

Evaluation of muscle tissue growth in Young Mediterranean Buffaloes slaughtered at different weights

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ABSTRACT: This study evaluated muscle, adipose and bone tissue growth in young Mediterranean buffaloes slaughtered with different weights. Twenty eight non-castrated males, approximately 14 months old and 330 kilos, were distributed in four experimental and one control groups. Received the same diet during a non-fixed period and when reached the pre-established weights (450 kg, 480 kg, 510 kg, 540 kg) were fasted for 16 hours and slaughtered. NRC 1996, level 2, ruminal simulation program for non-castrated animals with a daily weight gain of 1.40 kg determined percentage composition of experimental diet (dry matter): coast cross hay (20.6%), corn silage (7.8%), cotton seed (8.2%), humid corn silage (46%) and commercial mineral concentrate (17.4%), representing 13% of crude protein and 2,68% of metabolizable energy (Mcal/kg). Feed was offered *ad libitum* twice daily. Slaughter of control group occurred after 30 days of an adaptation period. The other ones were weighted each 28 days until reached pre-established weight. Carcasses were chilled for 18 hours under -5°C. Ninth, 10^o and 11^o ribs of the half left carcass were submitted to HH section and according to the statistical regression analysis (SAS, 1996), allometric coefficient value was negative ($b < 1$) demonstrating the early growth of muscle in relation to empty carcass weight.

Key words: Muscle tissue, Buffalo.

INTRODUCTION - The main tissues types in domestic animal carcasses are muscular, adipous and osseous. According to a decreasing scale of physiological maturity, their formation obeys the following sequence: osseous, muscular and adipose (Müller & Primo, 1986).

Growth velocity of different tissues is stimulated in different stages of the animal life. Bone proportion in the animal carcass decreases slowly as the weight heightens, thus, osseous tissue is the one that varies the least in percentage. After birth muscles are the main responsible for total carcass weight, but as adipose tissue is deposited muscle tissue diminishes progressively (Gill et al., 1993; Owens et al., 1995). The aim of this study was to evalu-

ate muscle, adipose and bone tissue growth in young Mediterranean buffaloes slaughtered with different weights.

MATERIAL AND METHODS - In this experiment, 28 Mediterranean non-castrated buffalo males, with an average age of 14 months and an initial living weight (LW) of approximately 330 kilos, raised on native pasture on north litoral of Sao Paulo State were randomly distributed in four experimental groups (I, II, III, IV) and a control group (AB). Experimental animals were kept in four stalls that had 20 meters in width and 30 meters in length, australian drinking place for 1500 liters and a 6 m² shade area per each animal.

During a 30 days adaptation interval all animals received the experimental diet "*ad libitum*" and in the end of this interval the control group was slaughtered to be used as a reference to study the initial carcass composition.

The experiment did not have a pre-defined duration and the animals were slaughtered immediately after they reached the pre-established weight of 450 (group I), 480 (group II), 510 (group III) and 540 kg (group IV) with an age between 17 months. They were weighted every 28 days and as an animal approached the expected weight the measurement was performed in smaller intervals.

After slaughter of AB group the other ones were fed "*ad libitum*" with the same balanced diet containing coast cross hay, corn silage, cotton seed, humid corn silage and a commercial mineral concentrate (Table 1). This diet was formulated according to NRC (1996) level 2 based on a ruminal simulation for non-castrated animals with a daily weight gain of 1,40 kg. Concentrate and volumous proportion was maintained around 70:30 on dry matter (DM) base.

Table. 1. Percent composition of experimental diet (% on dry matter).

Ingredients	DM (%)
corn silage	7.8
coast cross hay	20.6
cotton seed	8.2
humid corn silage	46.0
NUTRUMIN® concentrate	17.4
crude protein	13.0
metabolizable energy (Mcal/Kg)	2.68

Before the adaptation period begun, animals were submitted to a 16 hours of solid fasten and then weighted, identified with numbers, treated for endo and ectoparasites and received an injection of 2.000.000 IU A vitamin.

Sixteen hours fasten with free access to water and weight measures were repeated before slaughter which was proceeded with cerebral concussion and jugular section.

Each carcass was divided into two halves using a chainsaw which were individually weighted and then chilled for approximately 18 hours under -5°C. Then the left half was submitted to a transversal section that included the 9^a, 10^a and 11^a ribs in which the HH section was performed (HANKINS & HOWE, 1946) to a further and proportional analysis of muscles, adipose tissue and bones according to the following equation:

Muscle tissue - $Y = 16,08 + 0,80 \cdot X$

Adipose tissue - $Y = 3,54 + 0,80 \cdot X$

Bone tissue - $Y = 5,52 + 0,57 \cdot X$

X is the percentage of the component in the HH section.

Empty body weights of control animals were determined adding the individual weights of carcass, blood, head, feet, leather, tail, viscera and organs. Specific relations between empty body weight (EBW) and living weight (LW) were established and the value obtained for each group was used to estimate the initial EBW of the animals belonging to the remaining categories (I, II, III e IV). Final EPW of such animals was determined in a similar method described after control animals' slaughter.

The relation between carcass weight and EBW observed for AB animals was used to calculate approximately the carcass initial weight of the remaining animals. Statistical regression analysis was performed using PROC REG of SAS software (SAS, 1994), considering the regression formula of the logarithm of carcass and tissues (muscle, adipose and bone) weights in function of the logarithm of empty body weight, as the following model:

$Y_{ij} = \mu + b_1 X_{ij} + e_{ij}$, where:

Y_{ij} = logarithm of carcass and tissues total weights (muscle, adipose and bone) (kg) in empty body of animal j in treatment i;

μ = mean effect;

b_1 = regression coefficient logarithm of carcass and tissues total weights (muscle, adipose and bone) (kg) in function of the logarithm of empty body weight for the treatments;

X_{ij} = logarithm of empty body weight logarithmo do peso do corpo vazio, do animal j in treatment i;

e_{ij} = random error, considered with a normal distribution, mean equal to zero and variable σ^2 .

To verify the $b=1$ hypothesis, growth was considered isogonic indicating an equilibrium between X and Y relative development in the interval. When $b \neq 1$, growth was called heterogonic. it was considered na early growth if $b < 1$ and late growth if $b > 1$.

RESULTS AND CONCLUSIONS - According to the statistical regression analysis used to evaluate muscular tissue growth, the allometric coefficient value was negative ($b < 1$) demonstrating the early growth of muscle in relation to empty carcass weight. These data agree with the ones from Vieira (2004) that observed $b=0.866979$ for buffaloes and with Keane et al. (1990) that related an early muscular tissue growth studying bovines from three different genetic groups.

Statistical analysis demonstrated that, under the conditions offered in this study, muscular tissue in Mediterranean buffalo carcasses presented an earlier growth when compared to the osseous and adipose tissues.

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