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Fleischqualität und Ausbeute von jungen Nelore, Chianina x Nelore und Marchigiana x Nelore Bullen

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In den letzten zwanzig Jahren wurden verschiedene europäische Rinderrassen in Brasilien eingeführt um die Intensiv-Rinderzucht zu verbessern. Zootecnische Untersuchungen zur Bewertung von Kreuzungen von europäischen und Indischenrassen wurden in verschiedenen Studien angewandt. In der vorliegenden Arbeit wurden Untersuchungen des Schlachtkörpers und des Fleisches durchgeführt. Sechs und dreissig jungen Bullen, (12 Nelore, 12 Chianina x Nelore und 12 Marchigiana x Nelore) wurden nach einer abschliessenden Fütterung unter kontrollierten Bedingungen mit einem durchschnittlichen Gewicht von 450 kg und einem Durchschnittsalter von 24 Monaten geschlachtet. Zur Untersuchung der Qualität wurden jeweils 2 Steaks in einer Stärke von 2,54 cm Dicke in einem Warmluft-Gerät (170°C Lufttemperatur) auf eine Kerntemperatur von 65°C erhitzt. Die sensorische Qualität und die Festigkeit des Versuchsgutes (Warner Bratzler Festigkeits Prüfgerät) wurde mit dem vorbehandelten Gut vorgenommen, wobei aus jeweils 2 Steaks 12 Probenzylinder (1,25 cm Durchmesser) ausgestanzt und verwendet wurden. Darüber hinaus wurden die erzielten Erträge von Edelfleisch, Knochen mit den Ergebnissen der analytischen Ermittlung des Muskelfleisch, Knochen und Fettanteils der 9 - 10 - 11 Rippenabschnitte verglichen. Von Partien des Longissimus dorsi wurden zusätzlich chemische Untersuchungen des Fett, Protein, Wasser und Asche-Gehaltes durchgeführt.

Meat quality and quantity of Nelore, Chianina x Nelore and Marchigiana x Nelore young bulls.

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In the last twenty-years several European breeds were introduced in Brazil in order to increase intensive beef cattle production. Zootechnics tests to evaluate crossbreeds from European and Zebu breeds have been utilized in several studies. Lately investigations on carcass and beef have been initiated. 36 young bulls (12 Nelore, 12 Chianina x Nelore and 12 Marchigiana x Nelore) were finished in feedlot and slaughtered with group average live weight of 450 Kg and approximate age of 24 months. Four steaks from Longissimus with 2.54 cm thick were oven broiled (170°C) up to an internal temperature of 65°C. 12 cores of 1.25 cm diameter (2 steaks) were allocated to palatability test. Objective tenderness were performed in 12 cores (2 steaks) with a Warner-Bratzler shear device. Data on boneless trimmed cuts, bone and trimmings were correlated with the results from dissection of muscle, bone and fat from 9-10-11 rib cut. Proximate analysis were performed on dissected Longissimus muscle.

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then subjected to Warner Bratzler shear test. One core from each taste steak was served to each of a six-member trained taste panel who ranked them for tenderness, juiciness and overall acceptability.

One-way analysis of variance was conducted to determine breed differences, a least significant difference test ($P < .05$) was applied to means and overall and pooled simple correlation coefficients were determined between major traits.

Results and Discussion

Carcass yield traits - Quantitative carcass traits observed in this study on the three breed groups studied are given in Table 1. The *Longissimus* area of the Nelore breed was significantly smaller than the crossbreds, however, similar or lesser have been reported (2,4) for Nelore steers and young bulls. Carcasses from the crossbred groups yielded significantly more boneless, closely trimmed meat from the special hindquarter than did Nelore carcasses. Part of the yield difference in boneless, trimmed meat from the special hindquarter is due to the greater percent fat trim from the Nelore breed. These results are in agreement with (3) who found a higher percentage of boneless trimmed meat from the special hindquarter in young Charolais and Chancim (5/8 Charolais x 3/8 Zebu) bulls when compared to Zebu breeds and (4) who found 32.53% and 33.09% of boneless trimmed meat from the special hindquarter respectively for young Nelore and Swiss x Guzera bulls. No differences, however, were observed in yields of boneless, trimmed meat from combined special hindquarter and forequarter between the breed groups. This would indicate that Nelore cattle yield more boneless, closely trimmed meat from the forequarter, much of this undoubtedly was due to the heavier weight of hump from the Nelore breed. Nelore carcasses yielded less bone indicating they may have a tendency to yield lesser percentages of bone but differences were not significant. Bone yields (table 1) from crossbred carcasses in this study were similar to those reported by (9).

