Effect of two feeding systems on Holstein crossbred bull carcass yield and composition

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Ten Holstein crossbred bulls were selected and divided into two feeding systems with sugarcane, in order to study the effect of both on the carcass characteristics. The animals were allocated, according to random block design, into two treatments with five repetitions per treatment: A) sugarcane forage + molasses-urea 2 % + concentrate, mixed in form of complete diet, and B) sugarcane forage + molasses-urea 2% (mixed) + concentrate (separated, semi-complete diet). The animals were put on a 24-h fast with water *ad libitum* and they were weighed before taking them to the slaughterhouse. Later, they were slaughtered by the method of captive bolt stunning. The hot carcasses were weighed 4 h after the end of the dissection and remained at temperature of 4 ºC for 24 h to determine the cold carcass weight. Later, the dissection of the left carcass was conducted to determine the percentage of edible meat (first and second class), bone, and excessive fat. No differences were found for the indicators hot carcass weight, cold carcass weight, yield, first and second-class meat, bone, and fat. Supplying the concentrate twice a day permitted obtaining larger amount of total meat in the carcass.

Key words: *cattle, carcasses, sugarcane.*

Carcass yield and composition in cattle are subject to variations in the feeding system. In numerous works, it is reported that animals under a feeding system based on pastures and forages show, before slaughter, lower yields as compared with those raised in stables with free access to concentrate (Osoro *et al*. 2001 and Jordán 2002). This is based on the highest content of fiber of roughages, which provokes longer time of feed retention in the digestive tract and lower rate of rumen emptiness.

Carcass characteristics and yield in animals fed sugarcane forage have been a subject little studied. However, Rodríguez *et al*. (2005), Vaz and Restle (2005), Macitelli *et al*. (2007) and Fundora *et al*. (2007) have reported carcass yields between 47 and 53 % of the final liveweight.

These figures are, mainly, due to the negative correlation between the animal yield and the weight of the gastrointestinal content when the feeding includes high forage levels (Buckley *et al*. 1990), because as the neutral detergent fiber increases in the diet, the retention time of the feed increases in the rumen (Pereira *et al*. 2007).

Macitelli *et al*. (2005) in a study with animals fed different forage sources reported that the digestive system of those consuming sugarcane had higher weight and represented higher percentage in respect to the liveweight. The objective of this work was studying the yields and the carcass composition of crossbred Holstein bulls fed sugarcane forage under two feeding systems.

Materials and Methods

Ten crossbred Holstein bulls of 28 months of age were selected and allocated according to random block design. The block was formed according to the average liveweights, 428 and 437 kg for the two treatments, respectively. Each block had five animals that were the replicate.

The treatments consisted in mixing the feeds: A) sugarcane forage (73 %), molasses urea at 2 % (10 %) and concentrate (17 %), and B) the same composition, but the concentrate was supplied in a different feeder. The feeds were given twice a day with six-hour difference. An analysis of variance was performed according to random block design.

The animals were allocated in concrete slotted floor pens. In the morning, the residual feed was withdrawn, and the pens were cleaned up. The feed was spread according to treatment.

The animals were weighed before taking them to the slaughterhouse. They were put for 24 h at a fast, with *ad libitum* water. Later, they were slaughtered by the method of the captive bolt stunning. The hot carcasses were weighed 4h after the dissection and they remained at temperature of 4 ºC for 24 h to determine the cold carcass weight. Later, the dissection of the left carcass was conducted to determine the percentage of edible meat (first and second class), bone and excessive fat. The yield of the animals was determined by the formula:

$$\text{Yield} = \frac{\text{Cold carcass weight}}{\text{Final weight}} * 100$$

Results and Discussion

The form of giving the concentrate had no effect on the final weight, the carcass weight, and the yield of the animals (table 1).

In order to determine the yield, the final weight of the animals was considered, reaching values of 410, 426, 431, and 412 kg, with yields of 51, 54, 60, and 53 % respectively. These figures were inferior to

Table 1. Weight and yield indicators in bulls fed sugarcane forage under two feeding systems

Indicators	Sugarcane forage 73 % + molasses urea 2 % (10 %) + concentrate 17 % (complete diet)	Sugarcane forage 73 % + molasses urea 2 % (10%) (mixed) + concentrate 17 % twice a day	SE±
Slaughter weight, kg	428.00	437.00	3.65
Hot carcass weight, kg	208.00	215.00	6.47
Cold carcass weight, kg	206.00	210.00	6,37
Carcass yield[1], %	48.17	48.00	1.31
Carcass yield[2] , %	53.98	53.59	0.97

[1]Percentage of the cold carcass weight in respect to the final weight of the animal
[2]Percentage of the cold carcass weight in respect to the final weight of the animal after removing the material in the digestive tract

reports of Menéndez *et al*. (1977), Araba and Byers (2002), Schoonmaker *et al*. (2002), and Fundora *et al*. (2007).

