

## INFLUENCE OF FEEDING SYSTEM AND FINISHING FEEDING IN TIE STALL HOUSING ON SENSORY QUALITY OF BEEF PRODUCED IN NE ARGENTINIAN AREA

TEIRA, Gustavo A.; PERLO, Flavia; BONATO, Patricia I.; MONJE, Ariel; GALLI, Ignacio

Facultad de Ciencias de la Alimentación. Universidad Nacional de Entre Ríos. Tavella 1450. 3200. Concordia. Argentina.

### Background

The North Eastern region in Argentina (NEA) has weather and topographic conditions that are more demanding than the Pampa area for cattle breeding. This fact, added to the loss of vast areas due to agriculture, does not allow the area to be considered a steer rearing region but a calf producing one. In spite of this fact, the NEA has a great potential value for rearing and fattening of calves (Sagpya, 2003). Cattle breeders often have to substitute the traditional extensive feeding system to achieve the desired final weight in reasonable time. Finishing feeding in tie-stalls, with high energy diets is a frequent methodology in other countries and beef producing areas. However, the feeding systems and finishing feeding may have a potential influence on physico-chemical characteristics (Keane & Allen, 1998), colour (Felicio, 1999), palatability (Dikeman et al., 1985) and the sensory characteristics in general (Price & Scheweigert, 1994).

### Objective

The objective of this work was to evaluate the sensory characteristics of beef produced by animals with a finishing period in tie stall housing in comparison with animals produced using only the grazing system. The longest feedlot period without affecting the final quality was selected.

### Methods

Beef from a total of 30 Hereford animals was used. The experiment was conducted on animals with different finishing feeding times in tie stall housing: 40 (F40), 60 (F60) and 80 (F80) days and animals raised on pasture exclusively (F0). An initial period of 10 days for the steers to get used to the new feeding system was not counted in the first three treatments. The high energy diet consisted of 95% of commercial pellet feed (85.4% dry matter, 15.4% brute protein) and 5% of milled hay (83.4% dry matter and 7.1% brute protein). The steers were slaughtered at approximately 380 kg of mean live weight. Samples 2.5 cm thick were taken from the striploin (*longissimus dorsi*) at the left side hindquarter. Ultimate pH (24 h) was measured and colour of meat and fat (CIELAB system, L\*: lightness, a\*: redness, b\*: yellowness, D<sub>65</sub> as illuminant, 10° as standard observer), total cooking losses (difference between raw and cooked meat) and Warner Bratzler shear force (AMSA, 1995) were determined at the 12<sup>th</sup> rib steak. Steaks were cooked to a final internal temperature of 80°C using dry heat (170°C) for sensory evaluation. These measurements were undertaken by a sensory panel where each panellist evaluated cooked steaks for flavor, taste, juiciness and acceptability on a scale of 1 to 7 (1: non-existent, very mild, very dry, poor; 7: intense, very strong, very juicy, very good).

### Results and discussions

The multiple analysis of variance (table 1) indicated that only tenderness was significantly affected ( $p < 0.05$ ) by the treatments (figure 1). Steaks corresponding to treatment F80 had a higher tenderness rating (4.33;  $p < 0.05$ ) compared with the treatment F0 (grazing production system). The comparison with treatments F40 and F60 did not reveal any significant difference ( $p > 0.05$ ). No significant correlations ( $p > 0.05$ ) were found in tenderness with pH and cooking losses (table 2). Previous reports suggested that feedstuffs may not be the principal cause for tenderness differences (Vestergaard, 2000) which may be explained by more intense physical activity during grazing. Ultimate pH was constant with the different treatments. Total cooking losses decreased significantly after 80 days of feedlot (7.5%,  $p < 0.05$ ) rendering a final lower value than the traditional extensive system. Cooking losses were similar to those reported in previous research (Vestergaard, 2000) except on treatment F80. Colour of meat (L\*, a\* and b\*) was not significantly affected ( $p > 0.05$ ) by the feeding system and finishing feeding. Although existing data do not correlate, Sapp et al (1996) found that meat color was similar in animals on different feeding systems. Subcutaneous fat showed a significant higher b\* value on treatment F0 (16.06;  $p < 0.05$ ) in comparison with different feedlot periods that did not show any discrepancies among them ( $p > 0.05$ ). This effect agrees with other reports (Moloney, 1999) that indicated that a significant b\* higher value correlates with a higher carotenoid content in forage or grass diets.

### Conclusions

The main quality characteristics were not affected by the feeding system or finishing feeding under the given conditions. A feedlot time of up to 80 days could be used without any sensory damage to meet the requirements of the agro-system productivity)

