SENSORY ACCEPTANCE OF BEEF FROM CROSSBRED ANIMALS

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Abstract – Sensory attributes of beef are very important in consumer's point of view, mainly regarding to its tenderness and flavour. Crossbreeding of two or more breeds from *Bos taurus* and *Bos indicus* species is an alternative for obtaining high quality meat from adapted animals to tropical climates. This study aimed to evaluate the sensory acceptance of crossbred heifers and steers from Canchim, Braunvieh or Hereford bulls and 1/2 Angus x 1/2 Nellore, 1/2 Senepol x 1/2 Nellore or Nellore cows. Flavour, texture and overall acceptance were evaluated. Beef of heifers from Hereford x 1/2 Senepol + 1/2 Nellore crossbreed showed the highest values ($p<0.05$) for flavour, texture and overall acceptance.

Key Words – Consumer, Eating quality, Meat

- INTRODUCTION

Sensory characteristics as colour, tenderness, aroma and flavour are very important for consumers. Many factors can affect these attributes such as breed, age, diet, live weight, sex as well as slaughter conditions, meat aging and cooking process [1]. In Brazil, ~80% of animals are originated from *Bos indicus*, which in general show less tender meat if comparing to *Bos taurus* [2]. Meat tenderness in crossbred animals tend to be lower when *Bos indicus* proportion rises and more than 25% of *Bos indicus* would not be recommended [3]. The use of tropical climate adapted *Bos taurus* breeds without losing adaptation to tropical and subtropical climates is an alternative to produce beef to satisfy both consumers and retailers. The aim of this study was evaluate the sensory acceptance of crossbred animals from adapted and non-adapted breeds.

- MATERIALS AND METHODS

Beef from steers and heifers from crosses of Canchim, Braunvieh or Hereford bulls and 1/2 Angus x 1/2 Nellore (TA), 1/2 Senepol x 1/2 Nellore (SN) or Nellore (NX) cows from Embrapa Southeast Livestock, São Carlos, Brazil were evaluated, in a total of 16 traits. The *Bos taurus* and *Bos indicus* proportions are shown in Table 1.

Table 1 *Bos taurus* and *Bos indicus* proportion in the crossbred animals

	Bull genetic group		
	Canchim	Braunvieh	Hereford
Cow genetic group	%		

Nellore	5/16 Bt + 11/16 Bi	1/2 Bt + 1/2 Bi	1/2 Bt+ 1/2 Bi
½ Angus + ½ Nellore	9/16 Bt + 7/16 Bi	3/4 Bt + 1/4 Bi	3/4 Bt + 1/4 Bi
½ Senepol + ½ Nellore	9/16 Bt + 7/16 Bi	3/4 Bt + 1/4 Bi	3/4 Bt + 1/4 Bi

Bt= *Bos taurus;* Bi=*Bos indicus*

After weaning at 8 months, animals were raised at pasture for approx. 10 months and maintained at feedlot for approx. 90 days. At the end of the feeding period, animals had an average age of 22 months and a live weight of 503 kg. Animals were slaughtered when reached 5 mm of fat thickness estimated by ultrasound measurements. After slaughtering the animals in a commercial abattoir, carcasses were chilled overnight at 2°C. At 24 hours post mortem, the left half-carcass was cut between the 12th and 13th ribs and 2.5 cm steaks were removed for sensory analyses, vacuum-packed and frozen. Beef steaks from five animals of each combination were used. The day before the sensory analysis session, they were placed in a refrigerator at 5°C overnight. The following day, steaks were cooked in a Tedesco combined oven, model TC 06 (Tedesco, Caixas do Sul, RS, Brasil), at 170°C, until reaching an internal temperature of 75°C. Each steak was cut into 1.5 cm cubes and was randomly assigned to 91 non-trained panelists, divided into 4 different sessions where 4 traits were analyzed. The samples were presented for each panelist in a balanced design assigned by Fizz Software version 2.41 (Biosystemes, Couternon, France). Attribute ratings were electronically collected using nine- point hedonic scales for flavour, texture and overall acceptance (1 = dislike extremely ; 9 = like extremely) The experimental design was completely randomized, with bull genetic group, cow genetic group and sex as fixed factors. The proposed model was analyzed by XLSTAT software [4].

- RESULTS AND DISCUSSION

Results of analysis of variance (ANOVA) are shown in Table 1. Cow genetic group (GGV) did not affect neither of the sensory attributes. Bull genetic group (GGT) affected texture and overall acceptance. The sex affected the flavour attribute, but no interaction was found.