These results could be associated with the type of diet. Pate *et al*. (1985) diminished the percentage of sugarcane from 71 to 39 % in the dry matter of the diet during the finishing stage, because the passage of this roughage through the digestive tract provokes its weight represents higher percentage in respect to the total weight of the animal.

Macitelli *et al*. (2005) corroborated these results and proved that in animals fed three different sources of roughages, the digestive tract of those fed sugarcane forage represented higher percentage in respect to the liveweight.

Coleman *et al*. (1995) reported that in animals that had a forage diet with restricted access to the concentrate, the weight of the gastrointestinal tract was 15.6 % of the shrunk weight. It diminished at 8.5 % at the end of the finishing stage, when the animals had free access to the concentrate. This provided empty body weight gain, which reached 118 % of the weight gain versus the 77 % obtained during the growing stage.

Buckley *et al*. (1990) stated that when the forage level in the diet was high throughout the finishing stage, the weight percentage of the gastrointestinal tract did not decrease. Therefore, there was negative correlation between the animal yield and the weight of the gastrointestinal tract content.

In this study, when removing the content of the gastrointestinal tract and obtaining the liveweight of the empty body, the yield was increased from 48- 49 % up to 54-55 %. These figures corroborated the report of Díaz (2008) on the high percentage of the digestive tract and its content between the different organs of the animal.

Tables 2 and 3 show that there was not effect of the diet on the fat and bone percentages in the carcass. Nevertheless, the total meat content was higher ($P < 0.05$) in the treatment with the feedstuff separated from the roughage.

In genetically selected beef cattle breeds, the bone ratio in respect to the carcass can be up to 10.5 % (Martínez *et al*. 2003), quite inferior to that herein. Likewise, it was superior to the report of Menéndez *et al*. (1977) in Holstein animals. However, in the results from the cited authors, the weight gain was higher throughout the growing-fattening period, which permitted an earlier slaughter age.

The highest protein percentage deposited in the

Table 2. Effect of two feeding variants on fat and bone percentage in respect to the carcass

Indicators	Sugarcane forage 73 % + molasses urea 2 % (10 %) + concentrate 17 % (complete diet)	Sugarcane forage 73 % + molasses urea 2 % (10%) (mixed) + concentrate 17 % twice a day	SE±
Bone percentage	27.76	27.38	0.59
Fat percentage	10.14	8.61	0.60

Table 3. Effect of two feeding systems on carcass meat indicators

Indicators	Sugarcane forage 73 % + molasses urea 2 % (10 %) + concentrate 17 % (complete diet)	Sugarcane forage 73 % + molasses urea 2 % (10%) (mixed) + concentrate 17 % twice a day	SE±
Total meat, %	62.09	64.02	0.53*
First-class meat, %	44.76	44.32	0.67
Second-class meat, %	55.24	55.69	0.67

*$P < 0.05$

form of muscle as the weight gain increases in the animal (Fernández 1998) may provoke a superior level, compared with the normal parameters, regardless the nutrient deposition occurs mainly in the bone system, and that animals of the same weight, but lower slaughter age, have better meat-bone ratio.

For both treatments, the meat percentage in the carcass was superior to that of Martínez *et al*. (1999 a and b) and Andrade *et al*. (2000), who obtained meat percentages between 57 and 60 in the carcass for animals slaughtered with higher liveweight. They reported, in view of these results, the fall in the muscle deposition and the rise in fat deposition. Owens *et al*. (1995) noted increment in the fat tissue in quadratic form, whereas the protein mass increases at a decreasing rate as the animal increases the empty weight.

The previously mentioned is possible, as long as the animal does not reach physical maturity and there is no surplus in fat deposition. In this study, fat deposition was similar to that in the report of Menéndez *et al*. (1977), who noted in their outcomes figures from 8 to 9 %.

Many works demonstrate the influence of the diet on fat deposition. Garret and Johnson (1983) noted that the forage diets provoke low fat coefficient in the carcass, because there is higher acetic-propionic SCFA ratio, increasing the energy losses as heat. Schoonmaker *et al*. (2002) obtained slaughter weights, similar to those in this experiment, in animals fed diets with high content of concentrates, and they reported fat values in the carcass of 27 %. This is explained because the diets with high content of cereals provoke a propionic rumen fermentation pattern, more favorable as glycogenic precursor. Besides, these diets stimulate the release of insulin in blood and, thus, the lipogenesis.

It was concluded that, in animal feeding, fractioning the concentrate twice a day allowed obtaining larger amount of total meat in the carcass in respect to the rest of the indicators measured in the composition.

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