

Chemical and physical characteristics of grains related to variability in energy and amino acid availability in ruminants: a review

Samantha L. van Barneveld

Abstract

This paper reviews the carbohydrate, protein, lipid, anti-nutritional, and physical characteristics of grains that determine the variability in their nutritional quality for ruminant animals. The amount, rate, and extent of starch fermentation in the rumen have been the subject of many studies, with large variation found between and within grain species. Electron microscopy scanning techniques have shown that the protein matrix limits the microbial colonisation of starch granules in some grain species, whereas in others it may be the structural carbohydrates that affect colonisation. The composition of the different fibre fractions of grains and their interaction with non-fibre carbohydrates requires investigation, since it has been shown that non-starch polysaccharides, including neutral detergent fibre and acid detergent fibre, may not be specific enough to predict animal response to grain. Fermentation patterns of the non-starch polysaccharide components of legumes are also poorly understood and hence require further investigation. Different varieties of grain and different seasonal conditions show variation in the protein fractions of the kernel. Since these fractions display different solubility and degradation rates in the rumen, rumen solubility values cannot be generalised for grains. The variability in solubility caused by rumen flow rate and pH is a further complication. Finally, the lipid content of grains varies greatly, with high-oil grains potentially contributing to the energy level of the diet, but possibly negatively affecting rumen fermentation. Due to the degree of variability of characteristics discussed in this review, it is clear that the nutritional quality of grains cannot be assessed in a single rapid assay.

Full Text

<http://www.publish.csiro.au/nid/40/paper/AR98159.htm>