Table 2 Analysis of variance

	Sum of squares		
Fixed effects	Flavour	Texture	Overall acceptance
GGT	2.797	7.924*	11.659**
GGV	1.281	2.724	2.555
SEX	16.383**	21.144**	28.195***
GGT*GGV	1.462	10.282	7.022
GGT*SEX	0.803	17.238**	6.874*
GGV*SEX	7.578	25.015***	7.290*
GGT*GGV*SEX	4.337	16.714**	5.917*
Error	1.700	2.438	1.818
R2	0.057	0.135	0.116
SD	1.326	1.658	1.417
S.E.M.	0.053	0.067	0.057

GGT=bull genetic group; GGV=cow genetic group;*p<0.05; **p<0.01; ***p<0.001

In this study, sex also played an important role in the texture and overall acceptance attributes, also showing double interactions between GGT and GGV. Sex is known to be a factor which affects meat texture. Female animals have higher intramuscular fat and smaller diameter muscle fibres, showing higher tenderness meat [5]. A triple interaction GGT x GGV x SEX was found

for these same attributes.

Table 3 Sensory acceptance values of beef from crossbred steers and heifers from different genetic groups

Fixed effects			Sensory attributes		
GGT	GGV	Sex	Flavour	Texture	Overall acceptance
CX	NX	F	7.2^{ab}	6.2^{ab}	6.9^{abcd}
CX	SN	F	7.6^{ab}	7.4^{cd}	7.1^{abcd}
CX	SN	M	6.6^{a}	6.8^{bc}	6.5^{abc}
CX	TA	F	6.8^{ab}	6.4^{bc}	6.8^{abcd}
CX	TA	M	7.0^{ab}	7.2^{bcd}	6.9^{abcd}
PX	NX	M	7.1^{ab}	6.9^{bc}	7.3^{bcde}
PX	SN	F	7.5^{ab}	7.5cd	7.5^{de}
PX	SN	M	6.7^{ab}	5.4^{a}	6.2^{a}
PX	TA	F	7.2^{ab}	7.0^{bcd}	7.4^{cde}
PX	TA	M	7.3^{ab}	7.0^{bcd}	7.1^{abcd}
RX	NX	F	7.4^{ab}	6.9^{bc}	7.4^{cde}
RX	NX	M	7.2^{ab}	7.0^{bcd}	7.3^{cde}
RX	SN	F	7.7^{b}	8.1^{d}	8.1^{e}
RX	SN	M	7.1^{ab}	7.2^{bcd}	7.4^{cde}
RX	TA	F	7.4^{ab}	7.4^{cd}	7.6^{de}
RX	TA	M	6.7^{ab}	6.1^{ab}	6.4^{ab}

GGT=bull genetic group; GGV=cow genetic group; RX=Hereford; PX=Braunvieh; CX=Canchim; NX=Nellore; SN= 1/2 Senepol x 1/2 Nellore; TA= 1/2 Angus x 1/2 Nellore; M=male; F=female; ^{a,b,c,d,e}Means in the same column with different superscripts are significantly different ($P<0.05$).

Sensory attributes values for flavour, texture and overall acceptance are shown in Table 3. Beef of steers from Canchim x 1/2 Senepol + 1/2 Nellore showed the lowest value for flavour and Braunvieh x 1/2 Senepol + 1/2 Nellore showed lower values for texture and overall acceptance. On the other side, beef from heifers from Hereford x 1/2 Senepol + 1/2 Nellore showed the highest values for flavour, texture and overall acceptance. Differences between the combinations among bull genetic group, cow genetic group and sex can be explained as flavour compounds such as nitrogen and sulphur compounds, free aminoacids, alcohols, aldehydes and ketones may differ among genetic groups [6,7]. In a study with *Bos taurus* e *Bos indicus* species, including crossbreeds from Hereford, Angus, Brangus, Beefmaster, Bonsmara e Romosinuano, calpastatin and μ-calpain markers, normally related to tenderness were associated to flavour intensity [8].

Principal component analysis is shown in Figures 1 and 2.

Figure 1. PCA attributes graph

Figure 2. PCA traits graph

The sensory acceptance attributes explained 99.31% of variation among the studied traits. It is clearly shown in the figures the separation of the traits, with heifers at the right side of the graph and steers at the left side, as well as the RXSNF trait close to all the sensory acceptance attributes at the very right side as the most accepted sample and at the other side, the PXSNM, which was the least accepted.

- CONCLUSION

Bull genetic group, cow genetic group and sex affected the sensory acceptance of beef from crossbred animals. Sex had effect on the flavour attribute. Beef of heifers from Hereford x

1/2Senepol + 1/2Nellore (RXSNF) crossbreed showed the highest values ($p<0.05$) for flavour, texture and overall acceptance, while steers from Braunvieh x 1/2 Senepol + 1/2 Nellore (PXSNM) showed the lowest values for texture and overall acceptance.

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