

EFFECT OF BOVINE GENOTYPES ON TEMPERAMENT SCORES AND MEAT QUALITY CHARACTERISTICS.

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Background

There are temperament differences between the genetic groups *Bos taurus taurus* and *Bos taurus indicus* and/or their crossbreeds (Grandin, 2000). This difference of behavior can be involved with the increase the stress level of the animals in the pre-slaughter, altering glucolysis rate, color and the water capacity retention of the meat, among other attributes, which affect the quality of the meat. Several works have demonstrated that more reactive animals show a higher incidence of DFD (dark, firm and dry) meat with lower level of tenderness. However, animals that suffer sudden stress usually characterize PSE (pale, soft and exudative) meat, a characteristic associated to genetics or pre-slaughter handling conditions (Burrow, 1997). Therefore, the temperament more excitable of *Bos taurus indicus* animals and their crossbreeds should be taking into consideration during slaughter, especially in situations of lower adaptability to the handling conditions, for producing high quality meat.

Objectives

This work evaluates the effect of the genotype on bovine's reactivity, relating it to the qualitative aspects of the meat. It also determines the levels of pre-slaughter stress of the animals through plasmatic cortisol and, in the *Sternomandibularis* muscle, it evaluates the *post mortem* glucolysis rate.

Methods

Forty castrated males, of which 20 Aberdeen Angus (AA) and 20 crossbreeds 50% Aberdeen Angus and 50% Nelore (N), aging from 18 to 24 months were used. The temperament was evaluated through a temperament score (TS), using a scale from 1 to 5 points, at the moment of weighting, attributing values for head movements, breathing, vocalization and kicks after their entrance (10 seconds) in the scales. The bovines were evaluated five times at intervals of 28 days (4 months before slaughter). Rising scores indicate a high reactivity. The speed flight score (SFS) refers to the time spent for running 2 meters distance after weighting. Less time indicate higher reactivity. After slaughter, pH was evaluated at 1, 3, 7, 12 and 24 hours *post mortem* in the *Sternomandibularis* muscle, using iodoacetate buffer to inhibit glucolysis. For the determination of plasma cortisol, blood (10 ml) was collected, centrifuged and frozen for further analysis through the RIA (Radioimmunoassay) method. The color was evaluated in the *Longissimus dorsi* muscle, using a Minolta colorimeter (Minolta Chroma Meter CR-300). The dependent variables TS, SFS, cortisol and color parameters, were submitted to correlation and variance analysis through GLM and CORR (Pearson), SAS version 6.12 (1989). The separation of the means was done by the Lsmmeans, DMS Fisher test. The minimum level of significance for rejection of the null hypothesis was the 0,05.

Results and Discussion

There were significant differences for the temperament score (TS) in all the five evaluations between the bovine genetic groups (Table1). Significant differences for the speed flight score (SFS) were found in the first and fourth evaluations, in which the animals AN presented the lower values (Table2). Grandin (2000) also observed that the *indicus* bovine crosses, without aging and breeding control, show higher reactivity for handling. Voisin et al (1997), working only with zebu crossbreeds did not find differences of temperament among the animals. According to Grandin (1993), the animals tend to reduce their excitability when the procedures are done repetitively. In *post mortem* the animals AN presented pH1 (first hour) values significantly lower than AA. Barbosa et al. (2000), also found pH1 values inferior for zebu crossbred in relation to European cattle. The pH values found in the experiment are similar to the ones reported by Hwang and Thompson (2001) in carcasses previously stimulated after bleeding. Zamora et al. (1996), working with bovines of Charoles breed found pH1 values similar to the ones found in the genetic group AA. These values of pH1 of the AA group indicate an intermediate anaerobic glucolysis rate, within the normal parameters, while in AN group there is an unusual faster rate. The average of cortisol value is 52 ± 13.18 ng/mL, varying from 29 to 71 ng/mL, which are above of the considered normal levels for bovines by Grandin (1997). It was not observed difference in the cortisol concentration between the genotypes, neither in the behavioral score measured in the loading, unloading and permanence in the waiting pens. However, Zavy et al. (1992) found that *Bos indicus* crossbred calves presented basal levels of plasmatic cortisol 26% higher than *Bos taurus* calves after transportation. There are significant interactions between the genetic group and SFS for colors a* and b*. Considering the genetic group AA, it was not detected difference of meat color in the animals that presented distinct speed flight. However the meat of AN animals had 23% higher color score a* ($P=0,0394$) and 9% higher color score b* ($P=0,0808$) for animals with higher SFS score. The L* color was negatively correlated with TS ($r=-0,54$) and pH24 ($r=0,39$), and the color b* with pH3 ($r=-0,39$) and pH7 ($r=-0,45$). Wulf et al. (1997) also observed that *Bos taurus* animals presented higher scores of color L* and lower scores of color a* than *Bos indicus* crossbred animals. The pH1 decreased when TS and the angle *ab* increased, according to the following regression equation: $pH1 = 7,30 - 0,284 ec - 0,11 ab$, $P = 0,0001$, $R^2 = 0,92$. Higher TS or lower SFS indicate higher reactivity and movement of the cattle, what might lead to an increase of glycogen intake rate by hormonal induction. There is no production of DFD (dark, firm and dry) meat when the energy depletion did not interfere significantly in muscle glycogen level. Nevertheless that energy depletion can hasten the anaerobic glucolysis rate explaining the decreasing of pH1. Higher scores of *ab* angle indicate a lighter color, which combined with the lower initial level of pH can characterize a higher incidence of PSE in these animals.

Conclusion

More reactive bovines present higher *post mortem* anaerobic glucolysis rate and lighten red color, characteristics that could be compatible with meat PSE (pale, soft and exudative).

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Table 1 – Means of Temperament Score (TS) of two bovine genetic groups after five evaluation time

Temperament score*	Genetic Group		P>F
	Aberdeen Angus	Aberdeen Angus x Nelore	
TS1	1,10 ± 0,02	3,20 ± 0,02	0,0001
TS2	1,10 ± 0,02	2,60 ± 0,02	0,0001
TS3	1,00 ± 0,19	1,95 ± 0,19	0,0010
TS4	1,10 ± 0,13	1,65 ± 0,13	0,0041
TS5	1,00 ± 0,14	1,70 ± 0,14	0,0009

*Evaluation number: 1 (initial evaluation 4 month before slaughter), 2, 3, 4 and 5 (after 28 days).

Table 2 – Means of Speed Flight Score (SFS) of two genetic groups after five evaluation time

Speed Flight Score*	Genetic group		P>F
	Aberdeen Angus	Aberdeen Angus x Nelore	
VS1	2,10 ± 0,16	1,34 ± 0,16	0,0022
VS2	2,61 ± 0,32	2,20 ± 0,32	0,3649
VS3	3,27 ± 0,53	2,60 ± 0,53	0,3739
VS4	4,67 ± 0,57	2,30 ± 0,57	0,0056
VS5	4,33 ± 0,84	3,16 ± 0,84	0,3261

*Evaluation number: 1 (initial evaluation 4 month before slaughter), 2, 3, 4 and 5 (after 28 days).