

## Effect of castration on carcass yield and composition of crossbred river buffaloes (Buffalypso) in the growth stage

O. Fundora, Verena Torres, J.L Medina, Lucía Sarduy and María. E. González

*Instituto de Ciencia Animal, Apartado Postal 24, San José de Las Lajas, Mayabeque, Cuba*

*Email: ofundora@ica.co.cu*

Twenty four crossbred river buffaloes (Buffalypso) were used from weaning with an initial average live weight of 135.5 kg and between 16 and 24 months of age. Animals were placed in grazing areas of natural pastures under two experimental treatments consisting of their sexual condition (castrated or not). An analysis of variance according to a completely randomized design and an analysis of covariance were applied in which as concomitant variables were used the initial live weight and the age in days, as well as the adjustment for the last variable in the carcass indicators resulting with higher coefficients. For identifying the most important variables in the performance of treatments and their variability, a multivariate analysis was employed. For the analysis of carcass yield and its components, data were transformed through arcsine  $\sqrt{\%}$ . Carcass yield (48.34 to 47.05 %) and their components, first quality (28.04 to 29.43 %) and second quality meats (29.35 to 28.84 %), bones (28.73 to 29.02 %) and fat (13.88 to 12.71 %) were not affected by castration. It is concluded that castration had no important effects on the studied indicators, although it is recommended to carry out new evaluations with animals at higher slaughter live weight.

Key words: *buffaloes, growth, carcass, grazing*

The rearing of river or domestic buffalo represents an alternative for the production of a great variety of meat and milk by-products. The potentialities of this species open an encouraging perspective.

Buffalo meat is consumed in the largest part of the world. In the last three decades, buffalo population has notably increased owing the survival capacity of this species. In Egypt, buffalo contributes 40 % of the meat produced in the country, while in India one million tons of frozen buffalo meats are exported yearly. Nonetheless, in the American continent there is scarce knowledge on the meat of this species, especially its quality is unknown.

Meat from water buffaloes is healthier than that of bovines, due to its lower cholesterol and saturated fatty acid contents. However, the carcass composition and yield could be affected by inadequate management and feeding.

The sexual condition provokes changes in the productive performance and carcass composition in other species. In water buffaloes this aspect has been poorly studied. In Venezuela, Huerta *et al.* (1997) analyzed the castration effect on these animals. The cited authors did not find significant differences on carcass parameters, although they reported better performance in daily live weight gains in whole animals. These results are contradictory regarding to what was stated in other studies, which can be probably related to slaughter age and quality of the feed supplied, among other factors.

The objective of this study was to evaluate the effect of castration on the productive performance and carcass composition of river buffaloes during the growth stage on a feeding system based on pastures.

### Materials and Methods

Twenty four crossbred river buffaloes (Buffalypso)

were used with an average live weight of 135.5 kg in the growth stage from weaning at 8 months old until ages between 16 and 24 months. Animals were placed in a grazing area with 67 % of natural pastures, composed of *Dichantium caricosum*, *Dichantium annulatum* and *Paspalum notatum*. The rest included *Paspalum virgatum* and *Sporobolus indicus*, in two experimental treatments with 12 animals each. Treatments were established from the sexual condition (castrated or not). Castration was practiced in the morning hours to all weaned animals. Once castrated, they were maintained in recovery for one week before the beginning of the experiment.

Prior to slaughter, individual weighing and selection of the animals according to their age were made. Homogenous lots were weekly constituted integrated by three buffaloes of each treatment. Animals were maintained to fast for 24 h and then weighed again to proceed to the slaughter.

Once dead, hide and the remaining non-edible carcass components were removed. This was divided in two parts, in the most possible symmetrical form, using an electric handsaw. After one hour of draining, hot carcasses were weighed. Weighing was repeated at 24 h of maturing in a cold room. Cuts were performed for determining the meat proportions of first and second quality, bones and fat. Each part was weighed separately for calculating the yield of each one regarding the carcass.

