EFFECT OF DIFFERENT DIETS ON CARCASS TRAITS AND MEAT QUALITY IN URUGUAYAN STEERS

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Introduction

Uruguay is a primary meat exporter and its economy is strongly dependent on that. The production systems are based on pastures but intensive systems are growing to improve animal performance and meat quality traits due to meat prices and the access to new markets. These intensive systems include a wide range between pastures and different levels of concentrates. The value of beef from extensive feeding is often discounted compared to concentrate-fed beef because of perceived differences in meat tenderness, colour, and flavour acceptability (French et al., 2000). Dietary effects in many of these experiments are confounded by differences in animal age or carcass end point at slaughter, pre-slaughter growth rate, time on feed, breed or sex. The objective of this experiment was to evaluate the effect of different levels of concentrate and pastures on carcass traits and meat quality in Uruguayan steers.

Materials and Methods

Eighty Hereford steers backgrounded on pasture were finished on one of the following diets with increasing amounts of concentrate: A. pasture (*medicago sativa*) *ad libitum*, B. pasture and concentrate (0.6% of live weight - LW), C. pasture and concentrate (1.2% of LW), and D. concentrate (corn, sunflower pellets and hay) *ad libitum.* Animals (age, 26-30 m.) were killed in a commercial slaughterhouse, when they reached in average 500 kg of LW in each treatment. After slaughter, carcasses were graded and hot carcass weight (HCW) was recorded. The rate of pH and temperature decline was measured at 1, 3 and 24 hs p.m. in the *Longissimus thoracis* (LT) muscle between 12-13th rib using a thermometer (Barnant 115) with type E thermocouple and pHmeter (Orion 210A) with gel device. At 24 hs p.m. carcasses were ribbed between 5-6th rib and fabricated in primal cuts and fat colour was recorded. The pistola cut and 7 boneless cuts from this primal (Strip loin, Tenderloin, Rump, Toproud inside, Bottom round, Thick flank, Tail of rump) *trimmings* and bones were weighed and retail yield was calculated. The muscle/fat/bone proportion was determined using a commercial standard. Two steaks were fabricated and vacuum packaged individually, aged for 7 and 20 days at 2-4 ºC for meat colour and tenderness determination (WB). The bags were opened and the exudation on the surface of the steaks was removed with paper towel. Muscle colour was measured on the LT at 20 d of aging in the L*, a*, b* colour space using a colorimeter (Minolta C10) with an 8 mm diameter measurement area after 1 h of blooming. The LT steaks were placed inside polyethylene bags and cooked in a water bath until an internal temperature of 70 ºC was achieved using Barnant 115 thermometer with type E thermocouple. About six 1.27-cm diameter cores were removed from each steak parallel to the muscle fiber orientation. A single peak shear force measurement was obtained for each core using Warner Bratzler (model D2000) and an average value was calculated for each steak. The results were analysed by GLM SAS procedure, including the treatment as a fix effect and LW as a covariate. LSM means and differences among treatments were estimated.

Results and Discussion

Carcass data of Uruguayan beef from 4 feeding systems are presented in Table 1**.** Grain fed animals had higher LW than cattle from the other treatments and for this reason it was included in the model as a covariate. Among these last (A, B and C) there were no differences (P>0.05). However, B and C treatments had heavier HCW than treatments A (P<0.01) and D (P<0.05). The lower dressing percent in grain fed animals could be explained by fat *trimmings.* Strip loin, tender loin and rump (rump&loin) represent most of the economical value of the carcass and a minimum weight for each cut is requested for certain markets. The heaviest HCW (C treatment) gave heavier (P<0.05) rump&loin than the cuts from pasture fed animals. When the retail yield of the rump& loin was studied, no differences were found among treatments (P>0.05). In this study, there was no difference (P>0.05) in muscle proportion among treatments. However, as it was expected, grain fed steers had higher content of fat (P<0.01). Bone percentage was lower (P<0.01) in D treatments and no differences (P>0.05) were found among the other treatments. Many studies indicate that a higher concentrate level during finishing periods leads to a lower proportion of muscle and bone in the carcass, along with a higher proportion of fat. Cerdeño et al. (2006) did not find differences in muscle and bone proportion in the 6th rib dissection, when comparing animals finished on *ad libitum* concentrate diet or on restricted concentrate diets. Meat quality traits are presented on Table 2. Carcasses from treatments A and C had higher (P<0 .01) pH values at 24 hs p.m. than carcasses from B and D

