

## EFFECT OF GENETIC GROUP AND SLAUGHTER WEIGHT ON CARCASS MEASUREMENTS

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**ABSTRACT.** Sixty bulls, 14 Mediterranean crossbred buffaloes (BUF), 16 Nellore (NEL), 16 F<sub>1</sub> Holstein-Nellore (HN) and 14 ¼ Fleckvieh-5/16 Angus-7/16 Nellore (DC) were used in this experiment. Animals from each genetic group were randomly divided into four slaughter categories so that each animal had representatives in the other three groups. One category was slaughtered immediately (AB), two were fed *ad libitum* a 1:1 concentrate : roughage ration until they reached slaughter weights of 450kg for BUF and NEL; 500kg for HN and DC (I); 500kg for BUF and NEL and 550kg for HN and DC (II); the remaining category was fed a restricted amount of the same ration to supply levels of energy and protein 15% above maintenance (AR). AR animals were slaughtered when corresponding category I animals reached expected slaughter weight. There were no differences between genetic groups regarding to loin eye area expressed as the percentage of empty body weight. Buffaloes showed greater back fat thickness than cattle. Category II animals showed lower relative carcass length than the other categories, indicating a more compact carcass.

**Key words:** back fat thickness, buffalo, carcass length, cattle, loin eye area.

## EFEITO DO GRUPO GENÉTICO E DO PESO DE ABATE SOBRE MENSURAÇÕES NA CARÇAÇA

**RESUMO.** Foram utilizados 60 animais não-castrados, sendo 14 bubalinos mestiços Mediterrâneo (BUF), 16 Nelore (NEL), 16 F<sub>1</sub> Holandês/Nelore (HN) e

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Received 19 August 1997.

Accepted 29 August 1997.

14  $\frac{1}{4}$  Fleckvieh-5/16 Angus-7/16 Nelore (Bimestiço-(DC)). Em cada grupo genético, os animais foram divididos em quatro grupos de abate (categorias), nos quais cada animal tinha correspondentes nos outros três. Um grupo foi abatido imediatamente (AB), dois receberam, em baias individuais, ração contendo 50% de concentrado na matéria seca *ad libitum* até atingirem pesos vivos de abate de 450kg para BUF e NEL, de 500kg para HN e DC (I), de 500kg para BUF e NEL e de 550kg para HN e DC (II); a categoria remanescente recebeu a mesma ração, em quantidade restrita, suprimindo níveis de proteína e de energia 15% acima da manutenção (AR). Ao ser abatido um animal I, era abatido o seu correspondente AR. Os grupos genéticos não diferiram quanto à área de olho de lombo, em porcentagem do peso corporal vazio. Os bubalinos apresentaram maior espessura de gordura subcutânea que os bovinos. Os animais da categoria II tiveram menor comprimento da carcaça, em relação ao peso, que os das demais categorias, indicando carcaças mais compactas.

**Palavras-chave:** área de olho de lombo, bovinos, bubalinos, comprimento de carcaça, espessura de gordura subcutânea.

## INTRODUCTION

*Longissimus dorsi* eye area, back fat thickness and renal fat are some of the parameters most frequently used to estimate the physically separable amount of muscle and fat in carcass.

When slaughtered at a similar live weight, comparisons between early and mature animals may lead to erroneous conclusions, for the presence of subcutaneous fat is greater in the former than in the latter, which present a lower absolute content of subcutaneous fat and variation in its thickness. (Cole *et al.*, 1962).

Cattle carcass length, when expressed as a percentage of empty body weight or when the animal is slaughtered at a constant weight, is a parameter that shows how compact the animal is.

The aim of this study was to evaluate the effects of genetic group and stage of maturity (slaughter weight) on carcass length, back fat thickness and loin eye area.

## MATERIALS AND METHODS

This work was carried out at the Department of Animal Science of Universidade Federal de Viçosa, Minas Gerais, Brazil.

Sixty bulls, 14 Mediterranean crossbred buffaloes (BUF), 16 Nellore (NEL), 16 F<sub>1</sub> Holstein-Nellore (HN) and 14  $\frac{1}{4}$  Fleckvieh-5/16 Angus-

7/16 Nellore (DC), 24-month average initial age and 356.7, 300.0, 406.2 and 359.5kg respective average initial live weight (LW), were used.

