The effect of post-weaning management on the physico-chemical and textural quality of beef from bulls and steers

M. Oliván, P. García, M.J. Martínez, M. Mocha, A. Martínez, P. Castro and K. Osoro
S.E.R.I.D.A. Apdo 13,33300 Villaviciosa, Asturias, Spain, Email: mcolivan@serida.org

Keywords: extensive system, castration, grain-finishing, beef quality

Introduction There is an increasing interest for extensification in Europe due to environmental and animal welfare concerns. Furthermore, forage-fed beef may present benefits for human health. However, animals fed at pasture produce in some cases darker and tougher meat. It has been shown that castration or a grain-finishing period before slaughter could improve some sensory traits of beef from pasture. The objective of this work was to study the impact of castration and four feeding systems (grazing, grazing + 70 days concentrate, grazing + 100 days concentrate, 200 days concentrate) on the quality of beef from yearling bulls and steers.

Materials and methods Ninety four bulls of "Asturiana de los Valles" breed were managed and slaughtered around 500 kg live weight (15 to 19 months age). Fifty five animals were castrated at 10 months age and 39 remained entire. For each physiological state, there were four feeding treatments: 1) grazing on ryegrass and clover pastures, 2) grazing + concentrate for 70 d before slaughter, 3) grazing + concentrate for 100 d, 4) intensive feeding with concentrate for 200 d. Animals were slaughtered in a commercial abattoir following approved EU procedures. At 24 h *post mortem* cold carcass weight (kg) was recorded and pH was measured on the *Longissimus* muscle of the left carcass. The loin from 6th to 8th ribs was extracted, sliced and aged for 7 d for subsequent analysis. Water-holding capacity was estimated as expressible juice (EJ) and intramuscular fat (IMF) content by Soxhlet extraction. The loin colour was measured after 6 d oxygenation in the CIE L* a* b* space. Toughness of cooked meat was determined by Warner-Bratzler (WB) shearing force.

Table 1 Effect of castration (C) and grain-feeding (F) on meat characteristics

	Bull				Steer				Effect	
Grain-feeding (days)	0	70	100	200	0	70	100	200	C	F
Carcass (kg)	288	295	349	324	253	266	293	244	***	***
pH24	5.7	5.4	5.4	5.4	5.5	5.4	5.4	5.4	**	***
EJ (%)	23.9	22.7	22.8	20.6	24.0	20.9	22.0	18.2	*	***
IMF (%)	1.1	1.9	2.3	2.9	2.3	2.9	3.8	4.1	***	***
WB (kg)	6.0	5.2	5.7	4.7	4.7	4.5	4.4	4.0	***	*
L*	35.8	41.7	41.8	42.7	38.0	41.5	41.3	42.8	NS	***
a*	18.3	21.0	21.6	18.6	21.3	21.7	23.0	21.6	***	***
b*	4.2	9.9	9.8	10.7	6.3	9.8	10.4	10.3	NS	***

Results Steers produced lighter carcasses ($p<0.001$), although they were slaughtered at the same age as bulls. Castration decreased the ultimate pH of carcass ($p<0.01$), but pH values were normal in all treatments. Meat from steers also showed lower juice losses ($p<0.05$), higher IMF ($p<0.001$), lower toughness ($p<0.001$) and higher redness values ($p<0.001$). Concentrate feeding affected significantly carcass weight and age, due to differences in fattening level. Ultimate pH was higher ($p<0.001$) in animals from pasture. Grain-feeding also decreased significantly juice losses (EJ, $p<0.001$), increased IMF ($p<0.001$) and decreased meat toughness ($p<0.05$). Meat produced from pasture was significantly darker than meat from any other treatment.

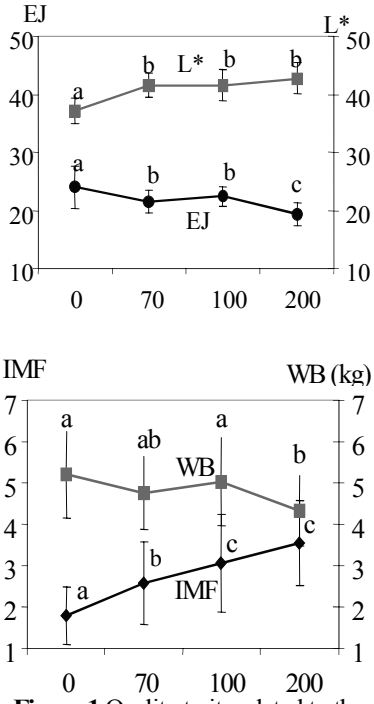

Figure 1 Quality traits related to the concentrate feeding period

Conclusions Castration and the inclusion of a grain-finishing period improved the quality of meat produced from pasture. Meat from steers had higher intramuscular fat, lower juice losses and lower toughness than meat from bulls. Concentrate feeding reduced meat toughness and juice losses and increased the intramuscular fat content. However, this increase was not significant when comparing the intensive feeding with the treatment based on pasture + 100 days concentrate. Whilst the quality of meat from pasture improved when using a grain-finishing period, the increase of concentrate feeding period from 70 to 100 d did not produce significant changes of quality traits such as lightness, water-holding capacity or toughness.