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## BRIEF COMMUNICATION

## Effects of chewing during eating on particle size reduction and subsequent fermentation in sheep

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Chewing is the dominant process regulating the breakdown of plant material introduced into the rumen. It reduces particle size and exposes internal plant structures to microbial attack. The effects of plant type on the extent of chewing and subsequent rate of fermentation in the rumen have been studied.

Four Romney Marsh wether sheep each prepared with a large oesophageal fistula were fed in turn on 4 different diets: fresh 'Grasslands Ruanui' ryegrass at two stages of maturity, early vegetative (PY) and early bloom (PM); fresh 'Grasslands Huia' white clover (WC); chaffed lucerne hay (L). The animals were fed 42 g DM/h by an hourly feeding device. Boli collected during eating were mixed and then sampled. One sample was wet sieved to determine particle size spectrum. A further sample of whole bolus was prepared for fermentation studies by squeezing to produce juice and a residue (remainder after washing with buffer). Fermentation studies using bolus, juice and residue inoculated with rumen liquor from donor sheep on same diet were conducted using a constant pressure manometric apparatus for 300 min periods.

Intake rate (Table 1) is a measure of how well the animals chewed the feed given each hour; a slow eating rate indicating greater chewing. Bolus particulate DM data reflects both eating rate and plant type: WC was eaten very quickly and not well chewed; PY was well chewed but its high tensile strength (Evans, 1964) resulted in poor breakdown; PM was very thoroughly chewed; L, while eaten rapidly, was well broken down because of its brittle nature and the fact that chaff cutting had already reduced particle size. Data on the fermentation rates of the bolus fractions show that the juice fraction was fermented more rapidly than the residue. Differences between plant types in juice fermentation largely reflect the chemical composition of the plant material: PM contained considerably more soluble polysaccharide than the other diets. Residue fermentation rates were strongly influenced by diet and rank the species in terms of their feeding value (Ulyatt, 1981). Bolus fermentation rates are largely influenced by residue rates because the ratio of

TABLE 1 Effect of diet on particle size reduction by chewing and subsequent fermentation in sheep.

	White clover	Perennial ryegrass early vegetative	early bloom	Lucerne chaff
DM digestibility (%)	80.1	81.0	72.5	65.0
Chemical composition (% DM):				
Soluble sugars	16.0	15.4	27.3	13.0
Neutral detergent fibre	27.4	41.5	57.9	50.9
Nitrogen	4.6	3.7	1.6	3.2
Intake rate (g DM/min)	11.2	6.5	4.1	9.9
Bolus particulate DM (mm):				
>1	78.1	78.9	65.3	64.8
<1	21.9	21.1	34.7	35.2
Fermentation rate (ml gas/g OM/300 min):				
Bolus	126	101	77	60
Juice	174	129	206	176
Residue	109	88	45	38

residue:juice (DM basis) was approximately 4:1 and also because juice fermentation, while rapid, is transitory.

The aim of this work is to examine the feed in the form it is presented to the rumen, i.e., the bolus, to make measurements that reflect its chemical, physical and morphological properties, and to study how these effect breakdown in the rumen. In this work a limited range of diets was used, however, the results give promise of more realistic prediction of feeding value than can be obtained by conventional proceedings involving drying and grinding that are likely to destroy the very attributes that distinguish feeds.

## REFERENCES

- Evans, P. S., 1964: *N.Z. J agric. Res.*, 7: 508.  
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