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Effect of pre- and post-pubertal castration on Piemontese male cattle. II: Carcass measures and meat yield

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Abstract

The effect of different castration ages on carcass morphological characteristics, meat yield, commercial cuts and bones weight and measures was evaluated on Piemontese steers and bulls. Carcasses (24) obtained from early castrated (EC, 5th month of age), late castrated (LC, 13th month) and intact males (IM, control group) of similar age (about 18 months) and fattening degree, were weighed, measured and dissected following the local commercial method. Very few differences were found in carcass conformation and fatness as in carcass weight and measures. After data adjusting, few meat cuts were heavier in IM compared to EC and LC, and only one cut measure was different, whereas, almost no differences were found in bone measures and weight. IM produced carcasses with more edible meat than LC and more forequarter and 2nd quality meat than LC and EC. Significant differences were found also between total, hindquarter and perinephric fat.

Keywords: Piemontese breed; Steers; Bulls; Early and late castration; Carcass; Commercial cuts and bone linear measures; Commercial dissection

1. Introduction

To produce quality beef meat for a value-based market the use of Piemontese castrated males is now increasing in the breed's native area (north–west Italy). Surveys on the renewal of castration of Piemontese calves (Biagini & Lazzaroni, 1999; Biagini, Lazzaroni, & Toscano Pagano, 2001) have showed that young cattle are actually castrated at different ages: before the start of puberty or at the age of puberty. Puberty was defined as the age at which a bull first produced an ejaculate containing at least 50×10^6 spermatozoa with a minimum of 10% motility (Lunstra, Ford, & Echternkamp, 1978) and in cattle it is attained at an average age of 10 months, although several factors such as breed and nutritional condition can affect pubertal age in calves (Bretscheider, 2005). In early breeds puberty is reached around the 5th month of age, but in the late breeds the average pubertal age is reached at 11 months of age at most, while the first sexual interest was shown approximately 3 weeks before reaching puberty and mating ability was attained approximately 6 weeks after reaching puberty (Lunstra et al., 1978). Traditionally the animals were castrated before the start of puberty (and always before 6 months of age) for easiness in operating and avoiding the risk of animal stress and disease, but to benefit from bull's higher growth rate they are also castrated later (until 12–14 month of age) (Ford & Gregory, 1983; Gregory, Seideman, & Ford, 1983). Late castration, over 12th month of age, is permitted by the EU regulations on animal welfare and organic production system if done to obtain traditional products, such as the Piemontese steer.

Sexual neutralisation, and the age when this occurs, can modify male cattle growth, the development of the different anatomic parts, the body tissues ratio and the quality of the final product (Knight, Cosgrove, Death, & Anderson, 1999; Knight, Cosgrove, Death, & Anderson, 2000; Knight, Cosgrove, Lambert, & Death, 1999; Lazzaroni, Biagini, Toscano Pagano, & Iacurto, 1999; Parrassin et al., 1999; Picard, Gobelin, & Geay, 1995; Pietersen,

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Bruwer, Naudé, & Vosloo, 1992; Pietersen et al., 1992; Wheeler, Cundiff, Koch, Dikeman, & Crouse, 1997). Such observations have led to a trial to verify the influence of this practice on animal's live and slaughter performance (Biagini & Lazzaroni, 2007) and meat quality (Destefanis, Brugiapaglia, Barge, & Lazzaroni, 2003), showing that castration of Piemontese bulls at 13th month of age did not improve live and slaughter performance compared to animals castrated at 5th month of age, even if the LC linear body measurements are more similar to IM than EC and that no significant differences were observed between early and late castration in meat quality, except for cooking losses. Now, to study and characterise meat production from Piemontese steers, carcass linear measures, meat yield by commercial dissection, fat and bone weights, commercial cuts and bones measures were evaluated in steers castrated at different ages (pre- and post-puberty) and intact males.

