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Effect of castration age on carcass traits and meat quality of Simmental bulls

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RIASSUNTO – Effetto dell'età di castrazione su caratteristiche della carcassa e qualità della carne di tori Pezzati Rossi. *Il posticipo dell'età di castrazione sembra limitare la riduzione delle performance produttive, mantenendo gli effetti positivi sulla qualità della carne. In proposito, su 24 tori di razza Pezzata Rossa, lo studio ha valutato l'effetto della castrazione a 10 o 12 mesi (Anticipata vs. Tardiva; periodo di ingrasso: 191 vs. 151 giorni) sulle caratteristiche qualitative della carcassa e del Longissimus thoracis. Sulla carne sono state analizzate composizione chimica, colore, tenerezza e gusto, con tecniche strumentali e sensoriali. La castrazione anticipata comporta l'ottenimento di carne a più elevato tenore lipidico che migliora la tenerezza, aumenta la luminosità e riduce le perdite di cottura. Nel caso degli animali castrati tardivamente, la minor marezatura sembra invece favorire la produzione di carne con un più elevato valore dell'indice del rosso e dal gusto più apprezzato alla valutazione sensoriale. In conclusione, in riferimento alle preferenze del consumatore medio italiano, i dati suggeriscono di posticipare la castrazione soprattutto per limitare una eccessiva deposizione lipidica intramuscolare.*

Key words: beef meat, castration age, carcass traits, meat quality.

INTRODUCTION – Italian beef management is usually based on entire males, since they show better growth rate and higher lean yield carcasses. Despite consumer's preferences require lean meat, producers have been induced to consider the positive effect of castration especially on meat organoleptic traits. Many studies, in fact, pointed up that castration could determine a lower growth rate and feed efficiency (Field, 1971; Schoonmaker *et al.*, 2002), but it reduces aggressive bulls behaviour and could improve meat quality. In comparison to entire animals, steers showed higher carcass fatness and meat marbling, resulting in an improvement of meat tenderness (Andrighetto *et al.*, 1997) also due to a lower amount of collagen (Boccard *et al.*, 1979). Regarding meat colour, juiciness and flavour, the effect of castration and age of treatment are still debated. In order to limit the negative effect of castration on productive performances and maintain the positive effect on meat quality traits, it was suggested to defer the treatment period (Worrel *et al.*, 1987; Destefanis *et al.*, 2003). Taking this in account, the aim of this study was the evaluation of the effect of two different castration ages on carcass traits and meat quality of Italian Simmental young bulls.

MATERIAL AND METHODS – Twenty-four Italian Simmental bulls were castrated by “Burdizzo” technique and assigned to two experimental groups: early (EC) vs. late (LC) castrated. At the beginning of the trial EC bulls were approximately 10 months old and recorded on average 339 kg of body weight, whereas LC ones were 12 months old and 413 kg heavy. Animals were subdivided in two pens and fed two times a day with a maize silage based *ad libitum* diet (CP = 14.7±0.3 and NDF = 34.3±0.8% DM; FU-meat = 0.90±0.04 kg of DM). Pen feed

consumption were daily recorded, and weight increase was determined by weighing bulls at the beginning and at the end of the trial. Experimental period was 191 and 155 days long for EC and LC, respectively. Carcasses were weighed to calculate individual dressing percentage and graded for conformation and fatness (OFIVAL, 1984). Twenty-four hours *post mortem*, a joint sample of *Longissimus thoracis* was excised from the 7th to the 8th rib of each half right carcass, visually evaluated for marbling (four points scale: 1=very lean ... 4=very fat) and colour (four points scale: 1=pale pink ... 4=dark red), vacuum-packaged and cool stored for a 8 days long ageing period. Regarding meat proximate composition, moisture, ether extract and ash were assessed according to AOAC (2000), instead crude protein was calculated as complement. Meat pH, colour, weight cooking losses and instrumental tenderness of cooked samples were determined according to ASPA methods (1996). After 1h of exposure to air (2±1°C), colour was measured with a chromameter (CR 100, Minolta). Weight cooking losses were assessed on a 2.5 cm thick steak heated in a thermostatic water bath (75°C for 50'). Tenderness was determined by a Warner-Bratzler shear force meter (Instron 1000). Sensory evaluation was carried out by a trained taste panel (AMSA, 1978) that judged tenderness, juiciness and flavour according to a five-points scale (1=very low ... 5=very high). According to a monofactorial design, data were submitted to ANOVA within PROC GLM (SAS, 1999).

