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CARCASS AND MEAT CHARACTERISTICS OF YOUNG BRAFORD STEERS AND HEIFERS, FINISHED WITH SUPPLEMENTATION ON CULTIVATED PASTURE

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ABSTRACT

The objective of the study was to evaluate the carcass and meat characteristics of young castrated steers and heifers. Twelve animals of each sex were used, fed during growth with energetic supplementation on *Lolium multiflorum + Avena strigosa* cultivated pasture, finished on *Pennisetum purpureum*, and slaughtered at fourteen months of age. Farm live weight and hot carcass weight were higher for steers, being of 365.8 and 203.4 kg, respectively, than for heifers being 310.3 and 168.6 kg, in the same order. Males also showed higher hot carcass dressing percentage (55.6%) then the females (54.4%). Males were superior in carcass length (118.1 vs. 111.3 cm), leg length (69.2 vs. 64.1 cm) and in the *longissimus dorsi* area (58.0 vs. 52.4 cm^2). No difference was observed for subcutaneous fat thickness, but heifers showed meat with better marbling (5.58 points) than the males (3.67 points). No differences for sensorial and organoleptical characteristics were observed between the two sexes. In conclusion, excepting relation to weight, young heifers have carcass and meat characteristics similar to males

.KEY WORDS: Beef cattle, Hereford x Nellore, meat tenderness, cultivated pasture, sex.

RESUMO

CARACTERÍSTICAS DE CARCAÇA E DA CARNE DE NOVILHOS E NOVILHAS BRAFORD SUPERJOVENS, TERMINADOS COM SUPLEMENTAÇÃO EM PASTAGEM CULTIVADA

Este trabalho teve como objetivo estudar as características de carcaça e da carne de novilhos castrados e novilhas Braford superjovens. Foram usados doze animais de cada sexo, recriados com suplementação energética sobre pastagem cultivada de *Lolium multiflorum + Avena strigosa* e terminados em pastagem cultivada de *Pennisetum purpureum*, onde permaneceram até o abate aos quatorze meses de idade. Os pesos de fazenda e de carcaça quente foram superiores nos machos, sendo de 365,8 e 203,4 kg, respectivamente, enquanto as fêmeas apresentaram 310,3 e 168,6 kg, citados na mesma ordem. Bovinos machos apresentaram maior rendimento de carcaça quente (55,6%) do que as fêmeas (54,4%). Os machos foram superiores nos comprimentos de carcaça (118,1 vs. 111,3 cm) e de perna (69,2 vs. 64,1 cm) e na área de *Longissimus dorsi* (58,0 vs. 52,4 cm^2). Não houve diferença na espessura de gordura subcutânea da carcaça, mas as fêmeas apresentaram carne mais marmoreada (5,58 pontos) do que os machos (3,67 pontos). Não foram verificadas diferenças nas características sensoriais e organolépticas da carne entre os animais dos dois sexos. Concluiu-se que exceto em relação ao peso de carcaça, novilhas jovens possuem características de carcaça e da carne semelhante aos machos.

PALAVRAS-CHAVES: Bovinos de corte, Hereford x Nelore, maciez da carne, pastagem cultivada, sexo.

INTRODUCTION

The growth of birth rate of Brazilian herds is considered an effect of the new production technologies (CALEGARE et al., 2007), resulting in an increase of calves production, and of young bovines slaughter.

More intrense production systems, with weaning rates higher than 80%, release in the market not only a surplus of calves, but also of heifers, because the high weaning rates imply a reduction of womb reposition. In an established herd, from the 80 male and female calves weaned from 100 cows, only half of the female calves have to be grown with the intention of replacing the cows that will be culled, considering that 80% of the weaning rate results in only 20 wombs that could be culled.

Livestock systems that present a flutuation in weaning rates usually grow and guard these female calves to replace wombs in the years with lower weaning rates. Growing with a reduced ponderal performance has been observed (VAZ, 2008), reaching the weight of 300 kg when heifers, after 24 months of age. This is a result of the priority given to the males that are directed to the best pastures in the farm (VAZ et al., 2002a), reducing the biological efficiency cow/calf (CALEGARE, 2007).

New market tendencies for beef indicate a preference for British x Nellore crossbred, such as Braford and Brangus. In a classic work, BARBER et al. (1981) compared different slaughter weights of Charolais and Aberdeen Angus, verifying that the improvement of the diet nutritional level resulted in an increase of fat deposition in the empty body and in the meat of Angus animals, regardless of the slaughter weight. It did not happen with Charolais steers, though.

