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SILOSOLVE® FC improves ruminal starch digestibility and aerobic stability of high-moisture corn

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Take home message

SILOSOLVE® FC improved ruminal starch digestibility in coarse particles of high-moisture corn.

Introduction

High-moisture corn (HMC) is a common feedstuff for ruminant animals. It shows greater ruminal and total-tract starch digestibility compared with dry corn. During ensiling, the starch-protein matrix surrounding starch granules is broken down, making starch more accessible for microbial degradation in the rumen. However, this is a continuous process that can last up to one year. Additionally, HMC is prone to aerobic deterioration at feed out.

Farmers often need to feed HMC less than 30 d after ensiling. The objective of the recent study of Saylor *et al.*, (2020) was to investigate the effects of **SILOSOLVE® FC** and particle size on fermentation profile, aerobic stability, and ruminal *in situ* starch degradation of HMC ensiled for a short period of time.

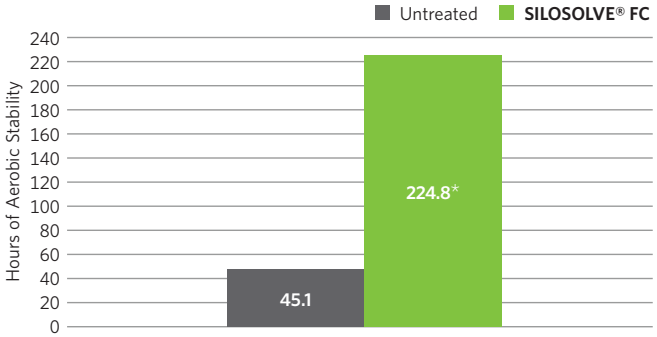
Trial design

HMC was harvested when kernel dry matter (DM) concentration was approaching 70%. Corn was coarsely ground (≈4 mm mean particle size) or finely ground (≈1 mm). Samples were vacuum-sealed in nylon-polyethylene standard barrier vacuum pouches. HMC was treated with distilled water (Untreated) or **SILOSOLVE® FC** and fermented for 14 and 28 days. After the designed length of fermentation, samples were transferred to plastic buckets without packing and stored at room temperature for determination of aerobic stability. Aerobic stability was defined as the time (h) for the silage temperature to exceed 2.0°C above the ambient temperature. For ruminal *in situ* starch degradation, fermented samples were weighed into filter bags and incubated for 7 h in cannulated lactating Holstein cows.

Results

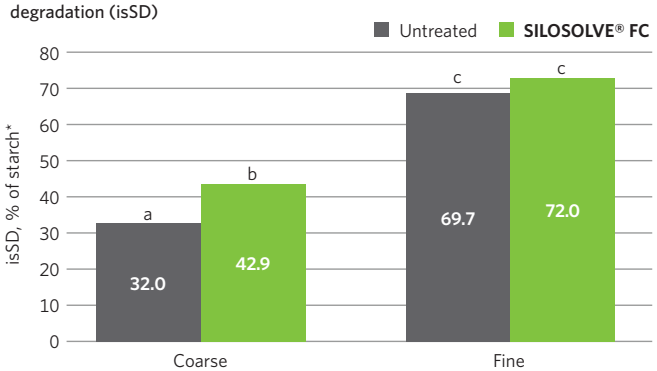
SILOSOLVE® FC significantly (P<0.05) improved aerobic stability of HMC (Figure 1). The effect was independent from storage length and particle size.

Figure 1. Effect of **SILOSOLVE® FC** on aerobic stability of HMC



Decreased particle size improved ruminal *in situ* starch degradation. The positive effect of **SILOSOLVE® FC** was observed in coarse particles (Figure 2).

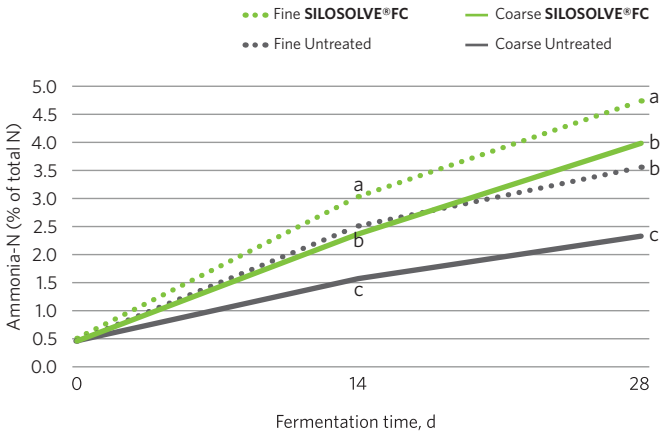
Figure 2. Effect of **SILOSOLVE® FC** and particles size on ruminal *in situ* starch degradation (isSD)



Means with different letters (a,b,c) differed (P < 0.05). Effects of processing (P = 0.001), microbial inoculation (P = 0.01), and their interaction (P = 0.07).

Previous study of Ferraretto *et al*. (2014) demonstrated the positive relationship between ammonia fraction of crude protein and ruminal in vitro starch degradation. Similar relationship was found in the present study as well (Figure 3). Increased ammonia fraction indicates breakdown of the prolamin matrix that may lead to improved starch digestibility.

Figure 3. Effect of **SILOSOLVE® FC** and particle size on the ammonia fraction of crude protein



Means within the same day with different letters (a,b,c,d) differed (P < 0.05). Effects of processing (P= 0.001), microbial inoculation (P = 0.001), ensiling time (P = 0.001), and their interaction (P = 0.001).

Conclusions from the study

As expected, **SILOSOLVE® FC** improved the aerobic stability after short time of fermentation. The trial confirms that particle size of HMC affects starch digestibility. The use of **SILOSOLVE® FC** improved the starch digestibility of HMC coarse particles. Under field conditions, both fractions, coarse and fine, are present. Therefore, it is expected that the inoculation of HMC with **SILOSOLVE® FC** may improve the total starch digestibility in HMC on farm level. A possible MoA, to explain the improved starch digestibility, may be linked to the observed increase in ammonia fraction as an indication of prolamin matrix break down. The **SILOSOLVE® FC** treated HMC particles were higher in ammonia fraction than the corresponding untreated samples, (irrespectively of particle size).

References

Saylor, B. A., F. Casale, H. Sultana, and L. F. Ferraretto 2020. Effect of microbial inoculation and particle size on fermentation profile, aerobic stability, and ruminal in situ starch degradation of high-moisture corn ensiled for a short period. J. Dairy Sci. 103: 379-395.