Effects of Dietary Protein and Starch on Intake, Milk Production, and Milk Fatty Acid Profiles of Dairy Cows Fed Corn Silage-Based Diets

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ABSTRACT

Feed intake, milk production, and milk fatty acid profiles of dairy cows fed corn silage-based diets with different protein and starch concentrations were measured in a 3-period experiment in a changeover design using 12 Holstein cows. Each experimental period lasted for 3 wk. The diet fed as a total mixed ration consisted of 45% corn silage, 5% coarsely chopped wheat straw, and 50% concentrate, on a dry matter (DM) basis. The 4 treatments, formulated to be isoenergetic and to differ in concentrations of dietary crude protein (CP) and starch (DM basis), were as follows: low CP and low starch (LPPLS; 14% CP and 15% starch), low CP and high starch (LPHS; 14% CP and 25% starch), high CP and low starch (HPLS; 16% CP and 15% starch), and high CP and high starch (HPHS; 16% CP and 25% starch). The LPPLS treatment led to lower DM intake, milk yield, milk protein concentration, and milk lactose yield, probably due to a shortage of both rumen-degradable protein supply to rumen microbes and glucogenic nutrients to the animal. There were no differences between protein-rich diets and LPHS, suggesting that this diet satisfied the rumen-degradable protein requirements of rumen microbes and did not limit feed intake, and the increased supply of glucogenic nutrients spared AA so that the nutrient requirements of midlactation dairy cows were met. Further increases in CP concentration increased plasma urea concentration and resulted in decreased efficiency of conversion of dietary N into milk N. Milk fatty acid profiles were affected by starch and protein supply, with starch having the largest effect. Additionally, increasing dietary starch concentration decreased the apparent transfer of dietary polyunsaturated fatty acids to milk, suggesting an increased channeling of fatty acids to adipose tissue. The results further suggest that C18:0 and C18:1 are synthesized de novo in animal tissues.

Key words: dairy cow, dietary protein, dietary starch, milk fatty acid

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