Without any doubts, the focus on meat with added value due to the brand is what guarantee that the cut comes from British crossbred animals, what ensures meat with the adequate intra and intermuscular fat deposition (MC KENNA et al., 2002). For the center of Brazil, besides focusing on the brand of the meat released in the market, it is also important to focus on tenderness, which is obtained with the use of animals slaughtered at young age, finished in pasture, regardless of the sex.

In addition to the importance of slaughter age for the meat quality, OWENS et al. (1993) reported that bovines finished right after the weaning are more efficient during the finishing than those that did not have complete growth after the weaning.

On the viability of the slaughter of intact or castrated male bovines at very young age, less than 18 months of age, PACHECO et al. (2006b) and RESTLE et al. (2007) pointed out these categories as the ones that may bring the best economic return to the producer. Although the economic return could be slightly inferior, good economic results with the finishing of young heifers have also been observed (COUTINHO FILHO et al., 2006).

The question this research must answer is implied in the comparison of the heifer´s and steer´s carcass and meat, finished at young age in good quality cultivated pasture. The objective of this work was to analyze the carcass and meat characteristics of 5/8 Hereford 3/8 Nellore heifers and steers, finished at 14 months of age, in cultivated pasture under temporary grazing and energetic supplementation.

MATERIAL E METHODS

This work was carried out in the Beef Bovineculture Sector of the Zootechny Department of the Federal University of Santa Maria (Universidade Federal de Santa Maria). Twelve Braford males and twelve females, slaughtered at 14 months of age, on average, were used. The animals came from the same herd, and they were kept under the same management and feeding conditions, grazing in the same area, separated from other bovine categories and other species of domestic animals.

During the stages of growing and finishing, the animals remained in *Avena strigosa* + *Lolium multiflorum* cultivated pasture (winter-spring), from July to October, following to a *Pennisetum purpureum* cultivated pasture (spring-summer), where the animals remained until the slaughter, in December of the same

year. Animals were supplemented with ground oat grain in the winter grazing, and with ground sorgum in the summer grazing, in an equivalent quantity of 1% of live weight.

At the beginning of the experiment, in July, the males weighed 184.8 kg and the females, 183.2 kg. The winter-spring pasture was managed to keep a 10% grazing pressure, and the spring-summer pasture was regulated to 12% grazing pressure. In 157 days of experiment, the males gained 181 kg (1.15 kg/day) while the females gained 127 kg (0.81 kg/day).

The slaughter occured in a commercial slaughterhouse. The animals were weighed in the farm before going to the facility, after a 12 hours solid food fasting. After 12 hours of sanitary rest in the slaughterhouse, all the animals were slaughtered according to the regular flow of the commercial slaughterhouse, with identical skinning and hygiene between the treatments.

After identification and weighing of the carcasses, they were washed and refrigerated at -2°C for 24 horas. Then the half carcasses were withdrawn from the cool chamber for the evaluation of physiological maturity, conformation and metric measures of carcass development, according to the methods described by MÜLLER (1987).

In the right half carcass the following evaluations were carried out: carcass, leg and arm lenght, and cushion thickness. The subcutaneous fat thickness was measured between 12th and 13th ribs. In this area the *Longissimus dorsi* muscle was trasnversally sectioned, and after 20 minutes of air exposition, subcutaneous fat thickness and the area in cm^2 of the *Longissimus dorsi* muscle were measured, in order to subjectively evaluate the color, texture and marbling.

From each right half carcass one section was extracted, according to HANKINS & HOWE (1946). From this section, the sample of the *Longissimus dorsi* extracted after the assessing of muscle, bones and fat percentages was packed in plastic bags and brown paper, and frozen for 30 days. After this time, the frozem samples of *Longissimus dorsi* muscle were cut in two steaks (A and B), each one 2.5 cm thick.

Steak B was weighed while still frozen, and the thawing of steaks A and B occured in a domestic refrigerator for 24 hours. Afer this time, the steak B was weighed again in order to assess the thawing loss.

The steaks were roasted in an oven, for 15 minutes, sufficient time for the steaks to reach a mean internal temperature of 70°C. Steak A was cut while hot, in pieces of $2cm^3$, and randomly distributed to five properly trained tasters, who subjectively evaluated tenderness, palatability and juiciness, according to MÜLLER (1987).

