EFFECT OF SPECIE AND NUTRITIONAL LEVEL ON BUFFALO CARCASS TRAITS

Efecto de la especie y el plan nutritivo en las medidas de la canal de búfalos

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Abstract

Sixty bulls, 14 Mediterranean crossbred buffaloes (BUF), 16 Nellore (NEL), 16 F_1 Holstein-Nellore (HN) and 14 ¼ Fleckvieh-5/16 Angus-7/16 Nellore (Double Cross – (DC)) were used for this experiment. Animals from each genetic group were randomly divided into four categories, in such a way that each genetic group was represented in all categories. One category was randomly assigned for immediate slaughter (IS), two were full-fed (AL) a 1:1 concentrate : roughage ration until they reached slaughter weights of 450 kg for BUF and NEL; 500 kg for HN and DC (AL1); 500 kg for BUF and NEL and 550 kg for HN and DC (AL2); the remaining category was fed with a restricted amount of a ration, to supply levels of energy and protein 15% above maintenance (RF). RF animals were slaughtered when corresponding AL1 animals reached expected slaughter weight. There were no differences among genetic groups regarding to *Longissimus dorsi* area expressed as 100 kg of empty body weight. Buffaloes showed greater back fat thickness than cattle. AL2 animals showed lower relative carcass length than the other categories, indicating more compact carcass.

Key words: Buffalo, carcass traits, cattle.

Resumen

Sesenta toros, 14 búfalos mediterráneos mestizos (BUF), 16 Nellore (NEL), 16 F1 Holstein-Nellore (HN) y 14 ¼ el Fleckvieh-5/16 Angus-7/16 Nellore (Doble Cruzamiento-DC) se usaron para este experimento. Los animales de cada grupo genético fueron divididos al azar en cuatro categorías, de tal modo que cada grupo genético estuviera representado en todos las categorías. Una categoría se asignó al azar para la matanza inmediata (IS), dos alimentados *ad libitum* (AL) con una ración con relación concentrado: forraje de 1:1, hasta que alcanzaran un peso de matanza de 450 kg para BUF y NEL; 500 kg para HN y DC (AL1); 500 kg para BUF y NEL y 550 kg para HN y DC (AL2); la categoría restante se alimentó con una cantidad restringida de una ración, que proporcionó niveles de energía y proteína de 15% superior al nivel de mantenimiento (RF). Los animales de RF se sacrificaron cuando los animales correspondientes AL1 alcanzaron el peso de la matanza previsto. No hubo ninguna diferencia entre grupos genéticos al considerar al área del *Longissimus dorsi* expresada por cada 100 kg de peso del cuerpo vacío. Los búfalos mostraron mayor espesor de grasa subcutánea que el ganado vacuno. Los animales de AL2 mostraron longitudes menores de la canal que las otros categorías, indicando canales más compactas.

Palabras clave: Búfalos, características de la canal, ganado vacuno.

INTRODUCTION

Longissimus dorsi area, back fat thickness and renal fat are some of the most used parameters to estimate the physically separable amount of muscle and fat in carcass. When slaughtered at a similar live weight, comparisons between early and later maturing animals may lead to the erroneous conclusion, due that the amount of subcutaneous fat is greater in earlier maturing breeds than in the later maturing breeds [3]. Carcass length in cattle, when expressed as percentage of empty body weight or measured when animals are slaughtered at a constant weight, is a parameter that shows how compact the animal is [2].

The aim of this research was to evaluate the effect of the genetic group (and specie) and plane of nutrition on carcass traits (carcass length, back fat thickness and *Longissimus dorsi* eye area.

MATERIALS AND METHODS

Sixty entire males, 14 Mediterranean crossbred buffaloes (BUF), 16 Nellore (NEL), 16 F_1 Holstein-Nellore (HN) and 14 ¼ Fleckvieh-5/16

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

In each specie, animals were divided into four categories (nutritional level). One category was slaughtered at the beginning of the experiment (IS), two categories (AL1 and AL2) were fed *ad libitum*, in individual pens, a 1:1 concentrate : roughage ration, dry matter basis, and the remaining category (RF) received the same ration, but in a restricted way to supply levels of protein and energy 15 % above maintenance (73 g/kg$^{0.75}$).

