

Effects of silage type and proportion in the diet on the growth and carcass characteristics of finishing lambs

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Introduction Within sheep systems in the UK and Ireland it is common for hill lambs to be housed late in the season and finished on high grain diets due to inadequate supplies of grass. However, due to a number of factors, concentrate feed costs have increased significantly in recent years so there is a need to investigate lower cost alternatives. Grass silage-based feeding systems for lambs have been studied extensively and are capable of sustaining good growth rates (>200 g/d) when supplemented with concentrates (Carson *et al.*, 2001). Forage maize has increased in popularity over the past 10 years and offers some opportunities to reduce forage costs on mixed beef/sheep farms, with the potential for high dry-matter yields (comparable to a 3-cut silage system) of high quality material from a single harvest (Keady *et al.*, 2008). However there is limited information on supplementation strategies for lambs offered maize silage. The aims of this study were to investigate the performance and carcass characteristics of lambs finished on grass silage or maize silage at two contrasting levels of concentrates.

Materials and methods Sixty crossbred lambs (48 females, 12 males) of mixed breeds, with a mean age of 217 ± 9.3 days and a mean live weight of 35 ± 0.5 kg, were allocated to four groups ($n = 15$) balanced for sex, age and sire breed. Lambs were housed in groups of six and offered *ad libitum* grass silage (G) or maize silage (M) plus concentrates. Concentrates were offered to achieve (on a dry-matter basis) a HIGH (0.80, H) or LOW (0.50, L) proportion of forage in the diet, giving a total of 4 treatments: GH, GL, MH and ML. Daily concentrate allocations were estimated from the previous day's silage DM intake and were offered in two equal sized meals at 0930 and 1600 h. The grass silage was predicted by Near Infrared Reflectance Spectroscopy to supply 291 g DM/kg, 655 g/kg digestible organic matter/kg DM, 10.5 MJ ME/kg DM and 140 g crude-protein/kg DM. Maize silage was predicted to supply 346 g DM/kg, 11.3 MJ ME/kg DM, 87 g CP/kg DM and 293 g starch/kg DM. Concentrates fed to lambs offered grass silage and maize silage were formulated to supply 167 and 214 g CP/kg DM respectively. Silage was offered fresh daily at 0930 h while the concentrates were offered in two equal size meals at 1000 h and 1630 h. Intake of silage and supplement were recorded daily. Lambs were weighed fortnightly until they reached their target slaughter weight of 44 kg. Cold carcass weight, dressing proportion and grade were recorded at the point of slaughter. Carcass conformation was scored on a 5-point scale using the EUROP classification system (E=5, P=1) while carcass fatness was scored on a 6-point scale using the Livestock and Meat Commission (NI) classification system (1=1, 2=2, 3=3, 4L=4, 4H=4.5 and 5=5). Data were analysed in a 2 X 2 factorial arrangement (Forage type X Proportion) using Residual Maximum Likelihood (REML) analysis with covariates included for carcass weight, sire breed and sex.

Results Intake of maize silage was 17% higher than grass silage for lambs on the HIGH forage diet, and 14% higher on the LOW forage diet ($P < 0.05$). Overall, total DM intake was increased by 15% when lambs were offered maize silage rather than grass silage ($P < 0.001$). Consequently, daily live weight gain was 34 g/d higher for maize silage-fed lambs ($P < 0.001$). Reducing the forage proportion from 0.80 to 0.50 decreased the intake of grass silage and maize silage by 17% and 14% respectively, but increased total DM intake by 32% ($P < 0.001$) and average daily live weight gain by 53 g/d. Finishing diet had no effect on carcass fatness; however with grass silage-fed lambs only, carcass conformation increased ($P < 0.05$) and dressing proportion tended to increase ($P = 0.12$) as the proportion of forage in the diet increased.

Table 1 Effects of silage type and proportion in the diet on the performance of finishing lambs

Silage type Silage proportion in the diet	Grass		Maize		s.e.d	Silage	Proportion	Silage X Proportion
	HIGH	LOW	HIGH	LOW				
Silage DM intake (kg/d)	0.66 ^b	0.56 ^a	0.77 ^c	0.64 ^b	0.010	***	***	*
Concentrate DM intake (kg/d)	0.16 ^a	0.53 ^c	0.19 ^b	0.60 ^d	0.007	***	***	***
Total DM intake (kg/d)	0.82 ^a	1.09 ^c	0.96 ^b	1.24 ^d	0.017	***	***	NS
Daily LWG (g/d)	79 ^a	149 ^b	129 ^b	166 ^b	20.2	***	**	NS
Conformation score	3.19 ^b	2.85 ^a	3.02 ^{ab}	3.12 ^{ab}	0.156	NS	NS	*
Fat score	2.94	2.96	3.00	2.97	0.234	NS	NS	NS
Dressing proportion	0.465 ^b	0.445 ^a	0.445 ^a	0.445 ^a	0.0088	NS	NS	P=0.12

HIGH, 80% silage on a dry-matter basis; LOW, 50% silage on a dry-matter basis; DM, dry-matter; LWG, live weight gain; Means sharing the same superscript are not statistically significant ($P > 0.05$)

Conclusion The results of this study demonstrate that high quality maize silage is an ideal forage for finishing lambs indoors, achieving higher intake characteristics and increasing daily live weight gain by up to 50 g/d compared to lambs offered medium quality grass silage. However the lamb performance benefits decrease significantly when diets contain high levels of concentrates.

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References

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 Keady TWJ, Kilpatrick DJ, Mayne CS and Gordon, FJ. 2008. *Livestock Science* 119, 1-11