Steak B was weighed after cooled down, for the assessment of cooking loss, and then it was used for the shear force assessment by the Warner Bratzler Shear (WBS) apparatus. In order to do that, three samples of 1 cm^2 each of the fiber cluster were extract perpendicular to the direction of the fibers. In each sample, two assements were caried out, in a total of six readings for sample.

The treatments corresponding to the animal sex and the experimental design were completely random, with similar number of replications, according to the statistical model:

$$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$$

being Yij the value in i-sex in j-replication; μ the general average of the variable; α_i the effect of i-sex; ε_{ij} the random effect associated to each observation presupposition NID (0; σ^2).

The data were submitted to variance analysis and *Student t* test, at a level of 5% of error probability, using the GLM procedure of the SAS program (1997). The correlation analysis with in the treatment (sex) was carried out by the same statistical program and the COR procedure, at a level of 1% of error probability.

RESULTS AND DISCUSSION

Table 1 presents the results regarding both characteristics farm weight and dressing weight. Male animals presented heavier farm and dressing weights than female animlas ($P<0.01$). The male´s heavier slaughter and carcass weight is explained by DI MARCO (1994) as a consequence of a bigger impetus growth caused by androgenic hormones, mainly testosterone, although the steers were castrated. BERG & BUTTERFIELD (1976) also pointed out that the lighter female weight is due to the fact that they start the fat deposition earlier, decreasing the growth speed (BOGGS & MERKEL, 1993).

Table 1 – Averages and standard deviation (SD) for the characteristics of carcass´weight and yield, and for fat thickness of Braford males and females.

Characteristics	Males		Females		P
	Averages	SD	Averages	SD	
Live farm weight, kg	365,8	24,3	310,3	25,6	0,001
Dressing weight, kg	203,4	14,0	168,6	13,9	0,001
Dressing yield, a%	55,6	0,9	54,4	1,5	0,026
Fat thickness, mm	4,1	0,7	5,1	0,8	0,329

[a] regarding live farm weight.

There was no difference (P>0.05) in fat deposition between the heifers and the steers (Table 1). The variations in the weight gain composition, whether composed by muscle tissue or adipose tissue, may result in alterations in the growth energetic requirements, elements that could differentiate animals of different sexes reaed under the same conditions (BERG & BUTTERFIELD, 1976; YAMBAYAMBA et al., 1996). CHIZZOTTI et al. (2006) studied crossbred Nellore x Red Angus, comparing castrated males, intact males, and young females. In this work, the authors did not verify difference in the net energy requirement for mantainance between the sexual states, altough the net energy for growth was higher in steers and heifers than in the intact males.

COUTINHO FILHO et al. (2006) also used bovines slaughterd before two years of age, as in the present work, and they also verified higher values for weight (257 vs 202 kg) and carcass yield (55.6 vs 52.8%) in non-castrated Santa Gertrudis males, while females of the same breed showed more kidney-pelvic-inguinal fat (7.66 vs 5.88 kg). In the same work, differences for subcutaneous fat thickness between Santa Gertudis steers and heifers were also observed (COUTINHO FILHO et al., 2006).

PAULINO et al. (2008) observed final weights of 435, 396 and 372kg, respectively, for Nellore intact male bovines, castrated males, and females. As regarding the empty body weight, the authors observed higher values in intact males (405.5kg) than in females (347.4kg), and castrated males presented intermediate values between intact males and females. Estudando o efeito da castração em fêmeas Nelore, By the study of castration in Nellore females, SILVA et al. (2007), observed that in heifers slaughtered within 28 and 30 months of age the fat thickness on the carcass reached 4.67mm in the castrated females and 4.52 in the non-castrated females.

In Table 1 it can be observed that steers presented higher dressing yield regarding farm weight than the heifers (P<0.05). JUNQUEIRA et al. (1998) reported smaller dressing yield in females (56.8% vs 58.9%); however, in a reasearch that studied crossbred Charolais x Nellore castrated males and females slaughterd at 14 or 24 months of age, SANTOS (2005) verifyied similar hot and cold dressing between the sexes, regardles of the slaughter age. The author points out that the similarities in hot and cold dressing are due to the fat deposition that occured in the females during the final stage of finishing in feedlot. Higher slaughter, and hot and cold dressing weight were observed in intact Nellore males, when compared to castrated males of the same breed, which presented bigger fat thickness (FREITAS et al. 2008).

