

IS IT POSSIBLE TO OBTAIN HIGH STANDARDS OF MEAT QUALITY WITH ENTIRE YOUNG MALES?

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Abstract. The aim of this study was to evaluate the effect of animal condition (entire or castrated) on animal performance and also on meat quality. Twenty Braford males, 12 months old (half castrated and half non castrated) were fed with grain for finishing purposes. Live weight evolution was registered each 15 days and 4 ultrasound measures were performed during the finishing period. All animals were slaughtered at 20 months old. Carcass pH, meat color and shear force were determined with 2 and 14 days of aging. Entire males reached 500 kg of live weight with 20 months old, but the castrated group did not. However, there were no differences between Treatments, in the fattening score. Meat quality traits did not show any difference between entire and castrated young animals, after 12 aging days.

Keywords: entire, castrated, beef, meat quality

I. INTRODUCTION

Meat production systems in Uruguay are mainly based on rangeland pastures and the age of animals at slaughter is around 32 months of age. Therefore, castration has always been a necessary management practice. Castration of male beef cattle is performed to reduce aggressiveness, prevent physical danger to other animals in the herd and to handlers, enhance reproductive control, manage genetic selection, and satisfy consumer preferences regarding taste and tenderness of meat (FASS, 2010). Entire animals could have some advantages in growing and carcass yield but animal welfare and meat quality could be compromised. According to several authors, entire males show many disadvantages when compared to castrated males, regarding tenderness, color, fat cover and marbling (2, 3, 4).

During the last years, international meat prices and the opening of new markets have provoked the intensification of Uruguayan fattening systems in order to improve animal performance and to satisfy different requirements. Considering these intensive systems which include a wide range of feeding alternatives between pasture and concentrate utilization, it could be possible to reach slaughter points with young non castrated animals, affecting neither animal welfare nor meat quality. Castration is one of the most critical practices regarding animal welfare. Accordingly, the special impact that this alternative (non castrating) could have on consumers from the ethical point of view, should also be considered. In this context, the aim of this study was to evaluate the effect of animal condition (entire or castrated) on reaching the slaughter point, on animal performance and also on meat quality.

II. MATERIALS AND METHODS

Twenty Braford males, 12 months old (half castrated and half entire) were finished on a grain based diet. The slaughter point was established at 20 months of age and 500 kg of live weight. Animals remained together during the whole finishing period. Castration had been performed at 7 months old and the Traditional surgery method was used (without pain mitigation).

The liveweight (LW) gain was registered each 14 days and ribeye area and fat cover were measured 4 times during the finishing period, by the ultrasound technique. Only entire males reached the final live weight at 20 months old. However, and for comparisons to be possible, both

Treatments were slaughtered on the same day. Slaughter was performed in a commercial abattoir licensed to export meat and following Animal welfare standard procedures. Carcasses were graded using the Uruguayan Grading System (5) based on conformation and fatness scores. Fat finishing was based on the amount and distribution of subcutaneous fat, using a five grade scale, where lower numbers indicate lack of fat cover and higher numbers, excessive covering. The scores used in Uruguay are: 0, 1, 2, 3, 4. Carcass pH was measured between the 11th and 13th rib at 2 and 14 days *post mortem* at *Longissimus thoracis et lumborum* (LM) muscles. To record the pH, a pH meter (Orion 210A) with a device gel was used. Muscle color was measured on the LM at L* (luminosity), a* (red index) and b* (yellow index) color space (6), after 2 and 14 days of aging using a Minolta® (Model 400 C) colorimeter. The values were recorded in three different regions of each sample to obtain a representative average value of the color of the meat sample. Shear force measurement was obtained also on the LM and after 2 and 14 aging days using Warner Bratzler device. Six pieces of 1.27 cm diameter were taken of each sample following the direction of the muscle fibers, using a biopsy forceps. From six measurements of each meat sample, the mean value was calculated. The method used for the analysis of shear force (SF) was based on the work of Purchas et al. (6). Data was analyzed by the SAS software applying GLM and GLIMMIX procedures using mixed models adjusted for repeated measures.

III. RESULTS

Results from this experiment demonstrated that is possible to reach the slaughter point (500 kg of live weight) with 20 months old entire males, but more time would be necessary for the castrated group ($p < 0.05$; Table 1). However, there were no differences between treatments in the score of fatness, with a 2 score for all animals.

Table1. Live weight evolution during the finishing period.

Days	Castrated LW (kg)	Entire LW (kg)
0	169	164
13	183	174
33	184	177
89	203	201
124	254	260
176	308	317
232	359 ^b	375 ^a
309	452 ^b	497 ^a

Treatments with different letter in the same line, differ with $p < 0.05$

No differences in ribeye area were found between Treatments, neither during the fattening period nor immediately before slaughter ($p > 0.05$; Table 2).

Table2. Ribeye area at 4 ultrasound measurements during the fattening period

Dates	Castrated Ribeye area (cm ²)	Entire Ribeye area (cm ²)
1	41	45
2	45	48
3	54	58
4 (pre slaughter)	65	62

Treatments with different letter in the same line, differ with $p < 0.05$

Meat redness was higher in castrated animals with 2 aging days (Table 3; $p < 0.05$) but this difference disappeared after 14 aging days. On the other hand, after 14 aging days, brightness was lower in castrated males ($p < 0.05$; Table 3).

Table 3. Meat Brightness (L*) and redness (a*) with 2 and 14 days of aging.

Meat color	Castrated	Entire
L* 2 days	33,2 ^a	31,4 ^a
a* 2 days	14,4 ^a	12,1 ^b
L* 14 days	32,3 ^b	36,2 ^a
a* 14 days	14,0 ^a	16,7 ^a

Treatments with different letter in the same line, differ with $p < 0.05$

After 2 days of aging, meat pH and shear force values were higher in the Entire group ($p < 0.05$; Table 4) but differences disappeared after 14 aging days.

Table 4. pH values and shear force with 2 and 14 days of aging.

pH and Shear force (kg)	Castrated	Entire
pH 2 days	5,50 ^b	5,81 ^a
pH 14 days	5,52 ^b	5,78 ^a
Shear force 2 days	5,5 ^b	7,4 ^a
Shear force 14 days	5,4 ^a	5,4 ^a

Treatments with different letter in the same line, differ with $p < 0.05$

IV. CONCLUSIONS

- Entire animals reached the final point at a younger age but showing no differences with the castrated group in the finishing degree (2 in both Treatments).
- Meat quality traits did not show any difference between entire and castrated young animals, if there is an aging period of 14 days.

- Uruguayan meat industry has an alternative to be developed in animals from grain fed systems
- Further research should be performed in order to evaluate at what age, behavior and meat quality from entire animals should be negatively and definitively affected.

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