

GROUND ROUGHAGE IN PELLETTED DIETS AND DIGESTIBILITY AND RUMINATION TIME BY SHEEP

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The possible effects of fineness of grinding (screen size) of the roughage component of pelleted diets on animal welfare and nutritive value was investigated in response to concerns by some sections of the live sheep export industry that pellets made from too finely ground material may be detrimental to animal welfare and productivity. Few studies have examined the effects of degree of fineness of grinding relevant to pelleted diets for sheep. The effects of fineness of grinding on digestibility and rumination time were examined in 4 experiments using adult Merino wethers individually penned indoors and fed 1000 g feed/head.day. In experiments 1 and 2, the sheep were harnessed for total faeces collection to determine digestibility (DMD).

In experiment 1, oaten hay (90.5% OM, 1.7% N, 40.2% ADF) used in the experiments was hammer-milled through 18 or 2 mm screens and fed as the sole diet to 14 sheep (7/diet) for 22 days. DMD was measured over days 15-22 (8 days). The hay was also hammermilled through either 10, 6 or 2 mm screens and included in 3 pelleted diets (C, M and F) consisting of 60% hay, 36% barley, 2% bentonite, 1% limestone and 1% salt and containing 92.7% OM, 2.4% N, 23.3% ADF and 37.5% starch. The pellets (10 mm diameter) were made with a Lister pellet mill. In experiment 2, the 3 diets were fed to a further 15 sheep (5/diet) for 21 days and DMD determined over days 15-21 (7 days). In experiment 3, 33 sheep (11/diet) were fed diets C, M or F and in experiment 4, the same sheep were re-randomised across previous treatments and fed (11 sheep/diet) either diet C, a 10 mm diameter commercial export pellet of similar composition to diet C, or chaffed oaten hay. In both experiments the sheep were fed daily at 0900 hours and rumination time (RT) was estimated by visually observing and recording rumination chewing (as distinct from eating chewing) every 2 min for 22 h from 1100-0900 hours (night-time observations made by torchlight) on day 12 of feeding. In experiment 4, rail chewing was also recorded.

Table 1. Dry matter digestibility @MD), rumination chewing (RT, time spent chewing) and times observed rail chewing of sheep fed pelleted diets containing 60% hay hammermilled through 2, 6 or 10 mm screens, F, M, C respectively (experiment 3); and C, commercial pellets and oaten chaff (experiment 4)

Within columns, means followed by different letters differ significantly ($P < 0.001$)

Diet	Experiments 2 and 3		Experiment 4	
	DMD (%)	RT (min)	Rail chewing	RT (min)
F	67.3	81	—	—
M	68.9	94	—	—
C	69.2	100	7.8	101a
Commercial pellet	—	—	5.7	170b
Chaffed oaten hay	—	—	3.7	253c
s.e.m.	1.72	14.2	3.46	23.2

The DMD of the hay milled through 10 and 2 mm screens (experiment 1) was 55.9 and 56.3% (s.e.m. = 0.89, n.s.). There was also no difference in the DMD of diets in experiment 2 (Table 1). In experiments 3 and 4, all sheep ruminated for at least 60 min (Table 1) with 3 exceptions (2 sheep fed diet M in experiment 3 and 1 sheep fed diet C in experiment 4) which ruminated for less than 20 min. These data were excluded from the analysis of variance and the means shown in Table 1. The results of experiment 4 indicate that diet C was not an appropriate model for pellets produced by at least some commercial manufacturers. Differences in rail chewing were mainly due to excessive chewing by 3 sheep on the 2 pelleted diets and there was no significant relationship ($r^2 = -0.22$) between rail chewing and RT of individual sheep. In experiment 3, there was no difference between diets in the pH of rumen fluid sampled from 4 sheep/diet (pH range = 6.1-6.7).

In this study, screen size used in grinding hay had no effect on diet digestibility and no major effect on rumination time. There appears to be little published evidence that low rumination time on pelleted feeds is detrimental to animal welfare. Differences in screen size and roughage type used in commercial pellets may be partly confounded in the industry's perception of pellet quality.