EFFECT OF FEEDING MANAGEMENT DURING THE GROWING PERIOD AND SLAUGHTER WEIGHT ON CARCASS AND MEAT QUALITY OF FINISHING DOUBLE-MUSCLED BULLS

Fiems, L.O., De Campeneere, S., De Boever, J.L., Vanacker J.M., De Brabander, D.L.
Department Animal Nutrition and Husbandry, CLO-Gent, Scheldeweg 68, B-9090 Melle, Belgium

Background

Double-muscled animals differ considerably from non-double-muscled ones. They require diets rich in energy and protein due to their reduced intake capacity and their extreme meatiness (De Campeneere et al., 2001). Even with high-energy diets, body fat content remains low. Grass intake in young double-muscled Belgian Blue bulls is considerably lower than in most other breeds (Fiems, unpublished data). Most often a period with a lower growth rate due to feed restriction or grazing is followed by a period with compensatory gain (Berge, 1991). During the last decades, there is an increasing interest for extensification of cattle husbandry, which is financially supported by the European Commission. It remains questionable if lean double-muscled animals are able to deposit a sufficient amount of adipose tissue to provide meat with an excellent eating quality.

Objective

This study deals with a less intensive production system during the growing period and the impact of a different slaughter weight on carcass and meat quality in double-muscled Belgian Blue bulls.

Materials and methods

One hundred and eleven 5-month old double-muscled Belgian Blue male calves, born at the institute, were randomly divided into three groups with a different feeding management (FM). Animals of group 1 turned out on pasture during summer and were daily supplemented with 2 kg dried beet pulp. During the winter period, they were confined in loose houses and fed grass silage to appetite and supplemented with 2 kg concentrate per day. Animals of groups 2 and 3 stayed permanently indoors in loose houses and were fed maize silage and concentrate (67:33 dry matter basis). The diet was restricted for a daily live-weight gain of ±0.85 kg (Group 2) or freely available (Group 3). From 400 kg onwards all animals were finished on maize silage and concentrate (50:50 dry matter basis) fed ad libitum. Within each group two slaughter weights (SW) were compared: 650 kg or 725 kg.
Carcass and meat quality traits were determined as described by Fiems et al. (2000). Results are presented as least square means with age at slaughter as covariate. Differences were tested for significance using an analysis of variance with feeding management and slaughter weight as the main factors. The effect of feeding management during the growing period was analysed based on the least significant difference test.

Results and discussion

The effect of feeding management and slaughter weight on carcass and meat quality characteristics is shown in Table 1.
Herbage feeding during the growing period resulted in a lower dressing and a lower cold carcass weight. A similar effect was also observed for the area of the Longissimus thoracis muscle. Carcass grading and composition did not differ. As a consequence of the different dressing percentage, meat production coefficient was lower for group 1. Dufrasne et al. (1995) did not find a negative effect of grazing on dressing proportion in double-muscled animals, but the animals were older at the start of that experiment. In non-double-muscled animals, Boucqué et al. (1978) neither found a significant effect of grazing on dressing percentage. Beside a different empty body weight and cold carcass weight, slaughter weight did not affect carcass quality. Increasing slaughter weight increased carcass fat content and reduced lean content in non-double-muscled animals (Steen and Kilpatrick, 1995).
Several meat quality traits were affected. Colour was darker (lower L*-value) and more red (higher a*-value) for animals kept indoors during the growing period (Groups 2 and 3) than for animals which were turned out on pasture (Group 1). This is in contradiction with the fact that most often a darker colour is obtained in older animals. These results neither confirm the findings of Dufrasne et al. (1995), where meat from indoor fed bulls was paler than in bulls which grazed initially. Based on an examination of 35 experiments Priolo et al. (2001) concluded that meat from ruminants raised and finished on pasture is generally darker than meat from animals fed concentrates mainly because of a lower intramuscular fat content. The paler meat colour in bulls of group 1 from our experiment may be due to a shift toward more pale IIB myofibres. Brandstetter et al. (1995) reported an increased occurrence of pale IIB fibres in bulls realising compensatory gain after a period with energy restriction. Drip and cooking losses were higher after grazing and were in accordance with results of Dufrasne et al. (1995). This may be related to the higher moisture content in the Longissimus thoracis muscle.
Slaughtering at 650 kg compared to 725 kg resulted in a increased waterholding capacity, a tendency for a higher cooking loss ($P = 0.055$) and a higher moisture content in the meat. Tenderness was not affected in this experiment, neither by feeding management, nor by slaughter weight. However, some effect could be expected in groups 1 and 2 as the animals showed a higher performance during the finishing period. Jones et al. (1990) reported a higher rate of protein turnover in realimented cattle after a feed restriction. This may increase myofibrillar protein breakdown. A high relation between myofibrillar protein breakdown and meat tenderness has been reported by Buts et al. (1987). Shear force values, averaging 40.7 N, were considerably lower than those reported by Dufrasne et al. (1995) for animals of a similar age.
Significant interactions between feeding management and slaughter weight with regard to carcass quality traits were found for dressing percentage, meat production coefficient, and meat and fat content in the carcass. As far as meat quality is regarded, an interaction was only found for waterholding capacity and moisture content.

