MEAT QUALITY TRAITS OF "GARONNAISE" CROSSBREED YOUNG BULLS

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Introduction and objectives

Garonnaise is the common name in the north part of Italy, for Blonde d'Aquitaine pure and crossbreed (BA x Aubrac and Limousins) young bulls, generally imported as calfs (180-240 Kg) from several south-west France districts (Garonne, Gers,) and finished in intensive units. Carcasses of these animals are very well conformed, lean and with a high meat yield, (from S to E for conformation, and 1-2 for fatness, according with EC grading scale). We have not found in the literature data on the level of intramuscolar fat (marbling) and the effect of carcass weight on that. Also tenderness variability should be investigated, in order to make clear if very lean carcasses from BA young bulls would produce more tender meat, similar to Piemontese, (Fischer, 1992) or tougher meat as was reported recently for Belgian Blue (Uyterhaegen *et al.*, 1994; Steen, *et al.* 1997),

The objective of this study was to investigate the variability and the effects of three ageing times, on meat quality traits of Garonnaise crossbreed young bulls.

Materials and methods

Fifty-six Blonde d'Aquitaine pure and crossbreed young bulls carcasses were casually choosen, during 12 slaughtering turns, (as a sample of a controlled production chain) in a commercial abattoir. Cold carcass weight, pH (homogenates solution of iodoacetate, 10 ml with 2 g of *M. longissimus dorsi* -LD-, from left carcass half, 9th-10th rib) at 1-3-6 and 24 hours *post mortem*, using a pH Meter, Testo, mod. 230, were recorded. Temperature of LD at a depth of 5 cm (air speed 0.3-0.5 m/s), were measured in the first 24 hours (data loggerTesto, mod.Testostor 171-4) with the aim of evaluating the risk of cold-shortening. After 24 hours chilling, three samples (boneless and vacuum packed steaks of 6 cm thickness, fom-8th-9th and 10th rib) were collected from the left carcass half, and aged for 3-10 and 17 days in a chill room (0-4 °C). Vacuum packed drip losses (VP) were measured and recorded before analyses after each ageing time. Steaks were divided in two slides (+/-2.5 cm of thickness), one for cooking losses in polyethylene bag, (water bath at 75 °C, for 50 min, then cooled under running water for about 40 min) and tenderness (Warner Bratzler shear force (kg) WBSF, using Instron Universal Testing Machine mod. 1011); and the other slide for colour measurement, (C.I.E.L*a*b*, Minolta CR 200) at 1 hour; after that, this steak was used for chemical analyses (ASPA, 1997). Carcasses were classified according to their weight (light < 404 Kg; medium-light 405-460 Kg; medium 461-516 Kg; medium heavy 517-572 Kg; and heavy > 573 Kg) and marbling, based on % of LD intramuscolar (ether extract) fat (very lean < 1.07; lean 1.07-1.51; fatty > 1.51). Data were subjected to statistical analysis GLM procedure of SAS (SAS-STAT®, 1995). The model included two factors (classes of carcass weight, from 1 to 5, and classes of marbling from 1 to 3) and their interactions.

Results and discussion

Meat quality traits and chemical composition (mean, SD, Minimum and Maximum) of LD samples are shown in Table 1. Variability of some traits, like tenderness (based on Warner Bratzler Shear Force-WBSF) or VP drip, is not surprising since values from different ageing times are put together. Ether extract values, (marbling), indicated a wide range of variability in our group of carcasses, but the majority of them show a very lean meat (83% of total with less than 1.51 % of fat).

Data from pH and temperature decline curve (Fig. 1) suggest that not a severe cold-shortening conditions were possible with this chilling regime, (pH6 < to 6.0 and temperature of muscle, at the same time, higher than 12 °C). However, less tender meat from very light and light carcasses groups (Tab. 3) indicate that maybe a low degree of shortening could have occurred in the more exposed portions of LD (Lee, 1985; Olsson, 1994). Muscular fibres in heavy carcasses are better protected from shortening risk probably because the bigger muscular mass offers more resistance to cooling, and the chilling rate is slower if compared to lightweight carcasses. Not clear effects on tenderness-WBSF, were found for the level of marbling (significant only for yellowness, as shown in Tab. 2). A wide range of carcass weights could be surprising for animals with the same genotype and sex. As discussed above, WBSF is influenced by the class of carcass weight ($P < 0.05$), and meat from heavy carcass is 0.8 WBSF Kg more tender. No differences were found on VP drip and cooking loss between weight classes. No significant effects were found between carcass weight and marbling classes interaction. Colour of meat, mainly redness and lightness parameters, is well known as one of most important quality attribute. BA young bulls are normally researched for their good reddish meat, (that means not very red) with high value of lightness; our carcasses have confirmed the expectations, but the wide range of values suggest that actions should be taken to reduce variability and standardise the product. Optimum range of lightness, for north Italian market, according with our information, is probably between 42-46 for L* value. Heavy carcasses have a significantly more red meat, as reported in literature (Boccard, 1986), but maybe these high values (a*> 23) could become nearly out of the acceptability scale, for this kind of meat. In Belgian Blue young bulls, Steen *et al.*(1997) have found lower values for L* and a*, similar to Destefanis *et al.* (1993) for Piemontese.

