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Feeding level and method effects on carcass traits and muscle chemical composition of steers.

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Introduction

Winter finishing is the most expensive phase of beef production systems in Ireland due to the high concentrate input. Therefore, it is important to establish the optimum level of concentrate feeding and ascertain if performance or carcass traits are affected by method of feeding (feeds offered separately or as a total mixed ration (TMR)). The objectives of the study were to determine the effects of (i) level of supplementary concentrates with grass silage, and (ii) separate or TMR feeding of silage and concentrates, on carcass traits and muscle chemical composition of finishing steers.

Materials and Methods

There were 6 feeding treatments (n = 14) for 132 days as follows: (i) grass silage offered *ad libitum* (SO), (ii) SO plus a low level of concentrates offered separately (LS), (iii) SO plus a low level of concentrates offered as a TMR (LM), (iv) SO plus a medium level of concentrates offered separately (MS), (v) SO plus a medium level of concentrates offered as TMR (MM), and (vi) concentrates *ad libitum* plus restricted silage (AL). Target low and medium concentrate levels were 3 and 6 kg dry matter (DM) per head daily, respectively. After slaughter the ribs joint (6 to 10) was removed and a sample of *m.longissimus et thoracis* was chemically analysed for moisture, protein and lipid. In the statistical analysis the sum of the chemical constituents was corrected to a common total and the 5 degrees of freedom for treatment were partitioned into the following 5 contrasts – the linear, quadratic and cubic effects of concentrate level, the effect of feeding method, and the concentrate level x feeding method interaction. Measures of carcass fatness and muscle lipid concentration were regressed on carcass weight and on carcass fat variables.

Results

Carcass weight and fatness indicators are shown in Table 1. Carcass weight, carcass fat class, perirenal plus retroperitoneal fat weight and perinenal plus retroperitoneal fat weight scaled for carcass weight all increased with increasing concentrate level and the linear and quadratic components were significant in all cases. There was no significant effect of method of feeding and no significant concentrate level x method of feeding interaction.

Muscle moisture concentration decreased (linear and quadratic terms significant) and muscle lipid concentration increased (linear term significant) with increasing concentrate level. Muscle protein concentration was not significantly affected by concentrate level. There was no significant method of feeding effect and no significant concentrate level x method of feeding interaction for muscle chemical composition.

Regressions of carcass and muscle compositional traits on carcass weight and carcass fat variables are shown in Table 2. Carcass fat class was moderately related to carcass weight. Otherwise, perirenal plus retroperitoneal weight scaled for carcass weight, and muscle chemical constituents, were poorly related to carcass weight. Carcass fat class was not a good indicator of either perirenal plus retroperitoneal fat weight as a proportion of carcass weight or muscle lipid concentration. Perirenal plus retroperitoneal fat proportion was not a good indicator of muscle lipid concentration.

Discussion

As there was no effect of feeding method on carcass weight no effect would be expected on measures of fatness or muscle chemical composition and there was none. The increase in carcass weight with increasing concentrate level was accompanied by increasing carcass fatness but the strong quadratic component to the response was surprising. There seems to be no obvious reason why carcass fatness increased to the medium concentrate level but not beyond.

It is concluded that there was no significant effect of feeding method or significant concentrate level x feeding method interaction for carcass traits or muscle chemical composition. Carcass weight and indicators of carcass fatness increased in a curvilinear pattern with increasing concentrate level. Muscle moisture concentration decreased and muscle lipid concentration increased with increasing concentrate level, but carcass weight and carcass fatness variables were poor indicators of muscle lipid concentration.

Table 1: Effects of concentrate level and method of feeding on carcass traits and muscle chemical composition

	Feeding treatment							Significance[1]	
	SO	LS	LM	MS	MM	AL	s.e.	L	Q
Carcass weight (kg)	305	350	348	367	360	374	7.4	***	*
Carcass fat class[2]	2.02	3.44	3.33	3.51	3.62	3.51	0.175	***	***
P + R fat[3] (kg)	7.5	12.2	12.1	13.2	13.9	13.2	0.76	***	***
P + R fat[3] (g/kg)[4]	29.7	34.9	34.8	35.5	38.6	35.3	1.98	**	**
Muscle composition (g/kg)									
Moisture	749	739	737	729	732	733	3.2	**	*
Protein	227	228	228	228	226	226	8.3	NS	NS
Lipid	21	28	32	36	34	34	3.1	*	NS

[1]Linear and quadratic effects of concentrate level, no significant cubic effect: [2]EU Beef Carcass Classification Scheme: scale 1 = leanest to 5 = fattest; [3]Perirenal + retroperitoneal fat; [4]Of carcass weight

Table 2: Regressions (y = a + bX) of carcass and compositional traits on carcass weight and fatness variables

X = Carcass weight	a ± s.e.	b ± s.e.	Significance	R^2
Carcass fat class	-1.2 ± 0.78	0.013 ± 0.0022	***	0.27
P + R fat (kg)	-5.7 ± 3.51	0.051 ± 0.0010	***	0.23
Muscle moisture (g/kg)	787 ± 13.5	-0.15 ± 0.038	***	0.15
Muscle lipid (g/kg)	-7.6 ± 15.6	0.11 ± 0.044	*	0.07
X = Carcass fat class				
P + R fat (kg)	4.9 ± 1.37	2.3 ± 0.41	***	0.26
Muscle lipid (g/kg)	7.2 ± 5.83	7.2 ± 1.76	***	0.16

See Table 1 footnotes