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Feeding Low Forage Diets to Dairy Cows

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Variation in forage quality, limited supply of forage, high prices for forage, and attempts to maximize milk yield are factors why low forage diets are fed to lactating cows. When considering the feeding of low forage diets, one must keep in mind that adequate effective fiber in the diet is critical for healthy, high producing dairy cows. Maintaining a stable rumen fermentation requires providing a minimum level of effective fiber and not exceeding a maximum level of nonfiber carbohydrates (NFC; e.g. starch). Neutral detergent fiber (NDF) from forage (FNDF) is a good indicator of effective fiber, but size and fragility of forage particles and fermentability of the starch source (e.g., dry vs. high moisture corn or ground corn vs. wheat) must be considered when formulating diets based on minimum FNDF. Other measures of fiber that can be monitored to avoid problems with inadequate fiber are acid detergent fiber, physically effective fiber (pef; proportion of particles $\geq$ 4 mm), and physically effective NDF (peNDF; proportion of dietary DM as NDF in the particles $\geq$ 4 mm). Low forage diets generally should not be fed to dairy cows during the first 30 days in milk because of the low dry matter (DM) intake at parturition and the risk of metabolic diseases. Intense feeding management is required when low forage diets are fed.

Generally speaking, diets should contain a minimum of 26 to 28% NDF when concentrates are based primarily on dry ground corn. Assuming that 75% of the NDF should be forage, 21% FNDF would be needed in the ration; however, research has revealed that lower FNDF can be fed. Based on several experiments, here are some guidelines for limiting forage in diets:

- Whole linted cottonseed (WCS) is the best concentrate source to use as a forage extender. Limit WCS to 5 to 6 lb/day per cow because of its unsaturated fat content. Dietary FNDF may be as low as 9 to 11% of DM when WCS is in the diet if dietary starch is limited to 20 to 25%. High fiber concentrate feeds, such as soybean hulls, distillers grains, brewers grains, wheat middlings, corn gluten feed, etc., can be used to limit the starch content in the ration.
- If WCS is not in the ration, the FNDF content should be at least 16 to 18% of dietary DM and high-fiber concentrate feeds used to limit starch to no more than 25 to 28% of the diet, preferably between 20 to 25% of the diet.
- The above suggestions are made assuming that corn silage is not the sole forage in the ration. If corn silage is the sole forage, the lower limits on FDNF should be increased 3 to 5 percentage units, and adequate particle size of the forage becomes even more important. This is because corn silage has fewer long particles than haylage and the corn grain is more rapidly degraded (more like high moisture corn) in the rumen than dry shelled corn.
- The above suggestions are being made assuming that dry corn is the principal concentrate providing starch to the ration. If more rapidly fermented starch sources are used (e.g., wheat, barley, high moisture corn, and steam-flaked corn), replace no more than 50% of the dry corn with one of these other starch sources or increase the amount of fiber in the ration.
- It is not necessary to add hay to a dairy cow ration, but hay does provide a safety net when feeding low fiber diets because of its particle size – provides for more cud chewing and a more dense rumen mat. Because of sorting, the use of long hay is not advised; chopped hay that is well incorporated into the TMR is needed.
- Feeding 2 to 5% chopped straw in the diet for lactating cows can be used to provide a source of effective fiber for maintaining rumen health and reduce the total amount of forage needed to meet targeted dietary fiber levels. Ensure the straw particles are well mixed into the TMR.

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- Sorting of the total mixed ration (TMR) should always be minimized but will especially be important to minimize when feeding low forage diets. Uniform particle size (which may require chopping of some forages before putting them in the feed mixer) and a moist TMR (40 to 60% DM) will reduce the risk for sorting. Adding certain liquid feeds, such as molasses, may reduce the risk for sorting. Feeding smaller amounts per feeding versus a large amount at one feeding can reduce the risk for sorting within the feed bunk.

- Always add a buffer to the ration at about 0.8% of DM when feeding low fiber diets.

- When using these guidelines, keep in mind that a balance needs to be maintained between fiber and starch in the ration. When feeding low fiber rations without WCS, a ratio of FNDF:NFC of 0.45 to 0.50 (FNDF: starch of 0.60 to 0.65) appears adequate.

Bottom Line: Management of low forage feeding programs must be very intense; without such intensity in management, cows are at greater risk of developing metabolic problems, hoof problems, reduced milk fat yields, and poorer feed efficiency. Changes in forage quality or particle size can result in major problems with little notice. Watch for the following as indicators of inadequate fiber intake: highly variable feed intake and milk yield, several cows within a group with inverted milk fat and protein percentages, or increased incidences of displaced abomasum, sore feet, and loose feces. Any of these occurrences can result in reduced profitability, feed efficiency, and animal well-being.

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