

Effect of Forage Source on Requirements of Particle Size of Lactating Dairy Cows

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Adequate long fibre, in a form that is physically effective, is necessary in dairy cow diets to maintain proper rumen function. The term physically effective fibre (peNDF; Mertens, Feedstuffs, 2000) is used as a means of formulating diets to provide adequate particle size. Physically effective NDF stimulates chewing activity which increases saliva secretion and rumen pH. The Penn State Particle Separator (Lammers et al., J. Dairy Sci. 1996) is a quick and cost-effective method to estimate particle size of forage and total mixed rations and can be used on-farm to evaluate peNDF.

The objectives of our study were to determine whether the peNDF content of forage influences how much feed the cow will consume and the digestion of feed in the rumen and in the total tract. Corn silage and barley silage, chopped fine, medium and coarse were each used in a separate study designed as a double 3H3 Latin square. The fine, medium and coarse silages were combined with a barley-based concentrate to provide three levels of peNDF in each study. The peNDF contents were 8.9, 10.3 and 11.5% of dry matter (DM) for the corn silage-based diets, and 10.5, 11.8 and 13.8% for the barley silage-based diets.

Feed intake was not affected by the peNDF content regardless of the forage sources. However, cows ate more when fed corn silage (20.4 kg/d) than when fed barley silage diets (19.3 kg/d). With corn silage diets, increasing the peNDF content improved the digestibility of organic matter (OM) and fibre in the rumen by 17 and 34% ($P < 0.15$), and in the total tract by 6 and 37% ($P < 0.01$), respectively. However, with barley silage diets, increasing the peNDF content increased ruminal digestibility of fibre (37%), but tended ($P < 0.11$) to reduce digestibility of OM (4%) and fibre (11%) in the total tract. Increased ruminal digestion with increasing peNDF content resulted in more microbial protein synthesis with corn silage, but the opposite was true for barley silage.

Implications: Increasing the peNDF content of the diet to improve rumen function also improves the digestibility of fibre in the rumen. Improved fibre digestion in the rumen can increase energy balance and performance of cows depending on the forage source. In this study, the benefits of increasing peNDF content of the diet were greater for corn silage than for barley silage, because the corn silage was slightly finer than the barley silage.