Performance of finishing cattle consuming diets based on grass silage plus fodder beet roots or rolled barley

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Introduction

Grass silage is the main winter forage fed on Irish cattle farms, and its sequential fortification with cereal grain progressively increases the performance of finishing cattle. The optimal combination of grass silage and cereal grain depends mainly on the target rate and value of animal performance, and on the feed value, availability and cost of both silage and cereal grain. Fodder beet roots can be an economically viable alternative to cereal grains on some farms (Finneran, 2012) and when appropriately balanced for other nutrients they can support performance similar to low-moderate supplementation rates of barley (Drennan, 1977). The objective of this experiment was to establish animal trait responses to fortifying grass silage with barley or fodder beet across a range of dietary proportions.

Materials & methods

Fifty-four Charolais (n = 36) and Limousin (n = 18) crossbred steers were blocked by breed and liveweight (522 (16.9) and 503 (16.5) kg mean (s.d.) starting liveweight, respectively), and randomly allocated from within block (n=6) to nine dietary treatments. The treatments (per head daily) were: grass silage *ad libitum* alone (1), or fortified with barley (830 g rolled barley, 100 g soyabean meal, 50 g molasses and 20 g mineral + vitamin premix per kg) at 2.5 kg (2), 5.0 kg (3) and 7.5 kg (4), or with fodder beet (930 g fodder beet roots, 64 g soyabean meal and 6 g mineral + vitamin premix per kg) at equivalent dry matter (DM) inputs as for barley (6, 7 and 8, respectively). Barley and fodder beet were also offered *ad libitum* plus about 1 kg grass silage DM (5 and 9, respectively). Animals were individually fed the appropriate diets for 112 days after which carcass and meat variables were measured. Animal data for treatments 1 (double counted), 2, 3, 4, 6, 7 and 8 were statistically analysed as a randomised complete block design with a 2 (type of supplement) x 4 (rate of supplement) arrangement of treatments, and with linear and quadratic effects being identified within the rate of supplementation. Data for treatments 5 and 9 were analysed using a model that accounted for type of supplement and block.

Results and Discussion

Grass silage was of moderate digestibility (Table 1) and well preserved (pH 3.8; lactic, acetic, propionic and butyric acids of 124, 24, 2 and 1 g/kg DM; ethanol of 9 g/kg DM; NH_3-N of 76 g/kg N). All cattle received adequate protein in their diet.

Table 1. Composition of grass silage and concentrate mixtures containing barley grain or fodder beet roots

	Grass silage	Barley	Fodder beet
Dry matter (g/kg; DM)	253	811	261
Ash (g/kg DM)	83	39	118
Crude protein (g/kg DM)	110	139	123
NDF[1] (g/kg DM)	558	141	106
Starch (g/kg DM)		472	5
WSC[2] (g/kg DM)	13		481
DM digestibility (g/kg)	676	878	859

[1]Neutral detergent fibre; [2]Water-soluble carbohydrate

Type of supplement did not affect performance or meat quality, but barley tended to permit a higher intake of silage DM than fodder beet (Table 2). When offered *ad libitum*, barley and fodder beet supported liveweight gains of 1170 and 1408 (sed 188.1; P>0.05) g/d and carcass gains of 941 and 917 (sed 85.3; P>0.05) g/d, respectively. Corresponding values were carcass gain/total DM intake 97.2 and 88.2 (sed 7.02; P>0.05) g/kg, concentrate DM intake 8.1 and 9.1 (sed 0.27: P<0.05) kg/d and silage DM intake 1.0 and 1.2 kg /d. Muscle colour was not affected by the type of supplement offered *ad libitum*, but fat yellowness (15.9 vs. 15.1; sed 0.35; P=0.08) and chroma (18.5 vs. 17.6; sed 0.40; P=0.07) tended to be higher for the barley-fed steers.

Conclusions

When balanced for protein and minerals both barley grain and fodder beet roots supported similar performance by finishing steers across a range of rates of input, with little effect on beef colour.

Reference

Drennan, M.J. (1977). *Anim Prod*, 24, 153 (Abstr).
Finneran, E., Crosson, P. and O'Kiely, P. (2012). *Irish Grassld Assoc J*, 46 (in press)

Table 2. Intake, performance and meat quality attributes (ns – not significant; L – linear; Q – quadratic)

	Type of supplement		Rate of supplement (kg DM/d)					Significance (P=)	
	Barley[1]	F. beet[2]	0	2.03	4.05	6.08	sed[3]	Type	Rate
Silage DM intake (kg/d)	5.37	5.02	6.90	5.76	4.72	3.40	0.390	0.08	L*
Total DM intake (kg/d)	8.41	8.06	6.90	7.79	8.77	9.48	0.390	0.08	L*
Liveweight gain (g/d)	805	798	411	802	949	1043	131.4	ns	L*,Q*
Carcass gain (g/d)	515	512	170	559	657	668	109.3	ns	L*,Q*
Carc.gain/T. DM intake (g/kg)	59.3	62.2	23.6	73.2	75.2	70.8	13.85	ns	L*,Q*
Fat lightness	66.9	67.3	69.2	66.4	65.6	67.2	1.67	ns	Q*
Fat redness	7.3	7.0	6.0	6.9	8.0	7.8	1.07	ns	L*
Muscle lightness	34.8	35.2	33.8	34.5	36.2	35.4	1.19	ns	L*
Muscle redness	13.3	13.8	12.9	13.2	14.0	14.1	0.80	ns	L*
Muscle pH	5.50	5.50	5.55	5.50	5.48	5.47	0.023	ns	L*

[1]Barley grain based mixture; [2]Fodder beet root based mixture; [3]Interaction standard error of the difference