AL1 and AL2 animals were slaughtered when they reached respectively 450 and 500 kg to BUF and NEL, and 500 and 550 to HN and DC live weight (LW). In each specie, RF animals were slaughtered when corresponding AL1 animal (which had similar weight and corporal condition at the beginning of the experiment), reached slaughter weight.

Before pre-experimental period animals were weighed, identified and treated against ecto and endoparasites and received supplemental vitamin A. Pre-experimental period lasted at least, 60 days of an *ad libitum* feeding of the same experimental ration. Entire males were weighed at the beginning of the trial and at every 28 days. Experimental ration was composed of 31.28 % *Brachiaria* sp. grass hay; 10.00 % soybean meal; 57.00 % corn and cob with husks; 0.84 % urea and 0.88 % mineral mixture, balanced in order to meet energy and protein requirements [8] as well as rumen degradable protein [1] and macro and trace minerals requirements. Ration was formulated in order to obtain a daily gain of 1.1 kg. Chemical composition of experimental ration is described in Table 1.

TABLE 1
Chemical composition of ration (dry matter basis)

Parameters	DM[1] (%)	CP[2] (%)	ME[3]	Ca (%)	P (%)	Mg (%)	Na (%)	K (%)
Ration	88.5	12.8	2.38	0.37	0.30	0.16	0.08	0.72

[1] DM = dry matter.

[2] CP = crude protein.

[3] ME = Metabolizable energy (Mcal/kg).

Values obtained from NRC [8].

Sixteen hours prior to slaughter, feed was taken off bunkers and animals were only provided with water. Animals were weighed just prior to slaughter. Carcasses were splitted in two sides, and weighed individually. After eighteen hours at –5 °C, the left side was used to measure carcass length, back fat thickness and *Longissimus dorsi* (ribeye) area according to methodology described by Galvao *et al.* [4]. Empty body weight of IS animals was calculated adding carcass, blood, head, feet, hide, internal organs and gastrointestinal tract weights. Relationship between empty body weight and live weight served to estimate initial empty body weight for all animals within each specie. Final empty body weight of RF, AL1 and AL2 animals was calculated in the same way.

Statistical analyses were carried out using LSMLMW program, PC-1 version [5], according to the model: $Y_{ijk} = u + G_i + C_j + G.C_{ij} + e_{ijk}$; where Y_{ijk} is observation of parameter in k-th animal, in i-th specie, in j-th category; u = overall mean; G_i = specie effect: i = 1(BUF), 2 (NEL), 3 (HN) and 4 (DC); C_j = category effect: j = 1 (IS), 2 (RF), 3 (AL1) e 4 (AL2); GC_{ij} = interaction between i specie and j category; e_{ijk} = random error normally and independently distributed with zero mean and a common variance. Means from data including carcass length, back fat thickness and ribeye area were compared by the Tukey test (at 5% probability level).

RESULTS AND DISCUSSION

There was no specie x category (nutritional level) interaction effect ($P>0.05$) for the characteristics studied. Therefore, these effects are presented independently.

Least squares means for carcass length (CL), back fat thickness (BFT) and *Longissinus dorsi* eye area (LDA), expressed as 100 kg of empty body weight (EBW), from animals of each specie are shown in Table 2. Adjusted means for the same traits at each category are shown in Table 3.

