

Effects of breed and concentrate supplementation on nitrogen utilisation in ewes offered fresh grass

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Introduction

- Nitrogen (N) excretion from sheep production systems is an important source of nitrate and nitrous oxide emissions responsible for groundwater pollution and global warming.
- The European Union introduced the Nitrates Directives (European Commission, 1991) that restricts livestock manure applied to the land - 170 kg manure N per hectare per year.
- Development of strategies to reduce N excretion from sheep is essential to reduce the environmental impact of sheep production systems.



Aims of Study

- To investigate the effects of breed and diet factors on N excretion in lowland ewes
- To identify key factors influencing N utilisation efficiency of sheep production



Material and methods

- Sixteen lowland replacement ewes (14 months old and 61 ± 5.3 kg live weight) were used in a 2 breed \times 2 diet factorial design study with a single period (23 days) (May to Jun, 2014)

Texel



Fresh ryegrass(*ad libitum*)

Highlander



Fresh ryegrass (*ad libitum*)+
0.5 kg/d concentrate



Material and methods

- Sward management
 - Prior to feeding, sward was divided into several plots, each plot was trimmed, in a week interval, at a residual height of 4 cm and allowed to grow for 2 weeks
 - Feeding started when grass was suitable to zero grazing
 - Each plot was used for one week
- Concentrate was pelleted in AFBI Hillsborough



Material and methods

➤ Feeding arrangement

Grass cut daily



Fed once a day
in pens for 19 d



Metabolism
crates for 4 d



➤ Measurements

- Feed intake
- Faeces and urine output



Concentrate Ingredient

Ingredient	g/kg, as-fed basis
Rolled barley	333
Sugar beet pulp	256
Soybean meal	256
Maize meal	103
Molasses	31
Vitamin and mineral premix	21

Chemical composition (g/kg DM)

Item	Grass	Concentrate
Dry matter, g/kg as fed	197	878
Ash	69	69
Crude protein	150	207
Neutral detergent fibre	459	258
Acid detergent fibre	236	119
Water soluble carbohydrates	215	95
Ether extract	36	24
Gross energy, MJ/kg DM	18.7	17.7

Data Analysis

- Data were analysed in a 2 (breed) x 2 (diet) factorial arrangement using Analysis of Variance (ANOVA) for evaluation of the effects of breed and diet on nitrogen utilisation
- The statistical programme used in the present study was Genstat statistical package (Lawes Agricultural Trust, Rothamsted, UK)



Effects of interaction

- There was no significant interaction between breed and diet types on any variable of nitrogen utilisation
- The results presented are focused on the main treatment effects





Effects of diet



Effects of diet

	Grass	Grass + Concentrate	SE	P
Live weight, kg	58.9	63.9	2.25	NS (0.056)
Grass DMI, kg/d	1.58	1.35	0.094	*
Total DMI, kg/d	1.58	1.79	0.100	NS (0.085)
DM digestibility	0.812	0.821	0.0126	NS
NDF digestibility	0.777	0.772	0.0193	NS
N digestibility	0.685	0.706	0.0394	NS

Effects of diet (g/d)

	Grass	Grass + Concentrate	SE	P
N intake	38.2	48.5	1.45	***
Faecal N	10.6	13.7	1.17	*
Urinary N	17.3	21.9	1.10	**
Manure N	27.9	35.6	1.70	**
Retained N	10.3	12.9	2.18	NS

Effects of diet

	Grass	Grass + Concentrate	SE	P
Faecal N/N intake	0.315	0.294	0.0394	NS
Urinary N/N intake	0.423	0.453	0.0381	NS
Manure N/N intake	0.738	0.747	0.0516	NS
Retained N/N intake	0.262	0.253	0.0516	NS
Urine N/Manure N	0.579	0.610	0.0354	NS



Effects of breed



Effects of breed

	Highlander	Texel	SE	P
Live weight, kg	59.5	63.4	2.23	NS
Grass DMI, kg/d	1.51	1.41	0.093	NS
Total DMI, kg/d	1.76	1.63	0.093	NS
DM digestibility	0.819	0.815	0.0125	NS
NDF digestibility	0.775	0.773	0.0192	NS
N digestibility	0.716	0.679	0.0390	NS

Effects of breed (g/d)

	Highlander	Texel	SE	P
N intake	45.5	42.1	1.44	NS
Faecal N	12.2	12.3	1.16	NS
Urinary N	20.6	19.1	1.10	NS
Manure N	32.7	31.4	1.68	NS
Retained N	12.8	10.7	2.16	NS

Effects of breed

	Highlander	Texel	SE	P
Faecal N/N intake	0.284	0.321	0.0390	NS
Urinary N/N intake	0.435	0.442	0.0378	NS
Manure N/N intake	0.719	0.763	0.0512	NS
Retained N/N intake	0.281	0.237	0.0512	NS
Urine N/Manure N	0.603	0.589	0.0351	NS

Conclusions

- Ewes offered 0.5 kg/d concentrate had higher N intake, faecal N, urine N and manure N outputs, than those given fresh grass only.
- However, diets had no significant effect on retained N or N utilisation efficiency .
- No significant differences in N intake, outputs and utilisation efficiency when compared between Texel and Highlander ewes.
- Neither breed nor concentrate supplementation had significant effects on N utilisation efficiency in sheep when fed high quality fresh grass. This adds information for the development of strategies to reduce N pollution in sheep production systems.



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Thank you !

