

ALIMENTARY RESTRICTION IN THE MEAT QUALITY OF LAMBS

Ferrão, Sibelli Passini Barbosa¹; Rebello, Flávia de Floriani Pozza; Bressan, M. Cristina; Pérez, Juan R. O.; Maturano, A. M. P.; Savian, Taciana V.; Andrade, Patrícia, L.; Rossi, Rodrigo, O. S.; Rodrigues, Érica C.; Ferreira, Milena W.

¹Department of Foods Science – Universidade Federal de Lavras - UFLA. P. O. Box, 37 - Lavras/MG/Brazil. ZIP CODE. 37200-000

* To whom correspondence should be addressed - E-mail: sibpass@hotmail.com

Background

Most of the animals explored economically is destined to the production of proteic substances with high nutritious content for the man's feeding. However, for that production to be maximum and the installation of lacking pathological manifestations be avoided, it is necessary an appropriate diet that supplies the maintenance and production requirements. The planned alimentary restriction is a practice of reduction in the daily volume of ration supplied seeking the decrease in the food consumption in a certain period (quantitative restriction), or of the nutrients (qualitative restriction), so that the requirements for great weight gain established by the genetic pattern of the animal don't be supplied (ROSE et al., 2000). The meat centesimal composition can be influenced by several factors such as: species, breed, sex, nutrition and slaughter weight. The physiochemical characteristics of the meat are important parameters because they are directly related with the sensorial aspects of appearance (brightness, coloration) responsible for the acceptance of the product or not in the moment of the purchase.

Objectives

The present work had as objective to evaluate the effect of different diets and slaughter weights in male lambs of the pure Saint Inês breed without wool on the centesimal composition, the cholesterol content and the physiochemical parameters of the sheep meat.

Material and methods

Animals: it was used 48 males lambs no castrated of the Santa Inês breed. The treatments were composed by three groups each one with 16 animals: prenatal restriction - Pe (the pregnant sheep and the fetus suffered energetic restriction during the final 1/3 of the gestation (60% of the maintenance requirement), however the lamb after the birth received ad libitum food until the slaughter), postnatal restriction - Po (the pregnant sheep (final 1/3 of the gestation) and the fetus received ad libitum food until parturition, however the lamb after the birth was submitted to the alimentary restriction so that his/her postnatal weight gain didn't exceed to 150g/day) and a control group -AD (the pregnant sheep and the fetus, as well as the lamb after the birth received ad libitum food being offered 30% more than the consumption verified in the previous day). The animals were fed twice a day, in morning and in the afternoon, with coast cross hay, concentrate (corn, soybean meal, urea and mineral premix), citric pulp, sugarcane and water ad libitum. Until the first 15 days of life the lambs received a milk replace substance (milk of integral cow, integral powdered egg and water). After 15 days the lambs were raised in individual cages and they started to receive the same added milk replace substance of integral powdered milk and the concentrated mixture. This feeding type was offered to the lambs until they completed 60 days of life. After that period, the lambs were weaned and they started to receive only the concentrated mixture, in the amounts according to each treatment, and water, and then they were slaughtered at 15, 25, 35 and 45 kg.

Chemical analysis: samples of the *longissimus dorsi* (LD) muscles were analyzed for humidity, fat, protein and ashes (HORWITZ, 1990) and cholesterol (BOHAC et al., 1988 adapted by BRAGANGNOLO & RODRIGUEZ-AMAYA, 1995). In the LD muscles pH readings were made at 0, 2, 4, 6, 8, 10, 12 and 24 hours *post mortem*, and analyzed for color by the CIE L*a*b* system (brightness index, red and yellow tenor) (BRESSAN, 1998), weight loss by cooking (PPC) (ONYANGO et al., 1998) and shear force (FC) by texturemeter.

Statistical analysis: a DIC (completely randomized design) was used in a factorial 3 x 4 with three diets and four slaughter weights. For significant slaughter weights regression analysis was used, and for the diets the Tukey test was used. The pH analysis was made in split-plot in the time (hour of the measures), and the analysis of variance was done by the SAS (SAS, 1985).

