T88

Effect of Month of Sample Submittal on Corn Silage Nutrient Fractions, Starch Availability, NDF Digestibility, and Fermentation Profiles Measured at a Commercial Forage-Testing Laboratory

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Introduction

With higher corn grain prices, many dairy producers are increasing the percentage of corn silage in diets. It has become even more important to get maximum utilization of corn silage by today's dairy cows.

- Newbold et al. (2006) sampled fifteen corn silages from commercial farms on a bi-monthly basis for 2-10 months after ensiling. It was found that 3 h *in situ* starch digestibility increased with storage time and was correlated with corn silage DM content at ensiling. Mean 3 h *in situ* starch digestibility was 53.2% and 69% at 2 months and 10 months after ensiling, respectively ($P<0.001$). CP degradation increased with time of ensiling but was not correlated with starch digestion.
- Benton et al. (2004) showed that *in situ* dry matter digestibility and rumen degradable protein of high-moisture corn increased with time of ensiling.
- It has been suggested that water-soluble nitrogen levels might be used as indicators of starch degradability (Mahanna, 2007)
- Time after ensiling of corn silage may be important to consider for diet formulation. Diet adaptations such as reducing starch levels, may need to be made when starch digestibility increases in order to prevent acidosis.

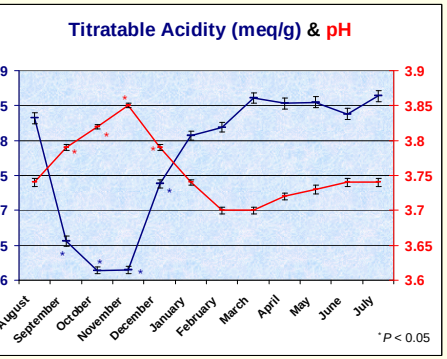
Objective

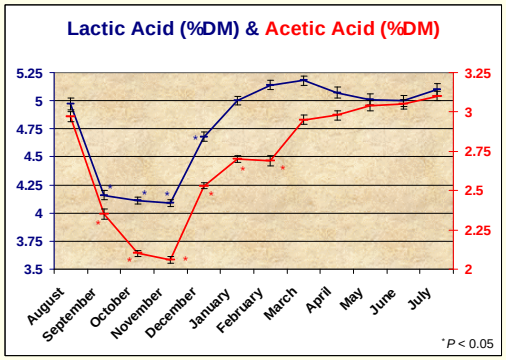
To determine if nutrient fractions, starch availability, NDF digestibility, and fermentation profiles in corn silage samples differed according to the month they were submitted for analysis.

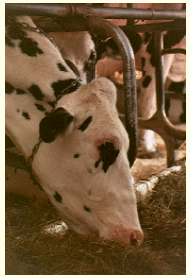
Materials & Methods

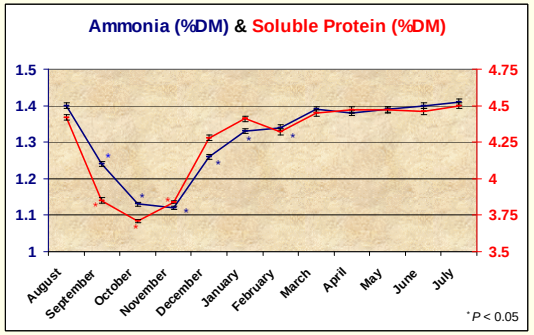
- Corn silage samples (n=19184) between 25 and 45% DM (Mean= 33.3%DM) were submitted to Cumberland Valley Analytical Services, Inc. from farms in New York between January, 2004 and February, 2008.
- All samples were analyzed by near-infrared (NIR) technique for soluble CP (%DM), ammonia (%DM), sugar (%DM), titratable acidity (meq/g), pH, lactic acid (%DM), acetic acid (%DM), and 30 h NDF digestibility (%NDF).
- Samples were analyzed for starch (%DM) and available starch (% Starch), also by NIR. Starch availability was defined as the amount of starch degraded by a one-hour amylase and glucoamylase treatment at 40°C.
- Data were analyzed using JMP statistical software (SAS, Cary, NC) to determine if nutrient content was affected by month of sample submittal. Multiple comparisons were conducted using Tukey's Honest Significant Differences test. Month of sample submittal was assumed to relate to length of crop fermentation.

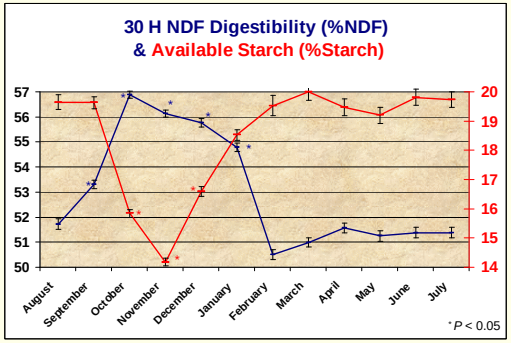
Results

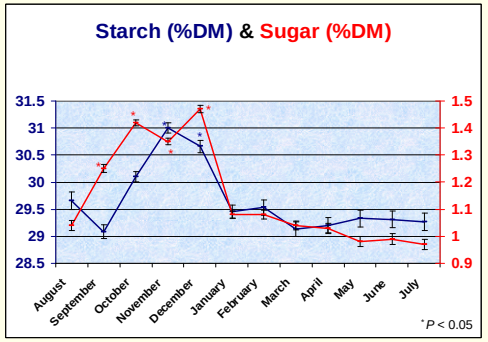












Discussion

Corn silage that is ensiled properly exhibits a rapid pH drop where homo-fermentative bacteria predominate. Well-preserved corn silage generally contains >3% lactic acid and <3% acetic acid with pH<4.0(Seglar, 2003).

- **Lactic acid (%DM), pH, and titratable acidity (meq/g) did not reach maximum levels (5.06%, 3.73, and 8.41, respectively) until 4 months after ensiling. Acetic acid levels (%DM) continued to increase until 6 months post-ensiling to 3.01%.**
- **Soluble CP was lower during the first three months post-ensiling (3.80%DM) and reached a plateau of 4.44%DM after 4 months. Ammonia was lower during the first six months post-ensiling (1.24 vs. 1.40%DM). As suggested by Mahanna (2007), soluble CP and ammonia may be related to starch degradability.**
- **Available starch (%starch) was lower in samples received in Oct, Nov, and Dec (15.54% vs.19.51%). But, total starch (%DM) was higher during Nov and Dec (30.83 vs. 29.41%).**
- **Sugar (%DM) was higher from Sept to Dec (1.37 vs. 1.03%DM) than during the rest of the year.**
- **NDF Digestibility (30H) (%NDF) was significantly higher from Sept through Jan (55.38 vs. 51.26%).**
- **These results indicate that at least 4 months are required for complete fermentation of corn silage. Ration adjustments should be made to account for changes in corn silage nutrient content and digestibility that occur during time of ensiling.**

Conclusion

At least four months are required for full fermentation of corn silage.

References

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