

The effects of forage: concentrate ratio on meat quality of bulls slaughtered at a range of liveweights

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Introduction The current upward trend in cereal prices will have a negative impact on the economics of intensive beef finishing systems. Patterson *et al* (1994) concluded that continental bulls could perform at a high level on diets which were relatively low in concentrates and predominantly based on grass silage. The objective of the present study was to evaluate the effect of forage:concentrate ratio and weight at slaughter on the meat quality of ¾ or more continental bulls.

Materials and methods A total of 260 (120 year 1; 140 year 2) continental bull calves (¾ or greater Charolais, Belgian Blue or Limousin breeding) with a mean initial live weight 351 ± 42.3 kg and mean age 8 ± 1.5 months were allocated to two dietary treatments balanced for breed, initial weight and age. The diets consisted of *ad libitum* concentrates supplemented with 1.2 kg silage dry matter (DM) or a totally mixed ration containing grass silage and concentrates at a 50:50 ratio, on a DM basis. Equal numbers of cattle again balanced for breed, initial weight and age were slaughtered after 191, 218 or 254 days on experiment in year 1 and 190, 217 or 253 days in year 2. Assessments of ultimate pH, sarcomere length, cooking loss, Warner Bratzler shear force and meat colour were undertaken on the *longissimus dorsi* muscle. The data were analysed using Genstat regression procedures with a model including treatment as a factor and slaughter weight as an independent variable and their interactions. Predicted values were calculated for each treatment at a range of slaughter weights.

Results The silage offered had a predicted D-value of 780 and 700 g/kg DM in years 1 and 2, respectively. Animal performance data has been presented by Keady *et al* (2006) and Dawson *et al* (2007). Slaughter weight had no significant effect on meat colour as assessed by L*, a* or b* (Table 1). There was a tendency (P=0.07) for cooking loss to decline after 7 days ageing as slaughter weight increased. Slaughter weight had no significant effect on meat quality as assessed by ultimate pH, sarcomere length or Warner Bratzler shear force. Decreasing the forage:concentrate ratio decreased (P<0.05) cooking loss assessed after 7 days ageing but had no other significant effect on meat quality (Table 2) or meat colour (Table 3).

Table 1 Effects of slaughter weight on meat colour and quality (prediction¹)

	Slaughter weight (kg)							Sem	Sig
	500	550	600	650	700	750	800		
<i>7 day ageing</i>									
Ultimate pH	5.63	5.63	5.63	5.63	5.63	5.63	5.63	0.027	NS
Sarcomere length (µm)	2.68	2.69	2.71	2.72	2.73	2.75	2.76	0.039	NS
Cooking loss (g/kg)	30.1	29.8	29.6	29.3	29.1	28.8	28.5	0.39	P=0.07
WBSF [†] (kg/cm ²)	3.47	3.48	3.48	3.49	3.50	3.50	3.51	0.088	NS
<i>21 day ageing</i>									
Cooking loss (g/kg)	30.7	30.4	30.1	29.9	29.6	29.3	29.1	0.42	NS
WBSF [†] (kg/cm ²)	3.14	3.13	3.13	3.13	3.12	3.12	3.11	0.081	NS
<i>Meat colour</i>									
L* (lightness)	40.9	40.7	40.5	40.3	40.1	39.9	39.7	0.73	NS
a* (redness)	17.1	17.2	17.2	17.3	17.4	17.4	17.5	0.39	NS
b* (yellowness)	13.8	13.9	13.9	14.0	14.0	14.0	14.1	0.29	NS

Table 2 Effect of forage:concentrate ratio on meat quality

	Forage: Concentrate ratio		Sem	Sig
	50:50	0:100		
<i>7 day ageing</i>				
Ultimate pH	5.61	5.65	0.023	NS
Sarcomere length (µm)	2.75	2.69	0.032	NS
Cooking loss (g/kg)	29.7	28.7	0.32	*
WBSF [†] (kg/cm ²)	3.43	3.55	0.074	NS
<i>21 day ageing</i>				
Cooking loss (g/kg)	30.1	29.5	0.35	NS
WBSF [†] (kg/cm ²)	3.06	3.19	0.066	NS

Table 3 Effect of forage: concentrate ratio on meat colour

	Forage: Concentrate ratio		Sem	Sig
	50:50	0:100		
<i>Meat colour</i>				
L*	39.7	40.7	0.61	NS
a*	17.1	17.5	0.32	NS
b*	14.0	13.9	0.24	NS

¹Values predicted from regression analysis

[†] WBSF Warner Bratzler Shear force

Conclusions The results of the current trial have demonstrated that continental bred bulls can be slaughtered at weights up to 800 kg live weight without detrimental affects on meat colour or quality. Replacing 0.50 of the *ad libitum* concentrate diet with grass silage resulted in an increase in cooking loss after 7 days ageing, but had no other effect on meat colour or quality.

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