Table 2 shows the values obtained for carcasses measurements and the conformation and physiological maturity evaluations, for both bovine sexes.

Table 2 – Averages and standard deviation (SD) for the characteristics of conformation, physiological maturity, carcass development measures and longissimus area in Braford. males and females.

Characteristic	Males		Females		P
	Averages	SD	Averages	SD	
Conformation, points[a]	9,9	1,4	9,4	1,2	0,360
Physiological maturity, pionts[b]	13,7	1,1	13,5	0,9	0,680
Carcass lenght, cm	118,1	2,6	111,3	3,0	0,001
Leg lenght, cm	69,2	1,7	64,1	1,7	0,001
Cushion thickness, cm	22,7	1,1	23,1	1,0	0,340
Arm lenght, cm	36,9	1,6	35,0	1,0	0,002
Longissimus area, cm^2	58,0	5,2	52,4	4,6	0,010

[a] scale from 1 to 18 points, being the higher value the better conformation;
[b] scale from 1 to 15 points, being the higher value the youngest maturity.

It can be observed in Table 2 that carcass conformation between males and females was similar (P>0.05), as well as cushion thickness, measure with good correlation to the conformation (VAZ et al., 2002b; SANTOS, 2005). Animals of both sexes were still in the growth phase, what can be proved not only by the animals`age but also by their reduced slauther and carcass weight (Table 1). These weghts are much inferior than the ones presented by Braford animals slaughtered at 24 months of age (RESTLE et al., 1999). This fact is important as far as, following the regular bovines` growth order, muscular differentiations in the hindquarters start being accentuated from older ages (BERG & BUTTERFIELD, 1976). On the other hand, RESTLE et al. (2001) did not verify any difference in the carcass conformation of cows slaughtered within the ages of 5 and 10 years and heifers slaughtered at 4 years of age, both Charolais x Nellore females.

COUTINHO FILHO et al. (2006) mention similar subcutaneous fat thickness between Santa Gertrudis steers and feifers, finished in feedlot from 13 to 17 months of age. Nevertheless, BUCKLEY et al. (1990) studied Hereford, Charolais and Simmental breeds, slaughtering females from 2 to 14 months of age, in order to study the exchanges in the body composition, from birth to slaughter, verifying that the carcass percentage increased from 58 to 67%, grastrointestinal tract and the internal fat percentage increased from 7 to 13%, while the head + limbs + hide percentage decreased from 26 to 15%, and the víscera + blood percentage decreased from 9 to 6%. In these constituents, the authors also verified that the water content in the empty body decreased from 73 to 51%, the protein amount decreased from 20 to 18%, whereas the fat amount increased from 3 to 28%, being the Hereford breed the one with the highest amount of fat in the empty body when compared to the other breeds studied by BUCKLEY et al. (1990).

As regards female bovines, OWENS et al. (1993) state that the growth is a fenomenum that occurs in young age, result of hyperplasia of cells at young age and following cellular hypertrophy. Nevertheless, the authors point out that hyperplasia of fat tissue continues even in the adult animal, and the growth curve is regulated by the individual´s adult weight, which is regulated by the genotype and the sex (DI MARCO, 1994).

Table 2 shows similarity as regards the carcass physiological maturity (P>0.05), however, the steers` carcasses presented great development, considering carcass, leg and arm lenght (P<0.05).

JUNQUEIRA et al. (1998) reported larger carcass lenght in steers when compared to the heifers. In the same work, the authors also observed a greater area of longissimus in males (79.1 vs 72 cm^2), owing to hormonal differences. The same results were observed in this work (Table 2), considering the longissimus of steers` carcasses was significantly greater (P<0.05).

COUTINHO FILHO et al. (2006) verified greater values for the lingissimus area in males, when

compared to the females (62.3 vs 45.7 cm^2), in Santa Gerturdis bovines at yearling. The longissimus area is pointed out as an index of the carcass muscularity, being easily evaluated in vivo by ustrasonography. Comparing heifers and steers, JOHNSON (1994) verified greater muscularity in the males`carcasses, whereas the amounts of fat and bones were greater in the females. Applying reversion equations, the author observed the same bone weight for both sexes, but 3kg more muscles and 3.5kg less fat in steers relative to heifers. On the other hand, in a classic work, ZINN et al. (1970) observed similar indices of marbing and subcutaneous fat deposit in steers and heifers, indicating that factors related to feeding and genotype have a determinat role along with the animal´s sex in the regulation of fat deposition in the carcass (BERG & BUTTERFIELD, 1976).