Ageing effects at 3-10 and 17 days *post mortem,* on meat quality traits are shown in Table 4. Tenderness-WBSF, improved from 3d to 10 d of about 22%, but only for 6% afterwards (10d to 17d). LD meat from these animals appears to be (WBSF at 10d) more tender than the meat of Belgian Blue young bulls, (Steen *et al.*1997). Vacuum packed drip increased dramatically with ageing, whereas cooking losses did not show any significant variations. Slightly but significant effects of ageing were observed also on colour parameters; probably b* values were more influenced by the rate of lipids oxidation than from the level of marbling (Tab. 2 and 4). No significant effects were found for both interactions, carcass weight classes *vs* ageing time, and marbling classes *vs* ageing time.

Conclusions

BA young bulls seem to offer both farmers and retailers very good carcass characteristics for beef market, however the large variability in some traits (weight and marbling) found in our observations, indicate that more emphasis should be given to quality assurance scheme, with the aim of standardising the product.

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Table 1. Mean, SD, Minimum, and Maximum, physical and chemical characteristics in M. *longissimus dorsi*.

	Mean	SD	Min	Max
Shear force (Kg)	3.7	0.91	2.1	7.2
VP drip losses (%)	2.1	1.50	0.2	6.5
Cooking losses (%)	25.4	3.77	15.2	33.6
Colour: Lightness	44.9	3.37	36.4	55.4
Redness	21.2	2.68	16.5	28.0
Yellowness	12.9	1.30	10.3	16.7
Moisture (%)	73.8	0.88	71.3	75.2
Ashes (%)	1.2	0.11	1.0	1.4
Protein (%)	23.8	0.70	21.6	25.4
Ether extract (%)	1.2	0.53	0.5	2.7
Cholesterol (mg/100g)	49.4	10.50	28.8	68.1
Fatty acid (%) of I.F.				
SFA	54.6	2.29	51.3	57.3
MUFA	33.9	4.38	25.7	37.9
PUFA	11.5	4.02	7.3	16.9

Fig 1: L.D. and air temperature decline during the first 24 hours of chilling

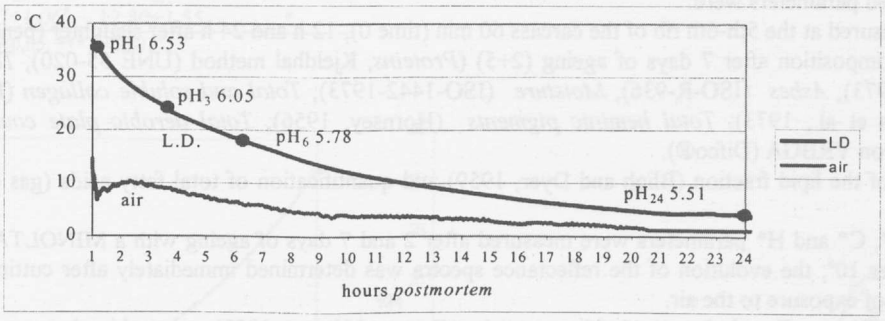

Table 2. Effect of LD marbling classes on meat quality traits

	Classes of carcasses marbling			(P)
	very lean	lean	fatty	
pH 24	5.53	5.52	5.53	n.s.
Shear force (Kg)	4.06	3.69	3.57	n.s.
VP drip losses (%)	2.06	1.97	1.55	n.s.
Cooking losses (%)	27.3	24.9	26.1	n.s.
Colour:				n.s.
Lightness	43.6	43.8	45.5	n.s.
redness	21.1	21.5	21.4	n.s.
yellowness	12.1	13.1	12.7	<0.05

Table 3. Effect of carcass weight classes on meat quality traits

	Classes of carcasses weight					(P)
	very light	light	medium	very heavy	heavy	
pH 24	5.46	5.54	5.55	5.55	5.54	<0.05
Shear force (Kg)	4.3	4.1	3.2	3.5	3.5	<0.05
VP drip losses (%)	1.5	1.9	2.2	1.9	1.7	n.s.
Cooking losses (%)	26.4	25.3	25.5	25.7	27.4	n.s.
Colour:						
Lightness	42.1	43.9	45.8	45.1	44.7	n.s.
redness	18.7	19.8	22.1	22.5	23.6	<0.01
yellowness	12.0	11.8	13.1	13	13.4	<0.01

Table 4. Effect of three ageing times on meat quality traits

	Ageing time			(P)
	3 d	10 d	17 d	
Shear force (Kg)	4.50	3.50	3.32	<0.001
VP drip losses (%)	0.49	2.21	2.89	<0.001
Cooking losses (%)	25.82	25.75	26.66	n.s.
Colour:				
Lightness	43.61	44.71	44.60	<0.05
redness	20.84	21.48	21.69	<0.05
Yellowness	12.20	12.78	13.03	<0.01