CONTRASTING UNDER 16-MONTH SUCKLER BULL PRODUCTION SYSTEMS: ANIMAL PERFORMANCE AND MEAT QUALITY CHARACTERISTICS

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Abstract –The performance and beef quality characteristics of under 16 month bulls from 4 different production systems: [*ad libitum* concentrates offered indoors (AD), grass silage *ad libitum* plus 5 kg of supplementary concentrate offered indoors (S+C5), grazed grass plus 50% of the dietary intake as concentrates (G+C50) and grazed grass exclusively (G+CO)] were analysed. Results indicate that animal performance, colour and chemical composition were significantly affected by diet/production system. However, no differences were found in ultimate pH or in meat tenderness after 14 days of ageing.

Key Words –Grazed grass, new production systems, pasture, tenderness, young bulls.

I. INTRODUCTION

Specifications for some commercial beef markets require bulls to be slaughtered under 16 months of age, with a minimum carcass fat score of 6 [1]. To reach these specifications bulls are usually produced indoors on high-concentrate rations. However, these production systems are often unprofitable. As feedstuffs are a major proportion of total expenditure in cattle production systems, there is interest in evaluating the effect of dietary inclusion of lower-cost feedstuffs, such as grass silage, and especially, grazed grass [2], on the profitability of bull beef production [3]. As animal diet can influence meat quality traits [4], these changes to production systems must be also assessed in this regard to ensure an acceptable market product. Therefore, the aim of the present study was to evaluate the influence of alternative production systems on animal performance and meat quality characteristics.

II. MATERIALS AND METHODS

Late-maturing suckler bulls (n=60) were blocked after their first winter (by sire breed, weight and age) and from within block randomly assigned to one of four experimental treatments until slaughter (100 days) at 15 ± 0.93 months of age. Treatments were: *ad libitum* concentrates indoors (AD), grass silage *ad libitum* plus 5 kg of concentrate offered indoors (S+C5), grazed grass plus 50% of the dietary dry matter intake as concentrate (G+C50), and grazed grass exclusively (G+C0). Concentrate composition (g/kg) was 862 rolled barley, 60 soya bean meal, 50 molasses and 28 minerals/vitamins. The grass and grass silage (unwilted and ensiled without additives) consisted of permanent grassland dominated by perennial ryegrass. Live and carcass weights were recorded and the carcasses were graded conformation and fatness. After 48 h at 0°C, *Longissimus thoracis* (LT) colour and ultimate pH/temperature were measured. LT was collected and one steak was used (day 3) for chemical composition and sarcomere length determination, while the remainder was aged for 12 additional days (4°C) for cook loss and instrumental texture analysis. The sampling process and analyses performed are described in Moran *et al.* [5] .

III. RESULTS

The AD bulls had heavier carcasses, and higher fat score compared with the grazing groups, while the values for S+C5 were intermediate. Carcass conformation scores were higher for the AD group compared to the other groups. Moisture and intramuscular fat concentrations were higher and lower, respectively, for grazing animals than in AD. While protein concentration was lower for the G+C0 animals compared to indoor groups in line with previous studies [6].
Meat from grazed animals was darker than that from indoors animals, although no differences were found in ultimate pH, in line with previous studies [7]. Additionally muscle from grazed animals had lower a and b levels than any other group. Surprisingly, sarcomere length was lower for muscle from indoors animals compared with grazed animals.

Usually smaller sarcomeres are related with cold shortening (leaner carcasses), but in this case smaller sarcomeres were found in animals with higher fat cover. Thus, these differences are more likely related with the fiber type profile [8]. Cook loss was higher for muscle from G+C50 compared indoor groups and intermediate for G+C0. Finally no differences were found in instrumental texture after 14 days of ageing.

Table 1. Animal performance and meat quality of under 16 month bulls differing in production systems: *ad libitum* concentrates (AD), grass silage *ad libitum* + 5 kg concentrates (S+C5), grazed grass + 50% of concentrates (G+C50) and grazed grass only (G+CO)

	Trait	AD	S+C5	G+C50	G+C0	SED	p-value
Animal performance	Live weight (kg)	464^{a}	444^{ab}	422^{b}	421^{b}	11.482	0.001
	Carcass weight (kg)	358^{a}	315^{b}	288^{c}	277^{c}	8.645	0.000
	Fat score (1-15)	7.2^{a}	6.0^{b}	4.2^{c}	3.6^{c}	0.400	0.000
	Conformation score (1-15)	10.0^{a}	8.6^{b}	8.5^{b}	7.7^{b}	0.358	0.000
Proximate composition	Protein (%)	23.0^{a}	22.9^{a}	22.6^{ab}	21.6^{b}	0.526	0.026
	Moisture (%)	74.8^{c}	75.2^{b}	76.1^{ab}	76.7^{a}	0.434	0.000
	Intramuscular fat (%)	1.3^{a}	0.6^{b}	0.2^{b}	0.1^{b}	0.199	0.000
Technological variables	pH	5.6	5.6	5.6	5.6	0.017	0.338
	Sarcomere length (µm)	1.39^{b}	1.51^{ab}	1.63^{a}	1.62^{a}	0.497	0.000
Meat colour (Hunter values)	L	37.3^{a}	34.4^{b}	31.7^{c}	32.5^{c}	0.7948	0.000
	a	19.4^{a}	19.2^{ab}	18.4^{b}	18.4^{b}	0.3618	0.010
	b	12.7^{a}	12.8^{a}	11.9^{ab}	12.2^{b}	0.2392	0.001
Cook loss and texture	Cook loss (%)	25.7^{b}	27.6^{ab}	28.5^{a}	27.5^{ab}	0.987	0.044
	Warner Bratzler Shear Force (N)	36.1	34.0	35.6	32.9	2.609	0.582

IV. CONCLUSION

The animal performance was superior on animals fed on concentrates. However, tenderness of meat from under 16-month old bulls after 14 days of ageing was independent of the diet. Finally, the differences observed in muscle chemical composition and colour between treatments were not large enough to have a negative commercial impact.

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