Effect of Grain Source on the Requirements of Dairy Cows for Physically Effective Fibre

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Dairy cows require diets that contain adequate physically effective fibre (peNDF) to prevent ruminal acidosis. The peNDF stimulates chewing activity which increases saliva secretion and rumen pH. The amount of peNDF supplied by the diet depends on the particle length of the forages and the proportion of forage in the ration. We conducted two studies to determine if the amount of peNDF required by dairy cows depends upon the type of grain in the diet. We speculated that more peNDF might be required when diets contain barley grain rather than corn grain because barley is more rapidly fermented in the rumen.

Barley and corn grains were each used in separate feeding studies with lactating dairy cows. Alfalfa silage, chopped short (5/16") and long (3/4"), was the forage in both studies. In each study, four diets were formulated using the two cuts (short and long) of alfalfa silage combined with two ratios of forage to concentrate (35:65 or 60:40, dry matter basis, DM). The peNDF contents of the diets were determined by measuring particle length of the ration using the Penn State Particle Separator with two sieves and a pan, and by chemically analyzing the fibre (NDF) content of the ration. The peNDF contents ranged from 9.6 to 19.8% for barley diets, and from 10.7 to 17.5% for corn diets (DM basis). Chewing activity and rumen pH were continuously measured for 48 hours.

When diets contained barley grain, increasing the peNDF content of low forage diets increased the mean ruminal pH by 0.31 units and reduced the amount of time each day that cows experienced ruminal acidosis (i.e, pH below 5.5) from 7.8 to 5.9 hours. However, no effects of peNDF on ruminal pH were detected for high forage diets containing barley. With corn diets, increasing peNDF improved mean ruminal pH of cows fed low forage diets, but not when fed high forage diets. In addition, higher forage to concentrate ratio increased chewing activity and mean ruminal pH, and reduced ruminal acidosis.

Implications: For low forage diets, increasing the peNDF content of the ration by feeding longer chopped forages improves rumen pH, and helps avoid acidosis. The reduction in acidosis by increasing the peNDF content of the diet was greater for barley than for corn diets, because the incidence of acidosis is higher in barley diets. Once diets contain more than 60% forage (DM basis), there is no need to consider particle length of forages.