Magnesium absorption as influenced by rumen passage kinetics in lactating dairy cows

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The K dependent Mg absorption through the rumen wall may be influenced by other dietary properties, such as forage type or forage to concentrate ratio which are likely associated to rumen passage kinetics. The study aimed to assess the effects of rumen passage kinetics on apparent Mg absorption and retention in lactating dairy cows. The passage kinetics were modified by feeding early or late harvested grass silages containing 341 and 572 g NDF/kg DM, respectively. Six lactating dairy cows, including 4 fitted with ruminal cannulas were randomly assigned to a 3×3 cross over design. The experimental diets consisted of early harvested low NDF (neutral detergent fibre, LOW) and late harvested high NDF (HIGH) grass silage and of concentrate (20% of DM intake). The diets containing late harvested silage were formulated to be either balanced in digestible protein with diet LOW (High+CP) or not. All diets were formulated to contain iso-Ca, -P, -Mg, -K and -Na. Passage kinetics of solid and liquid phase of rumen digesta were evaluated using marker disappearance profile of respectively, ytterbium labelled fibre and Co-EDTA. Cows fed LOW had compared to High+CP and HIGH, an up to 40% lower solid and 26% lower liquid phase volume and a higher liquid passage rate of rumen digesta. Rumen soluble Mg concentration doubled when cows were fed LOW. Faecal Mg excretion was up to 14% higher in cows fed LOW and Mg absorbability was 12% compared to up to 19% in other diets. Urinary Mg excretion in cows fed LOW was half of the ones in the other treatments, but Mg retention was not affected. Protein excess neither affected rumen passage kinetics nor Mg absorption and retention. Mg absorption correlated with rumen liquid volume which correlated with daily NDF intake. Consequently, daily Mg absorption decreased with decreasing NDF intake. To conclude, in addition to the known antagonistic effect of dietary K, present data indicate that Mg absorption was dependent from NDF intake which modified rumen liquid volume, but was independent of dietary protein excess likely associated to low NDF herbages.

Effects of dietary sainfoin on feeding, rumination, and faecal particle composition in dairy cows

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An experiment was conducted to test whether dietary sainfoin (*Onobrychis viciifolia*), a plant containing condensed tannins, affects feeding and rumination behaviour of dairy cows fed different roughage-only diets. Out of a herd of sixty lactating Swiss Fleckvieh cows, twenty-nine were chosen for a 6-week experiment. Cows were fed pasture, fresh cut grass and hay. During week 1 (baseline) and weeks 2-4, they had access to pasture for 4 hours during day, and received approximately 6 kg DM/day fresh grass and 4 kg DM/day hay in barn. In week 5 and 6, daily pasture allowance was 2 h; hay offer was doubled. In week 2-6, each cow individually received respectively 1 kg of pelleted feed in the morning and in the evening. Ten cows received ryegrass pellets in week 2, 3 and 5, and sainfoin pellets in week 4 and 6 (sainfoin short term; SST). Nine cows were fed sainfoin (Sainfoin long term; SLT) and another ten ryegrass pellets (Control; C) during the whole term. Rumination and feeding behaviour was measured with RumiWatch® sensor halters during week 1, 4, and 6. Individual faeces samples (4 per cow/week in week 1, 4 and 6) were analysed for particle fractions (wet sieving at 4.0, 2.0, 1.0, and 0.3 mm). Data was evaluated with a general linear model using group and week as fixed factors; baseline data served as covariate. Compared to week 4, all cows showed an increased duration of feeding (15.5%) and a decreased ruminating activity (14.2%) in week 6 ($P<0.001$). Feeding sainfoin pellets (SLT and SST) led to decreased feeding time (2.0-4.6%) and increased rumination time (4.4-6.5%) compared to C ($P<0.05$) in both weeks. Total particle proportion in faecal DM was lower in SST and SLT by 11.7% compared to C ($P<0.05$). Also the proportion of the 1.0-0.3 mm fraction was lower in faeces of SST and SLC ($P<0.05$). Milk yields, fat and protein contents were not affected. Results indicate effects of sainfoin supplements on eating behaviour and digestion even when roughage composition varies. This approach could be further used to develop targeted feeding aimed at improving digestion and feed efficiency in low-input dairy systems.

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