Results and discussion

The analysis of variance revealed that the slaughter weight influenced all the measures of the centesimal composition (humidity, protein, lipids and ashes), having difference among the slaughter weights ($P < 0.01$) and among the diets ($P < 0.01$), besides having happened interaction ($P < 0.01$) between the slaughter weights and the diets. The animals of Pe restriction had larger humidity content (76.59, 73.85 and 73.63%) when compared to the animals of Po restriction (74.94, 72.48 and 73.64%) in the 15, 25 and 35 kg, respectively. The animals of the AD diet showed a slight fall of the humidity content from 15 to 25 kg (from 75.03 to 74.55%) followed by an accentuated fall from 25 to 35 kg (72.43%) and increased from 35 to 45 kg (73.53%). As in the Pe diet the animals were fed with low quantity of nutrients and the lambs were born with a low amount of fatty tissue. Consequently, in the muscle of these animals there was more water than in the animals submitted to the Po restriction and the AD diet of same weight. The animals submitted to all of the diets showed increase of the lipids content with the increase of the slaughter weight. Among the Pe and Po alimentary restrictions, the animals of the Po restriction showed superior lipid content than those animals of Pe restriction (averages of 4.02 and 3.73%, respectively). Among the diets, the average values of protein were (19.12, 19.58 and 18.74%, for AD, Pe and Po, respectively), occurring very different behaviors among the diets in the weights of 15 and 35 kg. In the animals of the AD diet, there was a decrease from 15 to 25 kg, followed by an increment from 25 to 35 kg. The animals submitted to the Po restriction showed inverse behavior, with increase of the protein content between 15 and 25 kg and an accentuated fall from 25 to 35 kg. In the case of the animals submitted to the Pe restriction alimentary there was a tendency to the stabilization between 15 and 35 kg. After the 35 kg, the animals submitted to the three treatments had similar behavior, showing a fall in the protein content. The found results can be explained by the growth of the bone, muscular and fatty tissues of the animal. With the increase of the slaughter weight, the bone and muscular growth reduce and fat tissue increases. For the ashes content, all the animals of the three diets showed accentuated fall from 25 kg and increase from 35 kg. Between 15 and 25 kg, the animals of Po restriction showed larger ashes content (1.06 and 0.99%), following by the Ad animals (0.95 and 0.96%) and those submitted to the Pe restriction (0.83 and 1.00%). In sheep, APPLE et al. (1993) and GARCIA et al. (1998) found the same average values. For the cholesterol content, the animals submitted to the Pe and Po alimentary restriction had similar behavior, with fall from 15 to 25 kg, increase from 25 to 35 kg and new fall from 35 to 45 kg. The cholesterol content decreased lineally with the increase of the slaughter weight. This observation can be explained by the fact that the cholesterol is the precursor of the sex hormones synthesis, vitamin D and other hormones. Therefore, it is speculated that the lightest animals show larger values.

The pH curves of the LD muscle of the slaughtered lambs in different weights showed exponential behavior with fall more accentuated in the first hours followed by stabilization. There was difference ($P < 0.05$) among the slaughter weights in the measure times. However, the

different diets didn't influence the pH descent, the beginning of the *rigor* and the final pH of the LD muscles of the evaluated lambs. In the present work, the average final pHs (24 hours p.m.) were of 5.84 (15 kg), 5.73 (25 kg) and 5.78 (35 and 45 kg), what demonstrates that there was an appropriate acidification of the meat. The pH difference in the different slaughter weights possibly was not due to the stress, because the values of final pH, in most of the animals of the present study, were below 5.80 (with exception just of the 15kg animals). Average data and final pH behavior similar to this work in sheep were described by PRADO (1999) and BONAGURIO (2001).

The data obtained by the CIE L*a*b* system for the LD and SM muscles indicate that the brightness was influenced by the diets ($P<0.01$) and for the slaughter weights ($P<0.01$), besides having had interaction among these factors ($P<0.01$). The regression analysis showed that the AD and Po restriction diets showed a similar behavior for the animals of 15, 25 and 35 kg, although the animals submitted to the AD treatment have had L* values higher (average of 47.77) than the animals of the Po treatment (average of 46.18). The lambs that received nutrients in an appropriate condition showed meat more light than those submitted to diets with shortage of nutrients (as in the case of the animals submitted to the Po restriction). The animals of the Pe restriction at 15 kg showed a average L* similar to those of the AD group. However, at 25 kg, the L* that showed values above 48 passed to values inferior to 37 showing that there was a significant darkening of that meat until 35 kg. The average a* values showed behavior similar to the 15, 35 and 45 kg for the animals submitted to the three treatments, occurring an increase in the a* value with the increase in the slaughter weight. At 25 kg, there was an increase in the a* values for the animals submitted to the Pe restriction reaching values close to 19. The animals submitted to the three treatments showed average b* tenor results similar until 25 kg. However, from 25 kg the behavior of the data was similar only among the AD and Pe restriction diets and the animals of the AD diet showed the largest tenors (3.49).

The average PPC values ranged from 20.57% to 31.14%, being larger for the animals of 25 kg (31.14%) and smaller for the animals of 15 kg (20.57). The animals of 35 and 45kg showed PPC of 30.81% and 28.98%, respectively. The regression analysis showed that the diets didn't influence the PPC values, however there was difference ($P<0.01$) in the different weight categories evaluated and there was interaction between the diet and slaughter weight factors. BONAGURIO (2001) found larger values for the lightest animals (15kg), that is an observation contrary to that found in this study. The FC increased as the slaughter weight increased, in other words, the lightest animals (15 and 25 kg) showed larger softness (smaller FC) than the heaviest (35 and 45 kg), and the animals submitted to the Pe restriction showed a larger FC, when compared to the animals of the other diets.

Conclusions

The animals submitted to the ad libitum and prenatal restriction diets showed meats considered healthier, with more protein and less fat. The animals of postnatal restriction on contrary showed meats with larger fat and cholesterol content, being its consumption considered undesirable in reason of the possibility of occurring cardiovascular diseases. The diets didn't influence the pH decline. The animals of the ad libitum diet and those submitted to the postnatal alimentary restriction showed very similar values in all parameters of L*,a*, PPC and FC, showing paler meats (lighter and less red), with larger weight loss by cooking and larger softness when compared to the obtained meat from animals submitted to the prenatal restriction.

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