For the statistical treatment an analysis of variance was applied, according to a completely randomized design. Also an analysis of covariance was employed. Initial live weight (kg) and age (d) were valued as concomitant variables.

For identifying the most important variable in the performance of the treatments and their variability, the

technique of multivariate analysis (main components) was employed. For the analysis of carcass yield and its components the theoretical suppositions of the analysis of variance were verified from the Shapiro's-Wilk's (1965) test for the normality of the errors and according to Levene's (1960) test for the homogeneity of the variance. The variables analyzed did not fill the theoretical suppositions of ANAVA, though data were transformed by the application of the arcsine  $\sqrt{\cdot}$  for the variables expressed in per cent improving the fulfillment of such suppositions.

Since initial live weight was not significant, only the adjustment for age was carried out on the carcass indicators that resulted with higher coefficients in the analysis of main components. For the analysis of the results the statistical package INFOSTAT, version 1 (2001) was used.

**Results and Discussion**

Results from the analysis of variance of carcass yield and its components indicated that castration did not affect significantly these indicators (table 1).

Carcass yield values were relatively low in both treatments. In them, hide and head weights could have influenced regarding the live weight of the animals representing 10.7 and 5.5 %, respectively. Torres (2003), Angulo (2005), Fernández and Fundora (2011) reported similar results.

In studies of Fundora *et al.* (2004) are indicated the limitations of carcass yield in buffaloes with live weight at slaughter higher than 420 kg. That is, 100 kg more than the live weight of the animals used in this experiment. This element must be considered in the feeding and management schemes for attaining higher carcass yield, mainly through feeding systems guaranteeing more growth intensity. Rodas *et al.* (2011) reported similar results in animals of similar age, specifically regarding the marketable meat.

Carcass yields of first and second quality were low and resulted inferior to those reported by Fundora *et al.* (2004). They are associated to the low slaughter weight, since the animals did not complete their fattening phase. While at the average slaughter age (623 d) muscle tissues have not completed their growing phase, the skeleton has been practically developed completely.

In the carcass of castrated animals, similar fat levels to those reported by Cruz *et al.* (2004) were registered in Mediterranean buffaloes of same age. However, in non-castrated, the values were noticeably lower, which can be related to the feeding regime or the breed. This aspect must be studied in future investigations. The pieces with greater proportion of the total meat of first quality were: inside round, tip of leg, fillet and shortloin representing 65 % of the total (figure 1). This result is of interest for selection schemes, since in spite that these animals are the offspring of female buffaloes destined

Table 1. Carcass yield and its components according to the sexual condition

Yield, %	Castrated	Non-castrated	SE±
Carcass	43.54 (47.05)	44.12 (48.34)	0.02
1st. quality meat	32.66 (29.43)	32.09 (28.04)	0.01
2nd quality meat	32.66 (28.84)	32.66 (29.35)	0.01
Bones	32.66 (29.02)	32.66 (28.73)	0.01
Fat	20.63 (12.71)	21.77 (13.88)	0.01