RESULTS AND CONCLUSIONS – Performance data were not submitted to ANOVA because of the different experimental period length. Regarding early castrated (EC) group, daily gain was of 1.09 kg (final body weight=548 kg) and food conversion ratio (FCR) equal to 8.2. Late castrated (LC) animals reached a daily gain of 0.96 kg (final body weight=562 kg), corresponding to a FCR of 9.0. Results of carcass and meat quality traits are reported in table 1.

Table 1. Effect of castration age (early vs. late) on carcass traits and pH, proximate composition, colour, texture and sensory evaluation of *Longissimus thoracis*.

| | | Age of treatment | | P | RSD |
|------------------------------|--------------------|------------------|----------------|------|------|
| | | Early Castrated | Late Castrated | | |
| Carcass and meat evaluation: | | | | | |
| - Dressing percentage | % | 56.0 | 57.3 | ns | 1.0 |
| - Conformation (EUROP) | 1-15 | 8.3 | 9.0 | ns | 1.1 |
| - Fatness | 1-15 | 9.0 | 7.9 | ns | 0.7 |
| - Meat sample marbling | 1-4 | 2.8 | 1.3 | ** | 0.4 |
| - Meat sample colour | 1-4 | 2.4 | 3.0 | * | 0.3 |
| Chemical parameters: | | | | | |
| - pH | 5.52 | 5.50 | ns | 0.02 | |
| - Moisture | % | 72.3 | 73.0 | ** | 0.9 |
| - Crude protein ^a | % | 22.4 | 23.2 | * | 0.8 |
| - Ether extract | % | 4.22.7 | ** | 0.6 | |
| - Ash | % | 1.1 | 1.1 | ns | 0.1 |
| Rheological traits: | | | | | |
| - Lightness | L* | 43.3 | 42.3 | † | 1.5 |
| - Redness | a* | 17.4 | 21.0 | ** | 1.1 |
| - Yellowness | b* | 8.1 | 11.1 | ** | 0.8 |
| - Cooking weight losses | % | 27.7 | 30.0 | ** | 2.1 |
| - Maximum shear force | kg/cm ² | 3.01 | 3.76 | * | 0.34 |
| Sensory evaluation: | | | | | |
| - Tenderness | 1-5 | 3.18 | 2.96 | * | 0.27 |
| - Juiciness | 1-5 | 3.23 | 3.23 | ns | 0.38 |
| - Flavour | 1-5 | 3.06 | 3.23 | * | 0.22 |

^aCrude protein = 100 - (moisture + ether extract + ash); †: P<0.10; *: P<0.05; **: P<0.01.

