

## Comparison of the performance of finishing beef cattle offered grass silage and legume / cereal wholecrop silage either alone or in combination with grass silage

P Kennedy<sup>1,2</sup>, L E R Dawson<sup>2</sup>

<sup>1</sup>Queen's University Belfast, Belfast, United Kingdom, <sup>2</sup>Agri-Food and BioSciences Institute, Hillsborough, Co Down, United Kingdom

Email: peter.kennedy@afbini.gov.uk

**Introduction** In Northern Ireland grass silage is the basal forage for beef cattle during the winter feeding period. Increasingly however, other ensiled forages are being considered due to their potentially lower cost and perceived conservation and nutritional attributes. Wholecrop cereals such as wheat have been shown to improve dry matter (DM) intake but not animal performance (Keady *et al*, 2007). With increasing volatility in world markets creating major fluctuations in protein prices, interest has increased in home grown protein sources. High protein legumes with low input costs, such as lupins have given reasonable animal performance when offered as a monoculture. However, limited scientific research has been undertaken on the role of legumes in combination with a cereal as a bi-crop for finishing beef cattle. Consequently the objective of the current study was to evaluate the effects of legume/cereal wholecrop offered either alone or in combination with grass silage on the performance of beef cattle.

**Materials and methods** Eighty continental cross steers with a mean initial live weight  $557 \pm 32$  kg and mean age  $18.5 \pm 1.2$  months were allocated to one of 10 treatments, balanced for genotype, initial weight and farm of origin. The five forage diets offered included solely grass silage (GS), lupins/triticale silage (L/T) and vetch/barley silage (V/B) offered either as the sole forage or in combination with GS at a ratio of 70:30, on a dry matter (DM) basis, legume/cereal wholecrop: GS. The forages were offered *ad libitum* once per day following mixing in a paddle type complete diet mixer wagon, supplemented with either 2 or 5 kg concentrates/head/day. Daily intakes and fortnightly chemical analysis of forages and concentrates were used to calculate supplementation level of soyabean meal within treatments to stabilise protein intake over all treatments. Equal numbers of steers from each treatment were slaughtered after 105, 119, 126 and 140 days on experiment according to liveweight, from heaviest to lightest. Data were analysed as a 5 forage x 2 concentrate level experiment with genotype, farm of origin, fat class and start weight included as covariates using GenStat REML.

**Results** Lupins/triticale, vetch/barley and grass silage had concentrations of dry matter, ammonia nitrogen, starch, crude protein (CP) and a pH of, 291, 304 and 251 g/kg fresh, 120, 140 and 90 g/kg total nitrogen, 112.3, 101.3 and 5.6 g/kg DM, 97, 147 and 122 g/kg DM and 4.04, 4.68 and 3.87 respectively. Grass silage had a predicted D-value of 680 g/kg DM. Total intake of crude protein (CP) of animals on 2 kg concentrates/head was stabilised at 1272 g/day and at 5 kg concentrates/head at 1505 g/day. There were no significant silage type by concentrate level interactions. Increasing concentrate supplementation from 2 kg to 5 kg/concentrate/head/day increased final liveweight ( $626$  v  $664$  kg, sed 6.3,  $P < 0.05$ ), liveweight gain (LWG) ( $0.59$  v  $0.87$ , sed 0.054,  $P < 0.01$ ), carcass weight ( $338$  v  $364$ , sed 3.0,  $P < 0.001$ ), and carcass gain ( $0.30$  v  $0.50$ , sed 0.029,  $P < 0.001$ ). The effects of forage type on feed intake and animal performance are presented in Table 1. Steers offered GS had significantly ( $P < 0.001$ ) heavier final live weights compared to animals offered L/T, V/B and V/B:GS. Steers offered GS had significantly ( $P < 0.001$ ) greater carcass weights and carcass gains compared to L/T, L/T:GS, V/B and V/B:GS. Animals offered GS had a similar silage dry matter intake (SDMI) to L/T and V/B although significantly ( $P < 0.001$ ) lower than L/T:GS and V/B:GS.

**Table 1** Effect of feeding grass silage, lupins/triticale and vetch barley as sole forages and in combination and concentrate level on feed intake and animal performance

	Forage (F)					sed	Sig.
	GS	L/T	L/T:GS	V/B	V/B:GS		
SDMI (kg/day)	5.79 <sup>a</sup>	5.98 <sup>ab</sup>	6.34 <sup>bc</sup>	5.84 <sup>a</sup>	6.19 <sup>bc</sup>	0.110	***
Final live weight (kg)	664 <sup>b</sup>	638 <sup>a</sup>	650 <sup>ab</sup>	631 <sup>a</sup>	643 <sup>a</sup>	9.4	***
LWG (kg/day)	0.92 <sup>c</sup>	0.67 <sup>ab</sup>	0.76 <sup>bc</sup>	0.59 <sup>a</sup>	0.69 <sup>ab</sup>	0.080	***
Carcass weight (kg)	366 <sup>b</sup>	347 <sup>a</sup>	353 <sup>a</sup>	344 <sup>a</sup>	348 <sup>a</sup>	4.5	***
Carcass gain (kg/day)	0.52 <sup>d</sup>	0.33 <sup>a</sup>	0.41 <sup>c</sup>	0.35 <sup>ab</sup>	0.38 <sup>bc</sup>	0.043	***
Dressing proportion (g/kg)	557	543	544	546	543	8.0	NS
Conformation class <sup>γ</sup>	3.4	3.4	3.4	3.2	3.1	0.17	NS

GS: Grass silage; L/T:GS: Lupins/triticale : Grass silage on a 70:30 DM ratio; L/T : Lupins/triticale; V/B : Vetch/Barley; V/B:GS: Vetch/Barley : Grass silage on a 70:30 DM ratio.

SDMI: Silage dry matter intake; Sig: Significance;

γ: EUROP scale : 5,4,3,2,1, respectively; LWG: Live weight gain;

**Conclusion** Finishing beef cattle offered legume/cereal wholecrop silage as the sole forage or in combination with grass silage had, on average, 26% lower liveweight gain relative to high quality grass silage. These results demonstrate that legume/cereal wholecrop silages do not offer a suitable alternative to high quality grass silage for finishing beef cattle.

**Acknowledgements** The authors gratefully acknowledge funding from MLC and DARDNI

### References

Keady. T. W. J., Lively. F. O., Kilpatrick. D. J. and Moss. B. W. 2007: Effect of replacing grass silage with either maize or whole-crop wheat silages on the performance and meat quality of beef cattle offered two levels of concentrate. *Animal*, 1, p 613 - 623