( ) Values in parentheses are original data

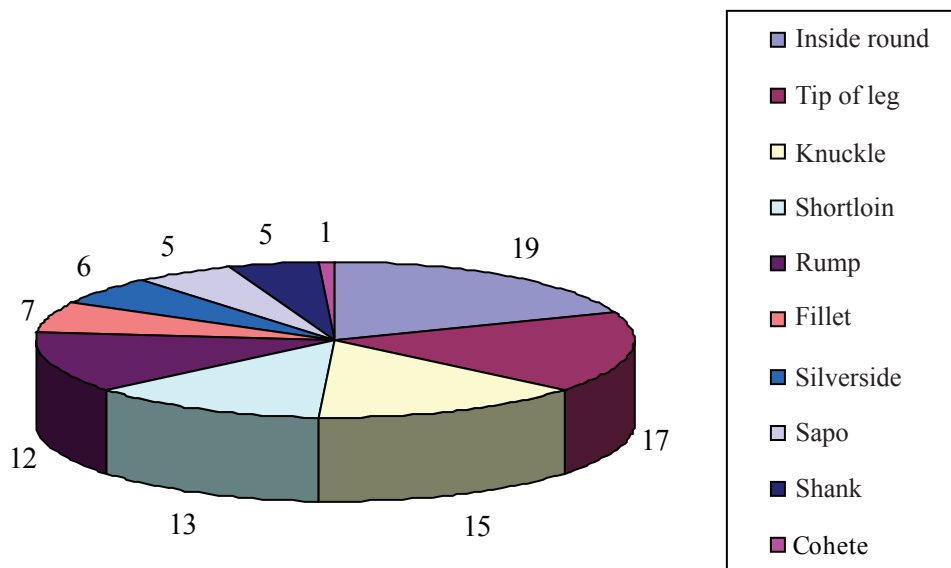


Figure. 1. Proportions of the pieces of first quality meat(%)

to milk production, the muscular development of these pieces of the carcass hind fourth quarter, makes them to be considered as important meat producers. That is, as dual-purpose animals. Presently, the number of dairy units of female buffaloes (*Buffalypso*) has increased substantially, though the number of animals destined to meat and milk production will increase.

The variables which resulted with greater weight in the analysis of the main components were final live weight, empty live weight and hot and cold carcass. Regarding the pieces, rump and fillet outstood (table 2). These variables, together with the brisket and the

nape, account for more than 80 % of the variability. These elements must be considered in subsequent studies.

The analysis of covariance indicated that the initial weight was not significant. From the adjustment for age in days, according to the analysis of main components, the significant influence of castration on the carcass indicators which resulted of greater effect (table 3), was confirmed. According to the analysis of covariance, castration had an effect highly significant on the final live weight, the empty live weight and carcass weight, hot and cold, and on the rump and fillet. In these latter,

Table 2. Analysis of main components to the carcass indicators. Matrix of rotated components

Indicators	Component			
	1	2	3	4
Initial live weight	0.655	0.168	0.130	-0.299
Final live weight	0.923	-0.253	0.072	0.057
Empty live weight	0.926	-0.220	0.043	0.116
Hot carcass	0.914	0.255	0.236	0.091
Cold carcass	0.919	0.259	0.160	0.104
1st. quality meat	0.874	0.199	0.075	0.402
2nd. quality meat	0.745	0.331	0.506	-0.095
Bone	0.835	0.170	0.229	0.014
Fat	0.762	0.438	0.037	-0.208
Shortloin	0.893	0.258	0.168	0.050
Inside round	0.846	0.260	0.091	0.147
Rump	0.921	0.129	0.268	0.067
Tip of leg	0.878	0.293	0.155	0.237
Fillet	0.921	0.204	0.101	0.150
Shank	0.671	0.474	-0.067	0.218
Shoulder meat	0.128	0.162	-0.152	0.839
Nape	0.107	0.064	0.901	-0.137
Brisket	0.112	0.915	0.117	0.151
Head	0.790	0.221	-0.277	-0.366
Skin	0.896	0.302	-0.218	-0.012
Age	0.830	0.017	-0.289	-0.160
Individual value	13.96	01.59	1.523	1.112
% Explained variance	66.46	07.56	7.25	05.30
Accumulated variance	66.46	74.02	81.27	86.57

Table 3. Effect of castration on different indicators, according to the analysis of covariance

Indicators	Castrated	Non-castrated	Sig.	Sig. of the covariance Age
Age (d)	615.33	631.67	±21.20 NS	
Final live weight, kg	311.93 ± 40.05	321.24 ± 38.96	NS	***
Empty live weight, kg	284.30 ± 41.31	300.70 ± 39.48	NS	***
Hot carcass weight, kg	131.45 ± 22.69	144.95 ± 22.09	NS	***
Cold carcass weight, kg	127.77 ± 22.65	140.83 ± 22.08	NS	***
Rump weight, kg	4.79 ± 1.26	5.24 ± 1.26	NS	***
Fillet weight, kg	5.75 ± 1.23	6.19 ± 1.23	NS	***

