

Colour evaluation AND ACCEPTABILITY OF BEEF FROM YOUNG BULLS FINISHED WITH STANDARD GRAIN DIET CONTAINING an increasing proportion of cotton hulls

M.V. Valero^{1*}, C.E. Eiras¹, C.B. Carvalho¹, M.S.S. Pozza¹, T. Ramos¹ and I.N. Prado¹

¹Animal Science Department, State University of Maringá, Av. Colombo, 5790, 87020-900, Maringá, Paraná, Brazil

*maribelvelandia@hotmail.com

This paper is poorly written and the English is not correct. This text must be read by a native English speaker. The statistical treatments of data are not appropriate. A two way variance analysis should be more appropriate with two factors (day and feed) and the interaction between the two factors. This paper is focused on colour evaluation by panalists. This is not equal to a visual evaluation of meat which also includes other parameters such as brightness, global aspect. Some suggestions are made in the text.

Abstract – This work was performed to evaluate the visual appraisal and acceptability of meat from 30 crossbred (½ Simmental vs. ½ Nellore) young bulls finished with high grain diets containing various amounts of cottonseed hulls (210 g/kg; 270 g/kg and 330 g/kg on DM: CH21, CH27 and CH33 respectively). *Longissimus* steaks from the three diets aged for 10 days, were used to analyzed visual acceptability of beef. Thirty seven Brazilian consumers participated in this study. Consumers evaluated colour acceptability of meat from using a hedonic nine point score. Cottonseed hull diets affect meat acceptability ($P \leq 0.001$). Meat from bulls fed diets with greater amounts of cottonseed hulls was the best classed from the second until sixth day. In general, shelf life of beef of four day and score above 5 points had a good acceptability.

Key Words –Alternative feeds, meat colour, shelf-life

I. INTRODUCTION

Co-products from agribusinesses could potentially be utilized in beef cattle production when they are fed in intensive system [1, 2] with no damage on carcass characteristics and meat quality [3].

Meat quality is a term used to describe properties and perceptions of meat; it includes lot of attributes, among them the visual appearance. The colour of the meat is an essential factor for consumer acceptance because it indicates its freshness. According to AMSA [4], the visual appraisals of meat color is the “fundamental standard” of colour measurements because they closely relate to consumer evaluations and set the benchmark for instrumental measurement

comparisons. Visual colour evaluation by panelists is not easy to conduct because human evaluation may not be replicable from day to day and is influenced by personal preference. Studies about beef visual acceptability evaluated by Brazilian consumer are scarce.

The aim of this work was evaluate visual colour consumers and acceptability of meat from crossbreed young bulls finished with diets containing various proportions of cottonseed hulls in feedlot.

II. MATERIAL AND METHODS

Thirty crossbreed young bulls (½ Simmental vs. ½ Nellore) of 319 ± 12.5 kg live weight were randomly assigned to one of three diets ($n=10$ per treatment) based on high grain feed with different levels of cottonseed hulls: CH21, CH27 and CH33 (210 g/kg; 270 g/kg and 330 g/kg of cottonseed hull on DM basis, respectively). The 3 diets (soybean hull pellets, ground corn, sugarcane bagasse pellets, corn gluten meal, cottonseed hull, yeast, urea, limestone and mineral salt) were formulated to be isonitrogenous and isoenergetics according to NRC [5] recommendations to provide a weight gain of 1.0 kg/day (Table 1).

Table 1: Chemical composition of the base diets (g/kg DM) fed to bulls in high grain system

Item	Cottonseed hull diets		
	CH21	CH27	CH33
Dry matter	905	905	906
Ash	51.9	52.3	52.9
Organic matter	938	938	937
Crude protein	110	110	110

Ether Extract	24.1	23.5	22.7
Neutral detergent fiber	559	579	604
Acid detergent fiber	363	367	376
Total carbohydrates	819	820	822
Neutral fiber carbohyd.	256	237	214
Metabolizable energy*	10.5	10.5	10.5

*ME: Metabolizable energy (MJ kg⁻¹ DM) was calculated from NRC, 2000 model.

Animal were fed *ad libitum* during 162 days until they reached a commercial live weight (423.6 ± 6.5 kg). Afterwards, they were slaughtered in a commercial abattoir according to cattle routine in Brazil. The left *Longissimus* muscle (LM) muscles were removed from each carcass 24 h after slaughter and cut into 2.5 cm-thick steaks from the 7th vertebra of each animal. Each sample was packaged in polystyrene trays over wrapped with a retractile oxygen permeable film and stored refrigerated at 4 °C under a fluorescent lamp (380 lux) for 12 h per day simulating typical Brazilian market conditions.

Steaks were stored for 10 days. Each day, a panel of 37 consumers evaluated the visual acceptability of meat and the willingness to buy each piece and, using an hedonic 9 points scale (1 = dislike extremely; 9 = like extremely). To avoid any consumers' tendency on steak evaluation, the identifying code placed on tray were change each two days, as well as the place of steaks on the display.

III. RESULTS AND DISCUSSION

There were differences in colour evaluation between the different diets and between days of storage ($p < 0.0001$, Table 2). Meat from bulls fed with CH33 diet showed the highest scores followed by meat from the CH27 diet and the lowest scores were for meat from the CH21 diet. Also, can be appreciated that CH33 diet maintained higher meat acceptability (until 6 days), than the other two experimental diets.