TABLE 1 - Means and standard deviation of carcass traits of the Nelore breed and breed crosses.

Traits	Breed Groups		
	Nelore	Chianina x Nelore	Marchigiana x Nelore
Cold Carcass Wt,Kg	254.1 ± 24.4	249.5 ± 22.6	265.2 ± 22.6
<i>Longissimus</i> area ¹	67.05 ^c ± 8.85	77.73 ^b ± 6.75	81.37 ^a ± 7.02
Fat Thickness ² ,mm	5.2 ^a ± 1.2	2.1 ^b ± .9	2.0 ^b ± .8
Boneless trimmed meat of special hindquarter*	32.4 ^b ± 1.2	34.9 ^a ± .9	34.5 ^a ± 1.0
Boneless trimmed meat forequarter*	30.7 ^a ± 1.4	29.5 ^b ± 3.4	28.1 ^b ± 1.3
Boneless trimmed meat of special hindquarter plus forequarter*	63.1 ± 2.1	63.4 ± 1.6	62.6 ± 1.5
Total bone*	16.0 ± 1.1	17.2 ± 1.3	16.7 ± 1.2

¹ The *Longissimus* muscle area was measured between the 11th-12th rib,cm²

² The fat thickness was measured at the 12th rib

* Expressed as a percentage of cold carcass weight

a,b,c, Means within same row bearing same or no superscript letter do not differ ($P < .05$)

Meat Quality traits - Comparative results of the three breeds groups for the meat quality traits studied are given in Table 2.

TABLE 2. Means and standard deviations by breed groups of *Longissimus* chemical composition, cooking losses and Warner Bratzler shear values.

Traits	Breed Group		
	Nelore	Chianina x Nelore	Marchigiana x Nelore
<u>Longissimus Composition</u>			
Moisture, %	74.29 \pm 1.27	75.32 \pm .97	74.66 \pm 1.25
Fat, %	3.36 ^a \pm 1.06	1.77 ^b \pm .64	1.93 ^b \pm .37
Ash, %	1.05 \pm .03	1.08 \pm .07	1.08 \pm .08
Cooking loss, %	19.99 ^b \pm 2.53	21.23 ^b \pm 2.44	23.53 ^a \pm 3.10
Shear force, kg	3.97 \pm .66	3.84 \pm .73	4.06 \pm .59

a,b Means within same row bearing same or no superscript letter do not differ ($P < .05$)

Carcasses from Nelore cattle are obviously fatter at the slaughter weight of this study. They had significantly more outside fat (Table 1) as well as a greater percent fat in the *Longissimus* muscle. This indicates a tendency for straight Nelore cattle to fatten at lighter weights than Nelore crossbreds. Young Nelore bulls and steers slaughtered at lighter weights have been reported to have less *Longissimus* fat content (2) and less outside fat cover (2.4) than found in this study. Cooking losses were significantly greater in steaks from Marchigiana x Nelore carcasses. Differences in cooking loss were directly related to cross-sectional area of *Longissimus* muscle and were probably largely due to greater surface area of the steaks from crossbred cattle, especially the Marchigiana x Nelore cross.

Warner Bratzler shear values between the breed groups were not significantly different. Subjective taste panel evaluation of tenderness, juiciness and overall acceptability showed no significant differences despite the higher fat content present in the Nelore breed. Components of 9-10-11th rib cut as removed in this study showed low relationships between separable muscle and fat to comparable separable carcass components (Table 3).