The indices of lean meat, fat and bones presented by the animals are important for the assessment of the meat quality (ZEMBAYASHI et al., 1995; LAWRIE, 2005). It is assumed that a greater fat amount in the meat of heifers would result in meat with better

gustatory qualities (MULLER, 1987; LAWRIE, 2005). Table 3 shows the results related to the meat quality, comparing both sexes.

Table 3 – Averages and standard deviation for organoleptic characteristics, relation muscle/bones and muscle+fat/bones, and qualitative aspects of the meat of Braford males and females.

Characteristic	Males		Females		P > F
	Averages	SD	Averages	SD	
Color, points[a]	4,58	0,67	4,50	0,67	0,760
Texture, points[a]	4,25	0,62	3,75	0,75	0,090
Marbling, points[b]	3,67	1,23	5,58	2,57	0,034
Relation muscle/bone[c]	3,73	0,22	3,80	0,23	0,849
Relation muscle + fat/ bone[c]	4,87	0,27	5,28	0,30	0,324
Thawing loss, %	8,74	1,73	8,32	2,29	0,613
Cooking loss, %	26,87	5,72	30,52	7,04	0,177
Total loss, %	33,29	5,00	36,31	6,38	0,211
Shear force, kgf	5,68	1,44	6,77	2,11	0,156
Tenderness, points[d]	6,00	1,08	6,06	1,05	0,901
Palatability, points[d]	6,11	1,10	5,92	0,86	0,630
Juiciness, points[d]	5,67	0,93	5,14	1,34	0,273

[a] scale from 1 to 5 points, being the higher value the best color and the smoother texture
[b] scale from 1 to 18 points, being the higher value the more abundant the marbling;
[c] tissue percentage estimated by the equations of HANKINS & HOWE (1946);
[d] scale from 1 to 9 points, being the higher value the most tender, palatable and juicier meat.

Bovines of both sexes showed meat with "bright red" color (MULLER, 1987), without difference between treatments (P>0.05). FEIJÓ (1999) would expect differences in the color between bovines of different sexes or sexual states. VAZ et al. (2001) observed a subjective coloration of 3.78 points in castrated males, and 3.05 points in intact males, in bovines slaughterd at two years of age.

VAZ & RESTLE (2000) verified a greater difference between castrated (4.37 points) or intact (2.85 points) Hereford males, slaughtered at 14 months of age. However, COSTA et al. (2007) did not verify differences in the color of the meat of young crosbred Nellore x Simmental steers, whether they were castrated or intact.

In a study about meat coloration of Hereford young bovines, LANARI et al. (2002) stated that the termination in systems that hasten the animals' weight gain, and anticipate the slaughter age favor bovine meat coloration. The same authors emphasized that bovines finished in good quality cultivated pasture, with high quantity of alpha-tocopherol, show greater stability of meat and fat coloration, as a result of this substance antioxidant activity. These statements would justify the good coloration presented by the steers and heifers in this work, 4.58 and 4.50 points, respectively.

Meat texture was also similar between the treatments (P>0.05), but numerically there was a difference between the sexes. The males showed a means of 4.25 points and the females, 3.75 points (Table 3). SANTOS (2005) verified similarities meat coloration and texture beween males and females, regardless of the slaughter age, when the author analyzed crossbred Charolais x Nellore bovines, slaughtered at young age, at 14 or 24 months of age. The author also pointed out that age is more important than sex for these two organoleptic characteristics of the meat.

Table 3 shows that heifers presented more marbling than than steers (P<0.05). Although the effect of sex over fat deposition in the carcass and meat has already been mentioned, it is worthy to point out the observations made by DI MARCO (1994). For this author, heifers present greater quantity and greater absolute value of fat than the steers, and this metabolic behavior seems to be a result of the animal adaptation to face the effects of energy restriction during reproductive periods. There was also no difference for the relation muscle/bone and muscle +fat/bone between the studied sexes (P>0.05), indicating that both sexes can be used to produce good quality meet, without interference in the industrial deboning yield. This process is usually jeopardized when it is carried out in adult cows whose relations muscle/bone or muscle+fat bone is smaller in adult females than in adult males, as VAZ et al. (2002a) observed in Herreford animals.

