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Associative effects between forages and grains: consequences for feed utilisation

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Abstract

Intake of metabolisable energy (ME) when forages and grains are fed together to ruminants may, due to digestive and metabolic interactions, be lower or higher than expected from feeding these components separately. These interactions, or associative effects, are due primarily to changes in the intake and/or the digestibility of the fibrous components of forage. Effects on voluntary forage intake (substitution effects) are usually much larger than on the digestibility of fibrous components, although the changes in forage intake may be a consequence of changes in the rate of digestion of the fibrous components. Positive associative effects, where grains increase voluntary intake and/or digestion of forage, are usually due to the provision of a limiting nutrient (eg. nitrogen, phosphorus) in the grain which is deficient in the forage. Negative associative effects, where grains decrease voluntary intake and/or digestion of forage, occur frequently and can cause low efficiency of utilisation of grain.

Rate of substitution of grain for forage is related to forage intake, forage digestibility, the proportion of grain in the diet, and the maturity of the animal. Substitution rates are usually high in ruminants consuming high intakes of forage of high digestibility, probably due to the metabolic mechanisms which control voluntary intake reducing forage intake. Substitution rates are often low when animals are consuming forage of low to medium digestibility. Since voluntary intake of such forages is most likely determined by the capacity of the rumen to accommodate and pass to the lower gastrointestinal tract undigested forage residues, and of the rate of forage fibre digestion in the rumen, substitution is likely to be determined by changes in these processes. Reduced rate of fibre digestion in the rumen is often due to low rumen pH and/or an insufficiency of essential substrates for rumen microorganisms. Use of grains for lactating dairy cows involves an additional constraint since dietary grain may severely reduce milk fat content. Negative associative effects can be alleviated by ensuring supply of essential microbial substrates, feeding management, and modification of grain to minimise their adverse effects on fibre digestion, while ensuring satisfactory digestion of the grain and efficient microbial protein production.

Full Text

http://www.publish.csiro.au/nid/40/paper/AR98165.htm