REFLECTIONS: YOUR CORN SILAGE IS CHANGING

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Since the French farmer Auguste Goffart published his book about ensiling green corn in 1877, corn silage has become one of the most used ingredient in the dairy industry. Corn silage is a good source of both energy and effective fibre, and an excellent forage for dairy cows. The nutrient composition of corn silage reported by a commercial laboratory in New York (+250,000 samples) was 33.7% dry matter (range 24.4-43.0), 8.2% protein (7.2-9.3), 43.6% fibre (NDF; 37.7-49.6), 31.8% starch (24.3-39.3), and 70.4% (45.1-95.6) starch digestibility, which is measured in vitro after seven hours of incubation in rumen fluid.

During the fermentation process of corn silage some nutrients remain stable while other change significantly. Researchers from University of Wisconsin evaluated the effect of ensiling time on ruminal in vitro fibre and starch digestibility in corn silage hybrids. These authors showed that while fibre digestibility was not affected by ensiling time (55.9% NDF digestibility at 30 h), gradual increases were observed for starch digestibility (61.7, 71.5, 79.0, and 83.8% of starch for 0, 30, 120, and 240 days of storage, respectively). Similarly, based on data from almost 15,000 samples, a commercial laboratory from Maryland reported starch digestibility changes over time during the first 27 weeks of fermentation from 62.3% in the fresh silage (week 0) to more than 76.0% after 18 weeks of storage (Fig. 1).

Starch that is ruminally-fermented increases propionate production and microbial protein synthesis in the rumen, whereas starch that escapes ruminal fermentation provides glucose that is absorbed or metabolised in the small intestine. Microbial protein could contribute to the total protein required by high producing cows between 32 and 63%.

To show the effects of starch digestibility in dairy cow diets, a diet including 40% corn silage with different starch digestibility values was formulated using the NDS software platform with the latest version of the Cornell University model. When corn silage with average starch digestibility (70% of starch) was included in the diet, this met 100% of the energy and protein requirements of the cows producing 45kg of milk. However, when starch digestibility of the corn silage was reduced to 45.1%, the supply of metabolisable protein (MP) was reduced in 142g/day (equal to 3.2kg of milk). On the other hand, when starch digestibility increased to 95.6%, the MP supply was 165g/d greater (3.5kg milk). Surprisingly, corn silage starch digestibility did not affect significantly the supply of metabolisable energy in the diet. In conclusion, extended fermentation time (3-4 months) and continuous monitoring of starch digestibility in corn silage are beneficial practices for dairy producers.

Fig. 1. Starch digestibility over time.