On the other hand, JUNQUEIRA et al. (1998) verified that the cuts botton sirloin, rump cover, striploin, sirloin and lean cuts were bigger in females than in the males, in Marchigiana x Nellore bovines. However, the yield of retail beef was bigger in males due to their lower trimmed fat quantity.

Cooking losses were similar (P>0.05) for both analyzed sexes (Table 3). Total loss in the longissimus dorsi weight reached 33.29% in the steers and 36.31% in the heifers. Weight losses during thawing and cooking can be altered by factors related to the carcass refrigeration in industry, or by the occurrence of a higher level of preslaughtering stress (RESTLE & VAZ, 1997; LAWRIE, 2005). VAZ et al. (2002a) verified that adult Hereford cows´meat presented greater weight loss during cooking than the steers of the same breed, what could be a result of a higher level of stress. This fact can be empirically observed in cows compared to younger heifers, however, this effect can be reduced with the supplemntation of grains, if it is compared to an exlusive growing and finishing in pasture (FRENCH et al., 2001). Researching very young Hereford males, VAZ & RESTLE (2000) observed whether the fact of the males being castrated or intacts had any effect on the qualitative characteristics of the animal´s meat, relating such effects to the accurence of DFD (dry, firm and dark) meat samples.

Meat marbling is another characteristic that can result in lower liquid losses during the samples´preparation, favoring meat juiciness and palatability (FORREST et al., 1979; VAZ et al., 2007). In the present work, similarities in these characteristics (P>0.05) were observed, as well as in the following ones: tenderness measured by the panel of tasters, and shear force to cut muscle fiber bundles (Table 3), with means of 6.00 points and 5.68 kg in males, and 6.06 points and 6.77 kg in females, respectively.

Working with crossbred Charolais x Nellore, SANTOS (2005) verified similarities in the meat tenderness measured by the panel of tasters, between male and female bovines, recording means of 6.10 and 6.54, respectively. In the same work, the shear force was also similar, being 3.91 for males and 3.54 for

females. However, SANTOS (2005) pointed out that the mles´meat was more palatable that the females´ (7.33 vs 6.22 points), although juiciness was similar (6.71 for males and 7.04 for females).

The correlations among the characteristics analyzed for males and females are presented in tables 4 and 5, respectively.

Table 4 – Significant correlations (1%) among the variables observed in Braford males´carcasses.

Variables*	CDW	TEX	LDA	%MUS	%FAT	%BON	%ToL	WBS	TEN	JUI
FW	0,97	-	0,80	-	-	-	-	-	-	-
CDW	-	-	0,78	-	-	-	-	-	-	-
AP	-	-	-	-	-	-	-	-	-	-0,73
FT	-	-0,76	-	-0,72	0,94	-0,73	-	-	-	-
%RIB	-	-	-	-	-	-	-	-0,76	-	-
%MUS	-	-	-	-	-0,77	-	-	-	-	-
%FAT	-	-	-	-	-	-0,77	-	-	-	-
%CL	-	-	-	-	-	-	0,97	-	-	-0,81
%ToL	-	-	-	-	-	-	-	-	-	-0,76
WBS	-	-	-	-	-	-	-	-	-0,84	-

* * CDW – carcass dressing weight; TEX – texture; LDA – longissimus dorsi area; %MUS – muscle percentage in the carcass; %FAT – fat percentage in the carcass; %BON – bone percentage in the carcass; %ThL – thawing loss; %CL – cooking loss; %ToL – total loss; WBS – Warner-Bratzler shear force; TEN – tenderness by the panel; JUI – juiciness by the panel; FW – farm weight; AP – arm perimeter; FT – fat thickness; %RIB – rib cut percentage.

It can be verified in Table 4 that the subcutaneous fat thickness in the males´carcasses was negatively correlated to the meat texture. VAZ & RESTLE (2000) did not verified significant correlation between these characteristics in Hereford castrated males.