In each genetic group, animals were divided into four categories. One category was slaughtered at the beginning of the experiment (AB), two categories (I and II) were fed *ad libitum*, in individual pens, a 1:1 concentrate : roughage ration, dry matter basis, and the remaining category (AR) received the same ration, but in a restricted way to supply levels of protein and energy 15% above maintenance ( $73 \text{ g/kg}^{0.75}$ ).

Category I and II animals were slaughtered when they reached respectively 450 and 500kg her BUF and NEL, and 500 and 550 for HN and DC live weight (LW). These weights were equivalent to 100 and 110% percent of mature cow weight in the respective genetic group. In each genetic group AR animals were slaughtered when the corresponding category I animal (which had similar weight and corporal condition at the beginning of the experiment) reached slaughter weight.

Before the pre-experimental period the animals were weighed, identified and treated against ecto and endoparasites and also received supplemental injectable vitamin A. The pre-experimental period lasted for at least 60 days of *ad libitum* feeding of the same experimental ration. Bulls were weighed at the beginning of the investigation and at every 28 days.

Experimental ration was composed of 31.28% *Brachiaria* grass hay; 10.00% soybean meal; 57.00% corn and cob with husks; 0.84% urea and 0.88% mineral mixture, balanced to meet energy and protein requirements (National Research Council, 1984) as well as rumen degradable protein (Agricultural Research Council, 1980) and macro and trace minerals requirements. Ration was formulated in order to yield a daily gain of 1.1kg. The chemical composition of experimental ration is showed in Table 1.

**Table 1.** Chemical composition of ration (dry matter basis).

Parameters	DM <sup>1</sup>	CP <sup>2</sup>	ME <sup>3</sup>	Mineral content				
	(%)	(%)	Mcal/kg	Ca (%)	P (%)	Mg (%)	Na (%)	K (%)
Ration	88.5	12.8	2.38	0.37	0.30	0.16	0.08	0.72

<sup>1</sup> DM = dry matter

<sup>2</sup> CP = crude protein

<sup>3</sup> ME = Metabolizable energy (Mcal/kg)

Values obtained from NRC, (1984).

Sixteen hours prior to slaughter, ration was removed from the bunkers and animals were given only water, and weighed just prior to slaughter.

The carcass was divided in two halves, weighed individually. After eighteen hours at -5°C, the left side was used to determine carcass length (CL), back fat thickness (BFT) and *Longissimus dorsi* eye area (loin eye area - LEA). The CL was measured from medium curvature of pubis to the anterior part of the first rib. The BFT and the LEA were measured on a transversal section of the *Longissimus dorsi* between 11th and 12th ribs.

The empty body weight of AB animals was calculated adding carcass, blood, head, feet, hide, internal organs and gastrointestinal tract weights. The relation between empty body weight and live weight determined in these animals was used to estimate initial empty body weight of all animals from each genetic group. Final empty body weight of AR, I and II animals was calculated the same way.

Statistical analyses were carried out using LSMLMW program, PC-1 version (Harvey, 1987), according to the model:

$$Y_{ijk} = u + G_i + C_j + G.C_{ij} + e_{ijk}, \quad \text{where}$$

$Y_{ijk}$  is observation of parameter in k-th animal, in i-th genetic group, in j-th category;

$u$  = overall mean;

$G_i$  = genetic group effect:  $i = 1$ (BUF), 2 (NEL), 3 (HN) and 4 (DC);

$C_j$  = category effect:  $j = 1$  (AB), 2 (AR), 3 (I) e 4 (II);

$GC_{ij}$  = interaction between i genetic group and j category;

$e_{ijk}$  = random error normally and independently distributed with zero mean and a common variance.

Means from data regarding carcass length (CL), back fat thickness (BFT) and loin eye area (LEA) were compared by Tukey test (5%).

## RESULTS AND DISCUSSION

There was no interaction effect ( $P>0.05$ ) between genetic group and category (slaughter weight) for the characteristics studied. For this reason, these effects are subsequently presented independently.

Least square means for carcass length (CL), back fat thickness (BFT) and loin eye area (LEA) from animals of each genetic group are shown in Table 2, and from animals of each category in Table 3.

**Table 2.** Quantitative carcass traits from animals of different genetic groups<sup>2</sup>.

Parameters <sup>1</sup>	Genetic group			
	BUF	NEL	HN	DC
	Empty body weight percentage			
CL (m)	0,36 b	0,39 a	0,37 b	0,38 ab
BFT (mm)	1,53 a	0,67 b	0,48 b	0,60 b
LEA (cm <sup>2</sup> )	12,19 a	13,13 a	13,85 a	13,69 a

Values followed by the same letter in the same row do not differ ( $P>0.05$ ) by Tukey test.