\*\*\* P < 0.001

Table 4. Effect of castration on some indicators of second quality

Indicators, kg	Castrated	Non-castrated	SE ± and Sig.
Shoulder meat	3.49	3.38	0.25
Nape	6.76	7.39	0.58
Brisket	3.25	4.50	0.30 * *

\*\* P &lt; 0.01

the influence is greater, since they are the pieces that weigh more in first quality meat, according to Ramírez *et al.* (2011).

This result suggests that the age at slaughtering should be considered because it influences on the final weight. Likewise, it has an effect on the carcass yield, specifically on the heavier parts. Nevertheless, the buffaloes used in this experiment were slaughtered with low liveweight. Further studies are suggested in animals with more than 400 kg at the moment of the slaughter.

From the results of the analysis of variance of the non significant indicators in the adjustments, it was verified that the castration did not affect the weight of the shoulder bone and of the nape (table 4)

The significant decrease of the brisket weight must be considered in castrated animals, since this result has not been previously reported. It could be due to some type of tissue atrophy in this zone, which is regulated by a phase of the sexual condition of the animals during the growth stage.

It is concluded that castration had no important effects on the studied indicators although new evaluations are recommended with animals with heavier slaughter weights.

### References

Angulo, R. 2005. Características de la calidad de las canales bufalinas y vacunas comercializadas en Medellín, Colombia. Grupo de estudio sobre búfalos. Facultad de Ciencias Agrarias. Universidad de Antioquia. Medellín, Colombia. p. 5

Cruz, V., Bressan, M.C., Cardoso, M.G. & Fonseca, R.T. 2004. Ácidos graxos na carne de búfalos e bovinos castrados e inteiros. R. Bras. Zootec. 33:2

Fernández, D & Fundora, O. 2011. Comparación del comportamiento productivo de cuatro genotipos de búfalos y vacunos en ceba. Resultados preliminares. VI Simposio de Búfalos de las Américas y Europa. p. 216

Fundora, O., Quintana, F. O & González, M.E. 2004. Performance and carcass composition in river buffaloes fed a mixture of star grass, natural pastures and native legumes. Cuban J. Agric. Sci. 38: 41

Huerta-Leindez, N., Rodríguez, R., Vida- Ojeda, A., Vidal-Quintero, A. & Jerez-Timaure, N. 1997. Características cárnicas de búfalos vs vacunos acebuados. Archivos Latinoamericanos de Producción Animal. p. 574

InfoStat. 2001. InfoStat, versión 1. Grupo InfoStat, FCA. Universidad Nacional de Córdoba. Argentina

Levene, H. 1960. Robust tests for the equality of variance. Contributions to Probability and Statistics. Stanford University Press.

Ramírez, B., Verdecia, D., Font, H., Ramírez, P. & Martínez, A. 2011. Rendimiento de la canal en búfalos de río (*Bubalus bubalis*) y bovinos mestizos (*Bos indicus* x *Bos taurus*) en el Municipio Bayamo. VI Simposio de Búfalos de las Américas y Europa. La Habana, Cuba

Rodas- González, A., Huerta-Leindez, N., Vidal, A., Colina, O. & Rodríguez, N. 2001. Comparación de búfalos y vacunos acebuados en características al sacrificio a edades contemporáneas. The Buffalo, an alternative for animal agriculture in the Third Milenium. VI World Buffalo Congress. p. 70

Shapiro, S. & Wilk, B. 1965. An analysis of variance test for normality (complete samples). 52:591

Torres, E. 2003. Manual de buenas prácticas en producción bubalina. Secretaría de Agricultura, Ganadería, Pesca y Alimento. Dirección de Ganadería, Departamento Bovinos y Carnes, Área Búfalos. Córdoba, Argentina. p. 14

Received: April 18, 2013