NISHMURA ET AL. (1999) examined the structural changes in meat texture, determined by the disposition of the intramuscular connective tissue. During the finishing of steers within 9 and 20 months of age, the authors observed that the collagen of perimysium increased muscle fiber thickness and they became more regular as far as the animals gained weight, making the texture rougher. Nevertheless, in a parallel with older steers, the authors verified that, when the animals reached 32 months of age, the fat excess in the longissimus muscle started reverting the process, forming thinner fiber bundles, reducing the meat texture.

Another result that should be highlighted in Table 4 is the negative correlation between juiciness and cooking loss, and total loss during thawing + meat cooking. FEIJÓ (1999) mentions a negative correlation between these variables, poiting out to the importance of the cooking process in the water retention capacity of the meat. For this author, the meat that reaches certain internal temperature more quickly presents more juiciness. FEIJÓ´s (1999) observations are important considering the juiciness assessment method utilized in this experiment. The author states that when the meat is roasted a coagulated protein cover is formed, preventing juice loss and resulting in juicier meat during the assessment by panel of tasters.

Meat juiciness and palatability can also be associated to the tenderness measured by the panel of tasters. This result is mentioned in the literature, and it was observed in the correlation assessment of the characteristics analyzed within the female sex, according to Table 5.

Table 5 – Significant correlations (1%) among the variables observed in Braford females´carcasses.

Variables*	CDW	CT	AL	%FQC	%RIB	%MUS	%FAT	%ToL	TEN	PAL	JUI
FW	0,94	-	0,73	-	-	-	-	-	-	-	-
CDW	-	0,73	0,75	-	-	-	-	-	-	-	-
FT	-	-	-	-	-	-0,79	0,73	-	-	-	-
TEX	-	-	-	-	-0,78	-	-	-	-	-	-
MAR	-	-	-	-	-	-	-	-	-	0,77	-
%SC	-	-	-	-0,76	-0,74	-	-	-	-	-	-
%RIB	-	-	-	-	-	-	0,79	-	-	-	-
%MUS	-	-	-	-	-	-	-0,84	-	-	-	-
%CL	-	-	-	-	-	-	-	0,97	-	-	-
WBS	-	-	-	-	-	-	-	-	-0,87	-	-0,78
TEN	-	-	-	-	-	-	-	-	-	-	0,83

* CDW – carcass dressing weight; CT – cushion thickness; AL – arm lenght; %FQC – forquarter cut percentage; %RIB – rib percentage; MUS – muscle percentage in the carcass; %FAT – fat percentage in the carcass; %ToL – total loss; TEN – tenderness by the panel; PAL – palatability by the panel; JUI –juiciness by the panel; FW – farm weight; FT – fat thickness; TEX – texture; MAR –marbling; %SC – sawcut percentage; %CL – cooking loss; WBS – Warner-Bratzler shear force.

Carcass dressing weight was positively correlated (P<0.01) to arm lenght (r=0.75) and to cushion thickness (r=0.73). The first measure shows hind growth, thus, the animal´s height. The chushion thickness is na importante measure to assess muscularity and general conformation of heifers´carcasses. VAZ et al. (2008) verified positive correlation between cushion thickness and carcass weight, when they sudied Aberdeen Angus steers finished in pasture.

Correlations in Table 5 show that the total fat amount in the carcass is positively correlated to the highest rib cut percentage in the heifers´carcasses. It is the part of the carcass which proportionaly recives more fat deposition with the advancement of bovines´ finishing level. VAZ et AL. (2004) also mentioned similar results for Nellore steers slaughterd at 24 months of age.

It is also observed in Table 5 that meat palatability was positively correlated to meat marbling, as well as juiciness was positively correlated to meat tenderness measured by the panel of tasters, according to the literature (FEIJÓ, 1999; LAWRIE, 2005). The correlations among these characteristics indicate that 5/8 Hereford 3/8 Nellore heifers, finished at 14 months of age, in cultivated pasture under controlled grazing and energetical supplementation present good quality meat. In this context, industries can use heifers that come from intensive production systems, obtaining high quality meat, considering the females are comparable to males with heavier carcass weight in the features color, texture, palatability, juiciness and tenderness.

CONCLUSIONS

Steers are heavier in the slaughter and present better carcass yield so that they result in heavier carcasses than heifers. Braford males present better developed carcasses and bigger longissimus dorsi area than bovine females.

Heifers present bigger marbling fat deposition; however, there are no differences in the gustatory characteristics of the meat of both sexes of the Braford bovines studied, when slaughtered at 14 months of age.

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