<sup>1</sup> CL = Carcass length; BFT = Back fat thickness; LEA = Loin eye area;

<sup>2</sup> BUF = Buffalo; NEL = Nellore; HN = F<sub>1</sub> Holstein-Nellore; DC = ¼ Fleckvieh - 5/16 Angus - 7/16 Nellore.

**Table 3.** Quantitative carcass traits from animals of different categories.

Parameters <sup>1</sup>	Category <sup>2</sup>			
	AB	AR	I	II
	Empty body weight percentage			
CL (m)	0,45 a	0,40 b	0,34 c	0,31 d
BFT (mm)	0,33 b	0,74 a	1,09 a	1,13 a
LEA (cm <sup>2</sup> )	14,92 a	13,98 ab	12,20 bc	11,78 c

Values followed for the same letter in the same row do not differ ( $P>0.05$ ) by Tukey test.

<sup>1</sup> CL = Carcass length; BFT = Back fat thickness; LEA = Loin eye area;

<sup>2</sup> AB = Immediate slaughter; AR = Restricted feeding; I = Slaughter weight of 450kg (BUF and NEL) and 500kg (HN and DC); II = slaughter weight of 500kg (BUF and NEL) and 550kg (HN and DC).

NEL animals presented greater ( $P<0.05$ ) CL, expressed as % EBW, than BUF and HN animals, while DC animals did not differ from all the others. These values agree with Galvão *et al.* (1991) who verified greater CL values for Nellore than for crossbred F<sub>1</sub> Nellore-Marchigiana e F<sub>1</sub> Nellore-Limousine, but disagree with Peron *et al.* (1995) who did not observe any difference in CL, expressed as % EBW, in Nellore, F<sub>1</sub>

Nellore-Chianina, F<sub>1</sub> Nellore-Holstein, F<sub>1</sub> Gyr-Holstein e  $\frac{3}{4}$  Holstein-Gyr. That author explained this based on the fact that crossbred animals from Holstein and Chianina breeds are large and not very compact.

Buffaloes showed greater ( $P < 0.05$ ) BFT, expressed as % EBW, than cattle which did not differ ( $P > 0.05$ ) between the various genetic groups. Similarly, Peron *et al.* (1995) in BFT verified no difference between genetic cattle groups (Nellore, F<sub>1</sub> Nellore-Chianina, F<sub>1</sub> Nellore-Holstein, F<sub>1</sub> Gyr-Holstein and  $\frac{3}{4}$  Holstein-Gyr). On the other hand, according to Galvão *et al.* (1991), slaughtering animals at equivalent stages of maturity presented greater ( $P < 0.05$ ) BFT, expressed as % EBW, in Nellore animals than in their crossbreds with Marchigiana and Limousine.

There was no difference ( $P > 0.05$ ) between genetic groups regarding LEA. Similar results were verified by Lorenzoni (1984) in Nellore, Holstein, F<sub>1</sub>,  $\frac{3}{4}$  and  $\frac{5}{8}$  Holstein-Zebu crossbreds and buffaloes, slaughtered at similar live weights and by Peron *et al.* (1995) in Nellore, F<sub>1</sub> Nellore-Chianina, F<sub>1</sub> Nellore-Holstein, F<sub>1</sub> Gyr-Holstein and  $\frac{3}{4}$  Holstein-Gyr animals.

Category II animals showed lower ( $P < 0.05$ ) CL than AB, AR and I animals, indicating that these animals showed a more compact carcass, for greater development of soft tissues, specially adipose tissue and, on a small scale, muscular tissue.

Category I and II animals tend to present a continual decrease in LEA, expressed as % EBW when compared with AB and AR animals. This is a consequence of the fact that these animals, in relation to other categories, present a greater portion of their empty body weight represented by fat (Jorge, 1993). The increase in relative values of BFT, in heavier animals (I and II), is in agreement with Berg and Butterfield (1976) and explains the relative reduction in CL and LEA. The results presented agree with Galvão *et al.* (1991) and Peron *et al.* (1995).

## CONCLUSIONS

1. Cattle and buffaloes did not differ regarding to loin eye area expressed as 100kg of empty body weight.
2. Buffaloes showed greater back fat thickness than cattle.
3. Animals slaughtered heavier showed lower relative carcass length than the other categories, indicating a more compact carcass.

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