### References

- AMSA. American Meat Science Association, guidelines. National Livestock and Meat Board. Illinois. 1995. 48p.
- Dikeman, M.E., Nagele, K.N., Myers, S.L., Schalles, R.R., Kropf, D.H., Kastner, C.L., Russo, F.A.. Accelerated versus Conventional Beef Production and Processing. *Journal of Animal Science*, v.61, p.137. 1985
- Felicio, P. E. de.. *Anales del XXXVI Reuniao Anual da Sociedade Brasileira de Zootecnia*. Porto Alegre, Brasil. 1999.
- Keane, M.G.; Allen, P. Effects of Production system Intensity on Performance, Carcass Composition and Meat Quality of Beef Cattle. *Livestock Production Science*, v.56, p.203-214. 1998.
- Moloney, A. The quality of meat from Beef Cattle. 1999. On line. [www.rhhall.ie/print/issue4-1999.html](http://www.rhhall.ie/print/issue4-1999.html). 25/octubre/00.
- Price, J; Scheweigert, B. *Ciencia de la carne y productos cárnicos*. Ed. Acribia, 2° ed., Zaragoza. 1994. 581 p.
- SAGPYA. Secretaria de Agricultura, Ganadería, Pesca y Alimentación de la República Argentina. On line: [www.sagpya.mecon.gov.ar/0-0/index/ganaderia/index-ganaderia.htm](http://www.sagpya.mecon.gov.ar/0-0/index/ganaderia/index-ganaderia.htm). Informe Inta: Situación de la Ganadería en el Noreste Argentino. 21/04/2003.
- Sapp, P. H., Williams, S. E., McCann, M. A. Sensory attributes, retail display and storage characteristics of pasture and/or grain-fed beef. <http://www.ads.uga.edu/annrpt/1996/96-054.htm>
- Vestergaard, M.; Therkildsen, M.; Henckel, P.; Jensen, L.R.; Andersen, H.R. & Sejrsen, K. Influence of feeding intensity, grazing and finishing feeding on meat and eating quality of young bulls and the relationship between muscle fibre characteristics, fibre fragmentation and meat tenderness. *Meat Science*, v.54, p.187-195. 2000.

Table 1. Effect of feeding system and feedlot time on the selected parameters.

	Treatments			
	F0*	F40	F60	F80
Flavor	4.35a <sup>(1)</sup>	4.05a	4.29a	4.32a
Juiciness	4.80a	4.20b	4.38ab	4.50ab
Taste	3.80ab	3.87ab	3.64a	4.20b
Acceptability	4.59a	4.55a	4.43a	4.54a
Tenderness (kgf)	5.84a	5.21ab	5.42ab	4.33b
Cooking losses (%)	12.7b	15.7b	13.9b	7.5a
pH	5.41a	5.48a	5.43a	5.43a
L*	35.04ab	34.49ab	33.67b	35.84a
Meat a*	19.06a	20.06a	20.03a	19.12a
b*	5.75ab	4.76a	5.92b	5.35ab
L*	68.25a	69.98a	68.87a	69.53a
Fat a*	4.63a	8.01b	6.00a	8.32b
b*	16.06a	12.87b	12.22b	10.74b

\*F0: animals raised on pasture exclusively; F40, F60 y F80: animals with 40, 60 and 80 days of finishing feeding in tie stall housing, respectively. <sup>(1)</sup>Lower case lettering indicates significant differences (p<0.05) according to Tukey test.

Table 2. Correlations between the quality characteristics of beef studied.

	Treatments	Tenderness	Cooking losses	Flavour	Juiciness	Taste	Acceptability	pH
Treatments	--	-0.49*	-0.52*	0.22	-0.09	-0.23	0.05	0.00
tenderness	-0.49*	--	0.33	-0.06	0.06	0.07	0.07	-0.15
cooking losses	-0.52*	0.33	--	-0.20	0.09	-0.14	0.17	0.13
flavour	0.22	-0.06	-0.20	--	-0.01	-0.04	0.33	-0.35
juiciness	-0.09	0.06	0.09	-0.01	--	0.10	0.35	-0.11
taste	-0.23	0.07	-0.14	-0.04	0.10	--	0.08	-0.12
acceptability	0.05	0.07	0.17	0.33	0.35	0.08	--	-0.25
pH	0.00	-0.15	0.13	-0.35	-0.11	-0.12	-0.25	--

\*Values of asterisk show significant correlations ( $\alpha=0.05$ ).

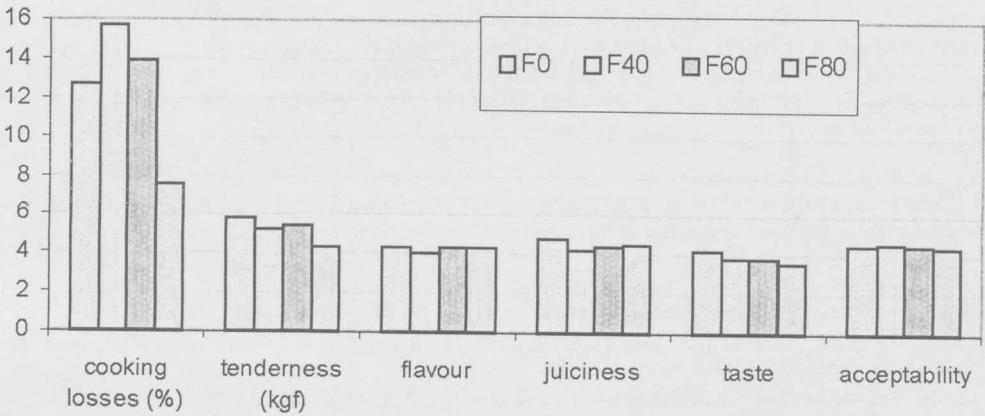


Figure 1. Sensory characteristics and cooking losses according to studied parameters.

Acknowledgements

The authors wish to acknowledge the financial support of Universidad Nacional de Entre Ríos and Instituto Nacional de Tecnología Agropecuaria (Experimental Concepción del Uruguay) and Professors Alicia Nocetti and Guillermina Chabrilón for her assistance.