TABLE 3 - Relationships between boneless trimmed meat, bone and trimmings of the special hindquarter plus forequarter and separable components of the 9-10-11th rib cut.

Relationships Between		All Bulls	Crossbred Bulls	Nelore Bulls
9-10-11th rib separable components Muscle	Special hindquarter plus forequarter	r	r	r
	Boneless, closely trimmed meats	.19	.43*	.35
	Bone	.68**	.63**	.79**
	Fat	.31	.30	.18

* ($P < .05$)

** ($P < .01$)

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Aspects qualitatifs et quantitatifs de la viande du jeune taureau Nelore, Chianina x Nelore et Marchiagina x Nelore

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Pendant 20 ans, plusieurs races europeaines ont ete introduite au Brasil pour vise une production intensive de la viande bovine.

Des essais zootechniques pour l'evaluation des mētis de ces races avec Bos indicus ont ete motif d'etude et plus recemment, des recherches sur la carcasse et la viande de ces animaux ont ete initiē.

Trente six animaux (12 Nelore, 12 Chianina x Nelore, 12 Marchigiana X Nelore) ont ete maintenue confine et l'abattage a ete faite quand le poids moyen du groupe avez 450 Kg (poids en vie) avec un age approximatif de 24 mois.

Quatre bifteck du muscle Longissimus dorsi de 2,54 cm d'epaisseur ont ete rōti au four (170°C) jusque une tempērate interieure de 65°C. Douze cylindres de 1,25 cm de diametre (2 bifteck) ont ete utilisee pour le test de palatabilitie, et plus douze cylindres (2 bifteck) pour la determination de la force de cisaillement avec l'instrument "Warner-Bratzler". Plusieurs resultat sur la viande profitable, os et dēchet (provenient de la toilette de les coupe), ont ete correlater avec les resultant de la dissection du muscle, os et graisse dans la coupe de la 9^e, 10^e e 11^e cōte. La composition chimie dus muscle Longissimus dorsi a ete aussi analiseē.

СПРАВНТЕЛЬНО КОЛИЧЕСТВО И КАЧЕСТВО МЯСА МОЛОДОГО БЫКОГО NELORE,
CHIANINA X NELORE И MARCHIGIANA X NELORE.

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За последние 20 лет, разный европейский говядина рода были ввезено в Бразилию, для того чтобы увеличить интенсивности продукции убойного крупного рогатого мяса. Целью этого работы являлось проведение оценки говяжьих мētисов, с говяжьим зебу (Bos indicus), по зоотехническим опытом и исследование качество мяса и туши. Испытание проводилось с 36 животными (12 Nelore, 12 Chianina x Nelore, 12 Marchigiana x Nelore), которые откармливались путем интенсивным питанием. Животным, для убой, отбрали при 450кг живым весом, в возрасте около 24 мес. Для варке 4 бифтексов мышц Longissimus dorsi, высотой 2,54см были нагревано при 170°C до достижения 65°C в центре мяса. Для органолептического анализа, отбрали 12 цилиндрической пробы, диаметром 1,25 см (из 4х бифтексов). Жесткость (нежность) определялась в цилиндрической пробы, аппаратом "Warner Bratzler". Сравнительные данные пригодного мяса, кости и изливки по соотношению с результатов вскрытым мышца, содержащая кости и жира, вырезанном на уровне 9-11 позвонков. В вскрытом длиннейшем мышце (Longissimus dorsi) изучали также их основной химический состав.

