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# GRASS-BASED PRODUCTION SYSTEMS FOR LATE-MATURING SUCKLER BULLS: CARCASS CHARACTERISTICS AND MEAT EATING QUALITY

Aidan P. Moloney[1*], Edward G. O'Riordan[1], Mark McGee[1], Maurice G. O'Sullivan[2], Joseph P. Kerry[2], Shannon Coyle[2] , Frank J. Monahan[3], Sibhekiso Siphambili[3] and Lara Moran[1,4]

[1]Animal & Grassland Research and Innovation Centre, Teagasc, Grange, Dunsany, Co. Meath, Ireland;

[2] University College Cork, School of Food and Nutritional Sciences, Cork, Ireland.

[3] School of Agriculture and Food Science, University College Dublin, Dublin 4, Ireland

[4]Teagasc Food Research Centre, Ashtown, Dublin 15;

*Corresponding author email: aidan.moloney@teagasc.ie

## I. INTRODUCTION

Some European markets for bulls from the suckler beef cow herd require that they be < 20 months of age and have a carcass fat classification of ≥6 on a 1 (leanest)-15 (fattest) scale. Grazing of late-maturing breed bulls for 100 days prior to indoor finishing on concentrates for 100 days achieved this fat classification [1]. Since grazed grass is the cheapest feedstuff in temperate climates [2], increasing the proportion of grazed grass in the diet of bulls through a longer grazing season, would decrease the cost of production and the beef would be more attractive to "grass-fed" beef consumers. However, the carcass fat classification may not be achieved due to the lower energy density of grass compared to concentrates. Given the modest correlation between carcass fat classification and many meat quality variables [1], we hypothesised that slaughtering bulls from pasture at 19 months of age with or without supplementary concentrates would have a minor impact on meat quality when compared with bulls finished on ad libitum concentrates.

## II. MATERIALS AND METHODS

Late maturing breed (Charolais and Limousin) sired-bulls (live-weight 425 kg, s.d. 35.2; initial age 390 d, s.d. 39.2), previously offered grass silage *ad libitum* + 2 kg of a barley-based concentrate daily were blocked on sire breed and weight and assigned at random within block (n = 15/ treatment) to either (1) grazed grass only for 200 d (G0), (2) G0 for 100 d, then offered concentrates at pasture (500g/kg dry matter (DM; G50) (G0G50), (3) grazed grass for 100 d, then housed and offered concentrates + grass silage *ad libitum* (G0AL), (4) G50 for 200 d (G50G50), (5) G50 for 100 d, then housed and offered concentrates + grass silage *ad libitum* (G50AL) or (6) concentrates + grass silage *ad libitum* indoors for 200 d (ALAL). At 19.3 months of age, animals were transported without mixing of treatment groups and slaughtered immediately upon arrival at a commercial abattoir. Post-slaughter (without electrical stimulation), carcasses were weighed and classified for fatness. At 48 h post-mortem, carcass fat colour was measured and a section of the longissimus thoracis (LT) muscle was removed and vacuum packaged for 24 h after which pH and colour (fresh cut exposed to air for 1h in darkness at 4$^{O}$C, wrapped with oxygen-permeable PVC film) were measured. Remaining LT was vacuum packaged, aged for a further 12 days at 2$^{O}$C and frozen, pending analysis of shear force and sensory characteristics as previously described [3]. Data were subjected to analysis of variance with block (composed of sire breed and initial liveweight) and treatment as main effects.

## III. RESULTS AND DISCUSSION

Data are summarised in Table 1 and stated differences are statistically significant ($P < 0.05$, at least). Carcass weight was highest for ALAL and lowest for G0. Carcass fat score was similar for all groups slaughtered from pasture and lower than the groups slaughtered from *ad libitum* concentrates and was generally reflected in the LT intramuscular fat concentration. In contrast to previous findings [4] subcutaneous fat was not more yellow (higher b value) in carcasses from the grazing bulls compared to those finished on concentrates which may reflect the generally low carcass fat cover *per se.* LT from bulls slaughtered from pasture was redder and more saturated than LT from bulls slaughtered from *ad libitum* concentrates. There were some

differences between groups in LT pH but all values were within the 'normal' pH range (i.e. 5.4 – 5.8) [5] indicating that bulls did not experience pre-slaughter stress. There was no difference between treatments for LT shear force or sensory characteristics.

Table 1. Carcass and meat quality attributes of bulls from different production systems

| | Production system | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | G0 | G0G50 | G0AL | G50G50 | G50AL | ALAL | sed | Significance[1] |
| Carcass weight (kg) | 362a | 374ab | 399bc | 380ab | 408c | 436d | 12.7 | *** |
| Carcass fat score (1-15) | 4.9a | 5.5a | 7.5b | 5.0a | 7.2b | 7.5b | 0.39 | *** |
| Carcass fat colour | | | | | | | | |
| L | 65.8ab | 63.9a | 67.0b | 63.3a | 68.1b | 71.7c | 1.30 | *** |
| a | 5.4a | 7.9bcd | 8.5d | 6.2ab | 8.3d | 7.1bc | 0.57 | *** |
| b | 13.6ab | 13.9abc | 14.3bc | 13.1a | 14.8c | 13.9abc | 0.53 | * |
| Chroma | 14.6a | 16.0b | 16.7b | 14.5a | 16.9b | 15.7ab | 0.64 | *** |
| Hue | 68.4d | 60.2ab | 59.4a | 65.1c | 60.9ab | 63.4bc | 1.63 | *** |
| *Longissimus thoracis* | | | | | | | | |
| pH | 5.62c | 5.60bc | 5.53a | 5.66c | 5.55ab | 5.51a | 0.033 | *** |
| L* | 45.2bc | 44.5abc | 45.5c | 43.4a | 43.9ab | 45.8c | 0.74 | * |
| a* | 12.5a | 13.0a | 14.2b | 12.7a | 14.8b | 15.2b | 0.58 | *** |
| b* | 10.7a | 10.6a | 11.8b | 9.9a | 11.8b | 12.3b | 0.53 | *** |
| Chroma* | 16.4a | 16.8a | 18.5b | 16.1a | 18.9b | 19.5b | 0.74 | *** |
| Hue* | 40.4c | 39.1abc | 39.6bc | 37.7a | 38.4ab | 39.0abc | 0.84 | * |
| Intramuscular fat (g/kg) | 7.8a | 6.9a | 19.5c | 8.5ab | 14.0bc | 27.0d | 2.92 | *** |
| Shear force (N) | 34.4 | 32.6 | 34.4 | 39.6 | 35.9 | 33.6 | 2.53 | NS |
| Tenderness[2] | 4.8 | 4.8 | 4.8 | 4.5 | 5.0 | 5.0 | 0.30 | NS |
| Flavour[2] | 5.0 | 5.2 | 5.2 | 5.1 | 5.3 | 5.4 | 0.24 | NS |
| Firmness[2] | 5.2 | 5.0 | 5.2 | 5.0 | 5.1 | 4.9 | 0.22 | NS |
| Texture[2] | 5.0 | 4.9 | 4.9 | 4.8 | 5.0 | 5.1 | 0.25 | NS |
| Acceptability[2] | 5.1 | 5.0 | 5.0 | 4.9 | 5.2 | 5.2 | 0.25 | NS |

[1] * = P< 0.05; *** = P < 0.001; NS = P > 0.05. [2]Scale 1=8; higher values are greater/more

## IV. CONCLUSION

Carcasses from bulls slaughtered from pasture did not achieve the market specification for fat score (≥6). The lack of difference in sensory characteristics indicates that fat score is not a good indicator of beef quality.

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