Table 2: Evolution of colour evaluation of meat from young bulls fed high-grain diet containing various proportions of cotton hulls during a 10 day display § (n=37 consumers)

Days	CH21	CH27	CH33	SEM	P
1	7.27A	7.29A	7.47 A	0.045	0.14
2	6.85 By	7.04 Axy	7.23Ax	0.043	0.002

3	6.18Cy	6.50Bx	6.53Bx	0.041	<0.001
4	5.59Dy	5.98Cx	6.04Cx	0.040	<0.001
5	4.92 Ey	5.17Dx	5.31Dx	0.039	<0.001
6	4.26 Fy	4.33Exy	4.48Ex	0.038	0.05
7	3.69 G	3.69G	3.72 F	0.036	0.94
8	3.12 G	3.09 H	3.05 H	0.036	0.73
9	2.31 H	2.22 I	2.16 I	0.031	0.15
10	1.67 I	1.59 J	1.63 J	0.028	0.45
SEM	0.037	0.038	0.038		
P-value	<0.001	<0.001	<0.001		

CH21: cottonseed hull 210 g kg⁻¹ on a DM basis; CH27: cottonseed hull 270 g kg⁻¹ on a DM basis; CH33: cottonseed hull 330 g kg⁻¹ on a DM basis; A-J: different letters in the same column indicate significant differences ($P \leq 0.05$) on time of display; x-y: different letters in the same row indicate significant differences ($P \leq 0.05$) on diets. SEM: Standard error of mean; §Based on a hedonic 9 points scale.

Beef steaks from these 3 diets were scored for colour over 4 points by the panellists until 6 day of storage. This colour score is considered as according to Gobert et al. [6] and Ripoll et al.[7]. However, less than 30% of the panelists accepted to purchase meat with a colour score under 5 (table 3). A score of 50% of consumers accepting to purchase meat is reach for a colour score above 5.59 (Tables 2 and 3).

Table 3: Frequencies of acceptability to buy meat from young bulls fed high-grain diet containing various proportions of cotton hulls during 10 day

Display	CH21	CH27	CH33
1	85.4	86.8	90.8
2	77.6	83.8	88.9
3	68.1	78.6	78.1
4	52.7	68.9	69.2
5	31.1	39.7	43.8
6	23.5	25.7	31.1
7	15.1	13.2	13.0
8	9.46	8.11	9.46
9	1.89	1.89	1.62
10	0.27	1.35	0.54

CH21: cottonseed hull 210 g kg⁻¹ on a DM basis; CH27: cottonseed hull 270 g kg⁻¹ on a DM basis; CH33: cottonseed hull 330 g kg⁻¹ on a DM basis; SEM: Standard error of mean.

IV. CONCLUSION

The higher score of color (visual appraisal) were for beef steaks from young bulls fed on the diet with with the higher content in cotton hulls on intensive feeding systems. In general, beef meat stored refrigerated for four day and with a colour score over 5 points had a good acceptability by local consumers. Although this would encourage the use of this kind of co-product in feeds of young bulls, it is necessary to make more studies to evaluate effects of animal health and welfare.

ACKNOWLEDGEMENTS

This work was supported by the Araucaria Foundation and the Brazilian Council for Research and Technological Development (CNPq). The authors gratefully acknowledge the FORTMIX animal technology® (Maringá, Paraná, Brazil) for providing the co-products used in this research. The mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendations or endorsement by the Department of Animal Science, Maringá State University, Paraná or Brazil.

REFERENCES

1. Eiras, C. E., Barbosa, P., Marques, J. A., Lima, B. S., Zawadzki, F., Perotto, D. & Prado, I. N. (2014a). Glycerine levels in the diets of crossbred bulls finished in feedlot: apparent digestibility, feed intake and animal performance. *Animal Feed Science and Technology*, 197, 222-226.
2. Eiras, C. E., Marques, J. A., Prado, R. M., Valero, M. V., Bonafé, E. G., Zawadzki, F., & Prado, I. N. (2014b). Glycerine levels in the diets of crossbred bulls finished in feedlot: Carcass characteristics and meat quality. *Meat Science* 96: 930-936
3. Eiras, C. E., Omaghi, M. G., Valero, M. V., Rivaroli, D. C., Guerrero, A., Carvalho, C. B., & Prado, I. N. (*in press*). Cottonseed hull content from Brazilian agribusinesses on carcass characteristics and meat quality of bulls finished in a high-grain system. *Animal Feed Science and Technology*.
4. AMSA. (2012), American Meat Science Association. In <http://www.meatscience.org>, Illinois USA.
5. NRC. (2000). *Nutrient Requirements of Beef Cattle*. 7th ed. Natl. Acad. Press, Washington, DC.
6. Gobert, M., Gruffat, D., Habeanu, M., Parafita, E., Bauchart, D., & Durand, D. (2010). Plant extracts combined with vitamin E in PUFA-rich diets of cull cows protect processed beef against lipid oxidation. *Meat Science*, 85,676–683
7. Ripoll, G., Joy, M., & Muñoz, F. (2011). Use of dietary vitamin E and selenium (Se) to increase the shelf-life of modified atmosphere packaged lamb meat. *Meat Science*, 87, 88–93.