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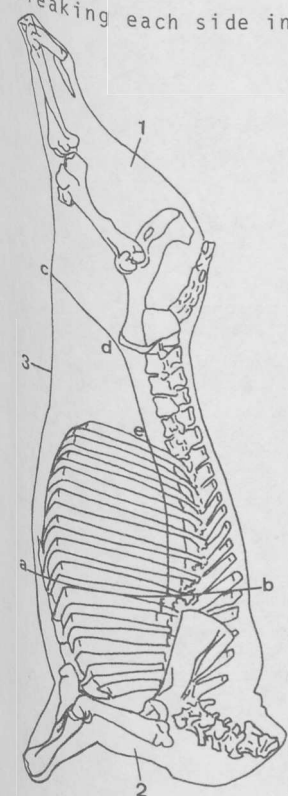
Introduction

Attempts to increase beef production in Brazil have resulted in the introduction of additional European breeds which have been crossed with Brazilian Zebu cattle. Tests to evaluate the effects of crossbreeding have been conducted without regard for carcass quality or yield characteristics. Limited Brazilian results are available showing the influence of crossbreeding on carcass yield and quality traits, however, those available utilized either the USDA yield grade equation (6,8) or the 9-10-11th rib separation (7). This study was conducted to categorize carcass yields and palatability traits of young bulls of Nelore, Chianina x Nelore and Marchigiana x Nelore breeding.

Materials and Methods

36 young bulls (12 Nelore, 12 Chianina x Nelore and 12 Marchigiana x Nelore) were fed in a feedlot and slaughtered in a commercial plant at a mean group live weight of approximately 450 kg. Carcasses were chilled for 24 hr at 2 C and data were then collected. Both sides of each carcass were separated into parts as is commonly done in the Brazilian commercial meat industry. These are the special hindquarter, forequarter and flank and the method of breaking each side into these parts is shown in Figure 1. The intact 9-10-11th rib cut was

FIGURE 1



1. Special hindquarter: line c-d-e- is cut starting posterior to and then through the pre-crural lymph node and adjacent to the major leg muscles (Quadriceps) to point d which is just ventral to the most anterior tip of the ilium. The cut is then continued parallel to the vertebral column to point e (20-22cm from the ventral tip of the 13th thoracic vertebra) and on to point f located at the 6th thoracic vertebra 4cm from the lateral edge of the *Longissimus* muscle.

2. Forequarter: separated along line a-b between the 5th and 6th ribs, perpendicular to the carcass vertebral column.

3. Flank: the area outlined by points a, c, d, e and f and that portion of the carcass remaining after removing the forequarter and special hindquarter.

removed from the special hindquarter by cutting adjacent to the 9th and midway between the 11th and 12th rib bones. The 9-10-11th rib cut was then physically separated into lean, fat and bone. The dissected *Longissimus* muscle from the 9-10-11th rib section was ground and sampled for proximate analysis of moisture, ether extract and ash (1).

The special hindquarter and forequarter were cut into boneless cuts (trimmed to 5mm or less fat cover), bones and excess fat. Relationships between these and separable lean, bone and fat of the 9-10-11th rib were studied. Four boneless loin steaks (25 mm thickness) were removed consecutively beginning at the 13th rib with the 1st and 3rd steaks used for shear analysis and the 2nd and 4th for taste panel analysis. The steaks were then frozen and stored at -25C. Prior to cooking the steaks were thawed 12 hours at 2 to 4 C, blotted dry and weighed. They were then oven broiled at 170 C in a preheated oven to an internal temperature of 65 C. After cooling approximately 15 minutes, they were re-weighed to determine cooking loss. Then six 12.7 mm cores were removed from each steak (5) and

then subjected to Warner Bratzler shear test. One core from each taste steak was served to each of a six-member trained taste panel who ranked them for tenderness, juiciness and overall acceptability.

One-way analysis of variance was conducted to determine breed differences, a least significant difference test ($P \leq .05$) was applied to means and overall and pooled simple correlation coefficients were determined between major traits.

