

The Importance of Forage Particle Size On the Health of the Dairy Cow

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If one was to go to a Kentucky dairy farmer and ask that farmer to name one thing that he or she would like to improve in his or her herd, there would be a strong possibility that the farmer would say milk production. In order to improve milk production, the farmer must first understand the factors which influence milk production.

Dry matter intake is a main factor influencing milk production. Dry matter intake is controlled by a number of factors, one of the greatest being the diet of the cow. Maximum dry matter intake can only be obtained by maintaining optimal rumen fermentation through proper diet formulation, mixing, and feeding. This is where the importance of forage particle size comes in. Particle length of forages can impact numerous aspects of rumen function and rumen health. In order to understand the role of particle size, one must first have a general understanding of the rumen and rumination or cud-chewing.

The rumen acts as a fermentation vat. The microbial population in the rumen digests or ferments the feed eaten by the cow or heifer. The microbial population in the rumen is very sensitive to changes in the pH of the rumen. Therefore, in order to optimize the number of microbes and increase digestibility, the proper rumen pH must be maintained. Cud-chewing (or rumination) produces saliva which helps maintain the rumen pH.

A cow may spend 35-40% of each day cud-chewing (rumination) and secrete approximately 12 lbs or more of saliva. During the rest periods, the cud is regurgitated for re-chewing to reduce the particle size and cause resalivation. As the particle size is reduced, the feed is more readily digested by the rumen microbes. Consumption of too finely processed forages decreases this cud-chewing activity associated with eating and rumination.

A certain amount of long forage particles is important in the diet to ensure proper rumen health by promoting rumination and salivation. Diets with too many small particles may result in feed particles spending less time in the rumen, resulting in less microbial digestion. Therefore, forage particles that are too fine may actually lower feed digestibility and may cause more digestive upsets if they are heavily fed.

Studies have also shown that forages that are too fine may cause lower butterfat tests. A study done to examine the effects of forage particle size reported that cows fed shorter particle size alfalfa silage had depressed fat tests. Besides depressed fat tests, finely-chopped forages can cause metabolic disorders such as ruminal acidosis and displaced abomasum due to their ineffectiveness in maintaining the cow's chewing activity and rumen pH. Diets that predispose cows to ruminal acidosis also increase the risk of feet and leg problems. For example, laminitis is associated with ruminal acidosis. Cows that suffer from laminitis are going to spend less time eating since it is painful for them to stand on their feet. These cows would, therefore, experience a drop in dry matter intake and milk production.

When considering forage length in dairy rations, one can keep the following recommendations in mind. Silage chopped at 3/8 to 1/2 inch has 15-20% of particles longer than 1.5 inches. This is ideal, and therefore all of the forage dry matter can come from just the silage. Silage at 1/4 inch has 7-10% of the particles longer than 1.5 inches. In this case, 25% of the forage dry matter should be long hay. Lastly, silage at 3/16 inch has less than 7% of the particles longer than 1.5 inches and needs to have 50% of the forage dry matter as long hay. Buffers should be considered whenever feeding corn silage-based diets to the milking herd.

In conclusion, maintaining the proper forage particle size is key to maintaining the health of dairy cows because of its role in promoting cud-chewing and saliva production by the cow. Cud-chewing and saliva, in turn, help to maintain the proper pH in the rumen and keep the rumen healthy. This healthy rumen then will aid the cow in consuming the maximum amount of dry matter that she can. If the farmer is able to increase dry matter intake, he or she can increase milk production. Remember, more income = high milk production = maximum dry matter intake = optimal rumen function = proper forage particle length.