Conclusions

Feeding management during the growing period, followed by a finishing period in similar conditions, affected some carcass quality traits in double-muscled Belgian Blue bulls, but there was no effect of slaughter weight. Feeding management also affected colour, drip and cooking losses and chemical composition, while the effect of slaughter weight on meat quality traits was of minor importance. It is concluded that extensification in double-muscled bulls is more detrimental for carcass quality than for meat quality. Due to the late maturity of double-muscled animals, they can be slaughtered at a high body weight without excessive fat deposition or decreased meat tenderness.

Table 1. Effect of feeding management and slaughter weight on carcass and meat quality characteristics

	Management during the growing period			Slaughter weight (kg)		Pooled s.d.
	Group 1	Group 2	Group 3			
	Grazing	Indoors		650	725	
		Restricted	Ad lib			
Age at slaughter (d)	648.9[a]	618.0[b]	572.0[c]	584.7[a]	641.3[b]	64.2
Empty body weight (kg)	650.2	649.9	647.3	619.0[a]	679.3[b]	18.5
Cold carcass weight (kg)	468.6[a]	477.3[b]	478.0[b]	452.4[a]	496.8[b]	13.9
Carcass quality characteristics						
Dressing (%)	72.1[a]	73.4[b]	73.8[b]	73.1	73.1	1.1
Longissimus thoracis area (cm^2)	146.4[a]	157.6[b]	148.9[ab]	148.6	153.3	23.2
SEUROP-classification						
Conformation	17.2	17.4	17.3	17.3	17.3	1.0
Fat covering	6.1	5.7	5.8	5.6	6.0	0.9
Carcass composition (%)						
Meat	76.1	76.2	76.4	76.5	76.0	1.7
Fat	12.3	11.7	11.6	11.5	12.1	1.6
Bone	11.6	12.1	12.0	12.0	11.9	1.1
Meat production coefficient (%)	54.9[a]	55.9[b]	56.4[b]	55.9	55.6	1.7
Meat quality characteristics						
Ultimate pH	5.47	5.52	5.52	5.49	5.51	0.1
Colour (CIE-lab units)						
L*-value	46.4[a]	44.0[b]	42.8[b]	44.6	44.2	3.9
a*-value	16.6[a]	17.5[b]	17.4[ab]	16.9	17.4	1.8
b*-value	15.1	15.1	14.5	14.8	15.0	1.8
Waterholding capacity (%)	33.0	32.7	32.6	33.3[a]	32.2[b]	2.2
Drip loss (%)	8.1[a]	7.2[b]	7.4[ab]	7.6	7.6	1.6
Cooking loss (%)	24.8[a]	23.8[b]	23.5[b]	24.4	23.7	1.6
Shear force (N)	38.8	40.0	43.4	42.0	39.5	10.6
Chemical composition (%)						
Moisture	75.7[a]	75.4[b]	75.4[b]	75.6[a]	75.4[b]	0.3
Protein	22.1[a]	22.4[b]	22.4[b]	22.3	22.4	0.3
Fat	1.1	1.1	1.2	1.1	1.2	0.3

[abc]: values with the same superscripts within management and slaughter weight items are not different ($P > 0.05$)

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