Results and Discussion

Carcass yield traits - Quantitative carcass traits observed in this study on the three breed groups studied are given in Table 1. The *Longissimus* area of the Nelore breed was significantly smaller than the crossbreds, however, similar or lesser have been reported (2,4) for Nelore steers and young bulls. Carcasses from the crossbred groups yielded significantly more boneless, closely trimmed meat from the special hindquarter than did Nelore carcasses. Part of the yield difference in boneless, trimmed meat from the special hindquarter is due to the greater percent fat trim from the Nelore breed. These results are in agreement with (3) who found a higher percentage of boneless trimmed meat from the special hindquarter in young Charolais and Chancim (5/8 Charolais x 3/8 Zebu) bulls when compared to Zebu breeds and (4) who found 32.53% and 33.09% of boneless trimmed meat from the special hindquarter respectively for young Nelore and Swiss x Guzera bulls. No differences, however, were observed in yields of boneless, trimmed meat from combined special hindquarter and forequarter between the breed groups. This would indicate that Nelore cattle yield more boneless, closely trimmed meat from the forequarter, much of this undoubtedly was due to the heavier weight of hump from the Nelore breed. Nelore carcasses yielded less bone indicating they may have a tendency to yield lesser percentages of bone but differences were not significant. Bone yields (table 1) from crossbred carcasses in this study were similar to those reported by (9).

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Total bone*	16.0 ± 1.1	17.2 ± 1.3	16.7 ± 1.2

¹ The *Longissimus* muscle area was measured between the 11th-12th rib, cm²
² The fat thickness was measured at the 12th rib
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Traits	Breed Group		
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Longissimus Composition			
Moisture, %	74.29 ± 1.27	75.32 ± .97	74.66 ± 1.25
Fat, %	3.36 ^a ± 1.06	1.77 ^b ± .64	1.93 ^b ± .37
Ash, %	1.05 ± .03	1.08 ± .07	1.08 ± .08
Cooking loss, %	19.99 ^b ± 2.53	21.23 ^b ± 2.44	23.53 ^a ± 3.10
Shear force,kg	3.97 ± .66	3.84 ± .73	4.06 ± .59

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Carcasses from Nelore cattle are obviously fatter at the slaughter weight of this study. They had significantly more outside fat (Table 1) as well as a greater percent fat in the *Longissimus* muscle. This indicates a tendency for straight Nelore cattle to fatten at lighter weights than Nelore crossbreds. Young Nelore bulls and steers slaughtered at lighter weights have been reported to have less *Longissimus* fat content (2) and less outside fat cover (2.4) than found in this study. Cooking losses were significantly greater in steaks from Marchigiana x Nelore carcasses. Differences in cooking loss were directly related to cross-sectional area of *Longissimus* muscle and were probably largely due to greater surface area of the steaks from crossbred cattle, especially the Marchigiana x Nelore cross.

Warner Bratzler shear values between the breed groups were not significantly different. Subjective taste panel evaluation of tenderness, juiciness and overall acceptability showed no significant differences despite the higher fat content present in the Nelore breed. Components of 9-10-11th rib cut as removed in this study showed low relationships between separable muscle and fat to comparable separable carcass components (Table 3).

TABLE 3 - Relationships between boneless trimmed meat, bone and trimmings of the special hindquarter plus forequarter and separable components of the 9-10-11th rib cut.

Relationships Between		All Bulls	Crossbred Bulls	Nelore Bulls
9-10-11th rib separable components	Special hindquarter plus forequarter	r	r	r
Muscle	Boneless, closely trimmed meats	.19	.43*	.35
Bone	Bone	.68**	.63**	.79**
Fat	Fat trimmings	.31	.30	.18

* ($P < .05$)

** ($P < .01$)

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The only relationship of predictive value was between 9-10-11th rib separable bone and total carcass bone.

Equations for predicting percentage of total carcass bone are as follows:

1) All bulls: $Y = 5.71 + .61X$

2) Crossbreds bulls: $Y = 5.34 + .65 X$

3) Nelore bulls: $Y = 6.63 + .52 X$

Where $X = \% \text{ bone from 9-10-11th rib cut.}$

Conclusion

Based on these results, the 9-10-11th rib cut removed from the special hindquarter, is not an accurate predictor of fat trim or yield of boneless, closely trimmed meat from carcasses from cattle of these breeds produced under similar conditions.

This study suggests that crossing Nelore cattle with the Chianina and Marchigiana breeds results in the production of carcasses with larger *Longissimus* cross-sectional area and less outside fat cover, also, that crossbred carcasses have a higher bone to boneless trimmed meat ratio than do Nelore cattle.

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