8 kg of meat from each carcass. The economic efficiency of veterinary measures per head was 1250.27 tenge.

Thus, the data obtained indicate that rehabilitation therapy contributes to the healing of the body from helminthiases, guarantees an increase in productivity and production of high sanitary quality products, and is also cost-effective. It has more calories; it contains more fat and amino acids.

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