

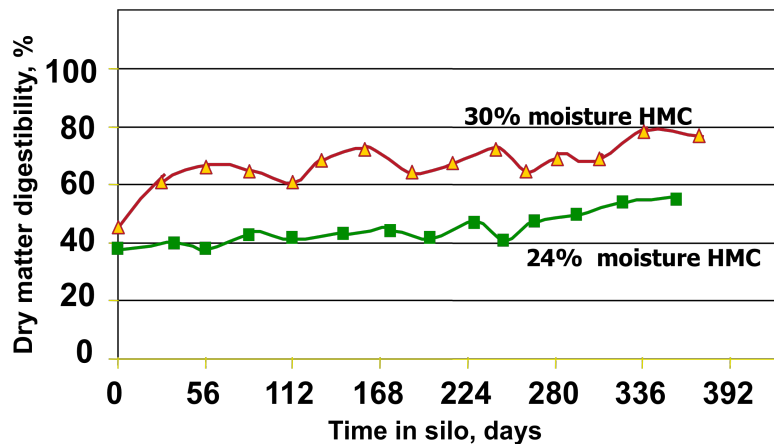


Prolonged Storage Affects Some Chemical and Nutritive Aspects of HMC and Corn Silages

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There is increasing evidence that the some nutritional components in silages continue to change even with prolonged length of time in the silo. Research from Nebraska showed that the starch in high moisture corn (HMC) became more digestible with time in the silo. The effect was greater for corn harvested at a higher moisture (Figure 1, Jaeger et al., 2004).

Figure 1. Increasing length of storage results in improved digestibility of HMC.



Work from Pat Hoffman's group at the University of Wisconsin (Hoffman et al., 2011) and our group (Der Bedrosian et al., 2010; Young et al., 2011) at Delaware would suggest that the reason for these findings is probably due to proteolysis. Our studies have shown continued increases in soluble protein in corn silage and HMC over prolonged periods of storage. Starch in the corn kernel is embedded in a protein matrix made of compounds called prolamins. Prolamins are a barrier to starch digestion. Microbial proteolysis appears to continue in the silo

for very long periods of time and it partially degrades the prolamins making starch more available. Improvements in starch digestion in corn silages with storage time have also been reported from Europe.

Increased starch-D from prolonged storage may explain several phenomena observed on dairy farms. For example, it is common in the Fall for cows switched from last year's corn silage to fresh silage to experience a drop in milk. The lower digestibility of freshly harvested silage may be one reason for this finding. Furthermore, it is relatively common for many herds to experience butterfat depressions starting in April or May. This may be related to the high availability of starch from these feeds after prolonged storage.

Controversially, Hallada et al. (2008) reported that storage time increased fiber digestion (NDF-D) in corn silages. In contrast, we (Der Bedrosian et al., 2010; Young et al., 2011) have not observed this phenomena in our studies and do not believe that this happens in corn or alfalfa silage.

Another common phenomena observed in silages stored for prolonged periods of time is that sometimes there will be a small decrease in lactic acid accompanied by a small increase in acetic acid. In these instances, silage pH may also be higher. The reason for these findings is probably due to the continued metabolism of certain lactic acid bacteria; e.g. *Lactobacillus buchneri* (added as an inoculant but also naturally occurring).

How do we use this information knowing that many chemical and nutritional components continue to change with time in the silo?

1) These findings would suggest that to maximize the effect of storage time on starch digestion in high moisture corn, producers should pay particular attention to harvesting this material between 26 to 30% moisture and avoid harvesting corn that is drier. Second, if a producer is feeding high levels of high moisture corn, they should be aware that fermentable starch may be in excess after prolonged storage and some of the high moisture corn might need to be replaced with dry corn to avoid rumen upsets.

2) Nutritionists must take into account that soluble protein continually increases with storage time when balancing diets.

3) Corn harvested at a late maturity has more prolamins and is lower in potential rumen starch digestion than a corn harvested at a very immature stage of maturity. Thus, it would make sense for producers to feed the immature corn first and allow the more mature corn to ensile for a longer period of time to improve its potential for starch-D.

4) For producers that have excess storage capacity, it might be useful to plan such that only well fermented silages stored for at least 5-6 months are fed to the milking herd (especially the high

producers). (This will obviously not be practical for the majority of dairymen.) However, a cost benefit analysis of prolonged storage is needed because it may require better silo management and greater DM losses have been reported with prolonged storage.