2. Materials and methods

The trial was carried out on 24 carcass sides obtained from three groups of animals: eight early castrated (EC, 5th month of age), eight late castrated (LC, 13th month of age) and eight intact males (IM, control group). The animals, all double muscled and similar in age and weight (157 ± 19 d and 162 ± 19 kg), were reared in pens under the same environmental condition (for 405 ± 9 d) and fed at the same energy and protein level with hay and concentrate for a daily gain of 1.2 kg, according to the INRA scheme for late maturing beef breeds (Jarrige, 1988). Details on feeding and sexual neutralisation are reported in Biagini and Lazzaroni (2007). The animals were slaughtered at a similar mean age (about 18 months) and fattening degree, as visually evaluated by expert butchers, according to market requirements, in an authorized slaughterhouse. The carcass conformation and fatness were evaluated according to the EU standard method (De Boer, Dumont, Pomeroy, & Weniger, 1974; Reg. EEC 1208/81; Reg. EEC 2930/81; Reg. EEC 1026/91) with an 18-point conformation scale (SEUROP grid) and 15 fatness subclasses. To adapt the carcass conformation and fatness evaluation for statistical analysis, the scores available to describe carcass muscle profile and covering fat were translated into numbers, from 1 to 18 (from S+, best hypertrophied cattle conformation, to P−, poor and defective conformation) and from 1 to 15 (from 1−, the lowest fatness degree, to 5+ the highest fatness degree), respectively.

Twelve carcass linear measures (carcass side, leg and loin length, maximum and minimum leg width, maximum leg thickness and girth, buttock outline, chest and total chest depth, half chest width and chest half girth; Fig. 1; Toscano Pagano, Lazzaroni, & Pacher, 1998) were recorded.

After seven days of ageing at a temperature of 2 ± 2 °C, the carcass sides were weighed and commercial dissected following the Italian standard method for retail cut trading

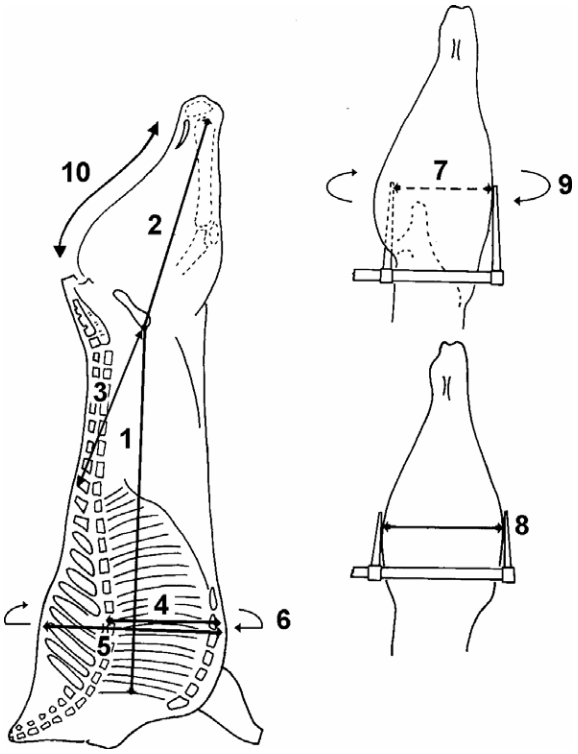

Fig. 1. Carcass measures scheme.1 – carcass length; 2 – leg length; 3 – loin length; 4 – chest depth; 5 – total chest depth; 6 – chest half girth; 7 – minimum leg width; 8 – maximum leg width; 9 – maximum leg girth; 10 – buttock outline.

(Faccincani & Massi, 1986; Swatland, 2000) slightly modified to fit the traditional local market customs (Toscano Pagano et al., 1998). This involves a close trimming and deboning of the lean (except the brisket, which maintained the sternum and part of the costae). Retail cuts (11 from the forequarter – regular roll, middle rib, chuck (a) and (b), shoulder clod (a), (b) and (c), blade filet, shank, brisket, forequarter flank; and 11 from the hindquarter – flank, strip loin, tenderloin, rump, top side, top beef, eye round, thick flank, cap of rump, leg of beef, shank; Fig. 2), fat and bone weights and retail cuts and bones measures were recorded, then meat yield and fat content percentage were calculated. The measurement of commercial cuts dimensions could give additional information on the shape of cuts (important for commerce) and on the effect of castration on the muscular development in different body regions of a hypertrophic breed.

The collected data were analysed to calculate the femur region and half carcass muscle to bone ratio (M to B) and muscularity index (MUSC) using an approach such as that used by Purchas, Fisher, Price, and Berg (2002). Data were then added to obtain some anatomical (total, fore- and hindquarter and *Longissimus* muscle) and economic (1st, 2nd, 3rd quality: suitable for steak, roast and stew respectively, and meat production as a percentage of carcass side weight) meat yield indices.

Data were analysed by a one-way GLM ANOVA for carcass conformation, fatness evaluation and measure-