treatments, although all pH levels were below 5.8. At 24 hs post-mortem, treatment C and D had the highest carcass temperatures. This is consistent with results reported by Realini et al (2004) when carcasses from pastures and concentrate diets were compared. Muscle colour is an important criteria used by consumers at the moment to decide purchase. With 20 d of aging, treatment C had differences ($P<0.01$) in L* values comparing with pasture fed animals. Realini et al, (2004) had shown that LT muscle of grain fed beef had brighter muscle colour than pasture fed steers. There were no differences in a* muscle values among treatments A, B and C. Nevertheless, all of them had higher ($P<0.05$) a* values than treatment D. Numerous studies have consistently shown that feed lot finished cattle have whiter fat colours than pasture fed ones (Realini et al, 2004) due to carotenoid content of green pastures. The b* fat values from carcass in treatment A was higher than carcass from treatment B and C ($P<0.05$) and from those of treatment D ($P<0.01$). WB values for 20 d of aging were higher ($P<0.01$) for treatments B and D than A and C, being pasture fed animal more tender than grain fed ones. This result is consistent with those reported by Realini et al (2004) being 2.8 and 3.5 kgF for pasture and concentrate fed animals, respectively.

Table 1 – Mean values for carcass traits

Variables	A	B	C	D
LW (kg)	497.9 ^{c}	492.6 ^{c}	498.3 ^{c}	539.4 ^{a}
HCW (kg)	264.2 ^{c}	271.2 ^{a}	271.6 ^{a}	264.6 ^{bc}
Rump&Loin (kg)	14.5^{b}	14.8^{ab}	15.3^{a}	14.7^{ab}
Rump&Loin/pistola cut (%)	22.9	22.9	23.2	22.9
Muscle (%)	64.3	65.0	65.2	63.6
Fat (%)	13.7 ^{c}	13.0 ^{c}	13.1 ^{c}	16.7 ^{a}
Bone (%)	22.0 ^{a}	22.0 ^{a}	21.7 ^{a}	19.7 ^{c}

^{a,b,c} Means within the same row with different letter (a,b) differ $P<0.05$ and (a,c) differ $P<0.01$

Table 2 - Mean values for meat quality

Variables	A	B	C	D
pH 24 hs	5.7 ^{a}	5.5 ^{c}	5.7 ^{a}	5.5 ^{c}
Temp 24 hs	3.6 ^{c}	6.0 ^{b}	6.8 ^{a}	7.1 ^{a}
L* muscle (20 d)	39.3 ^{b}	39.5 ^{ab}	40.3 ^{a}	40.1 ^{ab}
a* muscle (20 d)	19.4 ^{a}	19.4 ^{a}	19.7 ^{a}	17.1 ^{b}
b* muscle (20 d)	10.9 ^{abc}	11.4 ^{ab}	11.6 ^{a}	10.2 ^{c}
L* fat	78.7 ^{a}	76.7 ^{b}	73.9 ^{c}	76.2 ^{b}
a* fat	4.5 ^{c}	4.6 ^{c}	4.4 ^{c}	6.6 ^{a}
b* fat	18.8 ^{a}	17.5 ^{b}	16.9 ^{b}	15.5 ^{c}
WB kgF (7 d)	3.2 ^{c}	4.2 ^{ab}	3.6 ^{bc}	4.5 ^{a}
WB kgF (20 d)	2.9 ^{c}	3.7 ^{a}	3.2 ^{c}	4.0 ^{a}

^{a,b,c} Means within the same row with different letter (a,b) differ $P<0.05$ and (a,c) differ $P<0.01$

Conclusions

International research showed the effect of feeding system on production and most of the carcass traits and meat quality. Extensive production systems based on pastures, were associated with decreasing meat quality attributes (tenderness, colour, flavour). However, in this study the finishing strategy did not show changes in meat quality. Steers coming from pastures did not have relevant differences on carcass traits and meat quality than those coming from feed lot, therefore they showed lower shear force at 7 and 20 days of aging. Further investigations should be conducted in Uruguayan beef cattle to study the effects of pasture and pasture + concentrate on meat quality.

References

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