NEL animals presented longer ($P<0.05$) carcasses (as measured by CL expressed as 100 kg of empty body weight) than BUF and HN animals, while DC animals were not different from the rest. These values agree with those of Galvao *et al.* [4], that verified greater CL values for Nellore than F_1 Nellore-Marchigiana and F_1 Nellore-Limousine crossbreds and disagree with those of Peron *et al.* [9], that did not observe any difference in CL, expressed as 100 kg of empty body weight, in Nellore, F_1 Nellore-Chianina, F_1 Nellore-Holstein, F_1 Gyr-Hostein and ¾ Holstein-Gyr

TABLE 2
Carcass length, back fat thickness and Longissimus dorsi area from Buffalo, Nellore, F1 Holstein-Nellore and Double Cross animals

	Species			
	Buffalo	Nellore	F_1 Holstein-Nellore	Double Cross[1]
Trait	/100 kg empty body weight			
Carcass length (m)	0,36 [b]	0,39 [a]	0,37 [b]	0,38 [ab]
Back fat thickness (mm)	1,53 [a]	0,67 [b]	0,48 [b]	0,60 [b]
Longissimus dorsi eye area (cm^2)	12,19 [a]	13,13 [a]	13,85 [a]	13,69 [a]

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

[1] Double Cross = ¼ Fleckvieh x 5/16 Angus x 7/16 Nellore.

TABLE 3
Carcass length, back fat thickness and Longissimus dorsi eye area from animals of different category

	Categories			
	Immediate Slaughter	Restricted Feeding	AL1[1]	AL2[2]
Trait	/100 kg empty body weight			
Carcass length (m)	0,45 [a]	0,40 [b]	0,34 [c]	0,31 [d]
Back fat thickness (mm)	0,33 [b]	0,74 [a]	1,09 [a]	1,13 [a]
Longissimus dorsi area (cm^2)	14,92 [a]	13,98 [ab]	12,20 [bc]	11,78 [c]

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

[1] AL1 = *Ad libitum* feeding until slaughter weight of 450 kg (BUF and NEL) and 500 kg (HN and DC).

[2] AL2 = *Ad libitum* feeding until slaughter weight of 500 kg (BUF and NEL) and 550 kg (HN and DC).

groups. The author justified it 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 100 kg of empty body weight than cattle breed types which did not vary (P>0.05) within specie. Similarly [9] no difference in BFT was found among cattle breed types (Nellore, F_1 Nellore-Chianina, F_1 Nellore-Hostein, F_1 Gyr-Holstein and ¾ Holstein-Gyr). On the other hand, Galvao *et al.* [4] when slaughtering animals at equivalent stages of maturity, Nellore cattle presented greater ($P<0,05$) BFT, expressed as 100 kg of empty body weight, than their Marchigiana x Limousine counterparts.

There was no difference ($P>0,05$) among species regarding LDA. Similar results were verified by Lorenzoni [7] in Nellore, Holstein, F_1, ¾ and 5/8 Holstein-Zebu crossbreds and buffaloes, slaughtered at similar live weights and by Peron *et al.* [9] in Nellore, F_1 Nellore-Chianina, F_1 Nellore-Holstein, F_1 Gyr-Holstein and ¾ Holstein-Gyr animals.

AL2 animals showed shorter ($P<0,05$) CL than IS, RF and AL1 animals, indicating that these animals showed more compact carcasses, due to greater development of soft tissues, specially adipose tissue and, on a small scale, muscle tissue. AL1 and AL2 animals tended to show a linear decrease in LDA, expressed as 100 kg of empty body weight when compared to IS and RF animals. This was due to the fact that carcasses from these animals, as compared to animals in other categories, presented a greater portion of their empty body weight as adipose tissue [6]. The increase in relative values of BFT, in heavier animals (AL1 and AL2) is in agreement with Berg and Butterfield [2] and explains the relative reduction in CL and LDA. Results presented agree with Galvão *et al.* [4] and Peron *et al.* [9].

CONCLUSIONS

Cattle and buffaloes have similar muscle development as indicated by the adjusted value of ribeye area. Buffaloes showed thicker back fat than cattle. Animals slaughtered at heavier weights showed a relatively shorter carcasses than animals belonging to other categories, indicating a more compact carcass.

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