Dressing percentage, carcass conformation and fatness were not affected by castration age. Meat marbling and colour, instead, resulted significantly influenced by castration age; particularly, EC-meat showed a higher marbling value that probably reduced sensory and instrumental redness. As expected, in EC animals a higher intramuscular fat (IMF) content (4.2 vs. 2.7%; $P < 0.01$) and a reduced moisture and crude protein percentage were observed. Instrumental colour was significantly affected by treatment: as described above, EC-meat showed a lower redness and yellowness and consequently an increased lightness. Quite apart the influence of the different IMF content, a darker colour of meat from LC animals could be also related to a different behaviour. An early castration seemed to limit aggressive temperament of steers determining a reduced haematin meat content (Perrossin *et al.*, 1999). In relation to rheological traits of cooked meat, EC steers showed significantly lower cooking weight losses and maximum shear force values. The lack of anabolic effects of testosterone on castrated animals is considered a metabolic condition that reduces intramuscular collagen deposition (Boccard *et al.*, 1979), even if its solubility could be also reduced (Mc Cormick, 1992) and meat tenderness could be not influenced (Destefanis *et al.*, 2003). Therefore, the significantly higher meat tenderness observed in LC steers was probably due to the different IMF content. Data of sensory evaluation evidenced a significant effect of castration age on tenderness and flavour. With regard to texture, results agreed with instrumental measurements, confirming that a higher IMF improved tenderness. On the contrary, juiciness was not affected, probably because LC-meat ether extract was not high enough to be able to increase even more the stimulating of salivation. A higher degree of flavour in LC meat pointed out that a more tender and marbled meat seems not be appreciated by trained panellists. Since meat flavour depends on IMF content and all over on lipid type, age of castration may modify fatty acids profile. Results of this study, however disagree with Varela *et al.* (2003), that reported that meat from steers seems to be better than that from bulls, because of its higher marbling degree and oleic acid amount. In conclusion, castration age seemed to affect quality traits of carcass and meat. In particular an early castration lead to an increase of meat fatness, affecting its colour, texture and flavour. Considering consumer preferences, results of this study indicated that a late castration could be recommended for Simmental bulls, in order to avoid a detrimental effect on meat marbling, colour and flavour, even if tenderness was reduced. These conclusions are supported considering that an early castration could negatively influence productive performances, particularly for weight daily gain and food conversion ratio.

REFERENCES – **Andrighetto, I.**, Andreoli, D., Cozzi, G., Parenti, E., Rioni Volpato, M., 1997. Prestazioni produttive quanti-qualitative di bovini da carne interi e castrati alimentati con una dieta addizionata di virginiamicina. *Zoot. Nutr. Anim.* 4: 179-193. **AMSA**, 1978. Guidelines for Cookery and Sensory Evaluation of Meat. American Meat Science Association and National Live Stock and Meat Board, Chicago. **AOAC**, 2000. Official Methods of Analysis. 17th ed., AOAC, Washington, DC. **ASPA**, 1996. Metodiche per la determinazione delle caratteristiche qualitative della carne. Università di Perugia. **Boccard, R.L.**, Naudè, R.T., Cronje, D.E., Smit, M.C., Venter, H.J., Rossouw, E.J., 1979. The influence of age and breed of cattle on their muscle characteristics. *Meat Sci.* 3: 261-280. **Destefanis, G.**, Brugiapaglia, A., Barge, M.T., Lazzaroni, C., 2003. Effect of castration on meat quality in Piemontese cattle. *Meat Sci.* 64: 215-218. **Field, R.A.**, 1971. Effect of castration on meat quality and quantity. *J. Anim. Sci.* 32: 849-858. **Mc Cormick, R.J.**, 1992. The flexibility of the collagen compartment of muscle. *Proc. 38th Int. Congr. Meat Sci. Tech.* Clermont-Ferrand, F. 1: 51-60. **OFIVAL**, 1984. Coupes et Découpes. Office Nat. Int. des Viandes, OFIVAL ed., Paris. **Parrassin, P.-R.**, Thénard, V., Dumont, R., Grosse, M., Trommenschlager, J.M., Roux, M., 1999. Effet d'une castration tardive sur la production de boeufs Holstein et Montbéliards. *INRA Prod. Anim.* 12 (3): 207-216. **SAS**, 1999. User's guide: statistic, 8th Edn., SAS Inst., Cary, NC, USA. **Schoonmaker, J.P.**, Loerch, S.C., Fluharty, F.L., Zerby, H.N., Turner T.B., 2002. Effect of age at feedlot entry on performance and carcass characteristics of bulls and steers. *J. Anim. Sci.* 80: 2247-2254. **Varela, A.**, Oliete, B., Moreno, T., Portela, C., Carballo, J.A., Sanchez, L., Monserrat, L., 2003. Calidad de la carne de machos enteros y castrados de raza Rubia Gallega sacrificados con 24 meses. *Arch. Zoot.* 52 (199): 347-358. **Worrel, M.A.**, Clanton, D.C., Calkins, C.R., 1987. Effect of weight at castration on steer performance in the feedlot. *J. Anim. Sci.* 64: 343-347.