CUMBERLAND VALLEY ANALYTICAL SERVICES
Tech Notes

Clostridia Fermentation During Wet Weather with Elevated Moisture Hay Crop

Will there be enough rain for the crops to grow? Is it going to rain today? These are common questions asked by all producers when planting and harvesting. For the last eighteen months, the answer to these questions has more frequently been "yes". Looking at precipitation data for central Pennsylvania over the last four years (Table 1), 2018 had almost 20 additional inches of rain than each of the previous three years. The 2019 crop year is starting off with record rainfall, in some areas more than 200% of historical levels. With higher rainfalls, harvesting at proper dry matter levels becomes a challenge due to the inability to access wet fields. Balancing harvest times for the best dry matter and the best nutrition can be difficult when this happens.

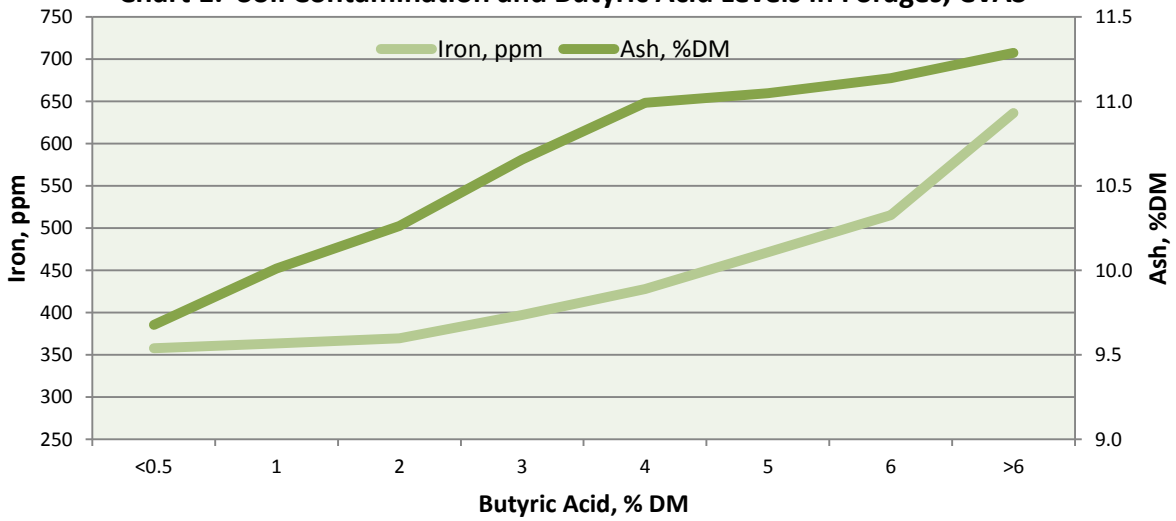
Table 1. RAINFALL IN CENTRAL PENNSYLVANIA

	2015	2016	2017	2018	2019 (to April 30)
Rain	40.4	37.8	36.4	58.9	15.5
Snow	28.6	35.4	24.3	30.6	29.3

From U.S. Climate Data, Central PA, online resource.

When ensiling legume, grass and small grain silages, it is common to have clostridia bacteria on the crop. There are two main sources of clostridia contamination– through soil and manure. Clostridia can be introduced to the plant from soil when lodged forages are harvested and through rain splash during wilting. Chart 1 illustrates how soil contamination in the form of iron and ash relates to butyric acid levels. Notice that as the amount of butyric acid in a sample increases, there tends to also be an increase in iron and ash. In addition to soil, manure application to fields can also introduce clostridia onto plants prior to harvest. To avoid this, manure should be applied to fields shortly after cutting to avoid possible contamination.

Chart 1. Soil Contamination and Butyric Acid Levels in Forages, CVAS



If the introduction of clostridia is coupled with a low level of dry matter (below 32%) at ensiling, there is an increased risk of the clostridia bacteria producing butyric acid during the fermentation process. During typical fermentation, the lactic acid produced will lower the pH of the ensiled crop enough to prevent clostridial growth and the production of butyric acid. In the presence of low dry matter however, the quick pH drop that the lactic acid bacteria would normally produce is difficult to obtain, which allows the growth of clostridia and the subsequent production of butyric acid. Table 2 below illustrates the difference in butyric acid production of forages harvested in the northeast and ensiled with a low dry matter or typical dry matter. Forages ensiled lower than 32% dry matter display a marked increase in the amount of butyric acid produced.

Table 2. LEVELS OF BUTYRIC ACID IN WET AND DRY FORAGES

	2015	2016	2017	2018	2019
All forages	0.54	0.52	0.59	0.73	0.87
Greater than 32% Dry Matter	0.38	0.35	0.46	0.57	0.56
Less than 32% Dry Matter	0.89	0.90	0.93	1.13	1.38

There are many detrimental effects when clostridia are present during forage fermentation. In additional to the lower dry matter, there is typically a reduced overall feed intake by the cattle. This is thought to be caused by the breakdown of the proteins into ammonia nitrogen, amines and amides which cause the feed to be less palatable. Feeds with higher butyric acid levels will have decreased energy as well as potentially causing health and reproductive issues.

Because the production of butyric acid generally takes several months to be seen in ensiled forages, there are several steps that can be taken to minimize the harmful effects.

- Obtain a laboratory analysis to determine the amount of butyric acid in your forage in order to identify how much can be fed safely. Butyric Acid levels will not remain stable but will continue to increase over time. So test often if you plan to feed forage high in butyric acid.
- Do not feed forages high in butyric acid to pre- and post-fresh cows.
- If you have to ensile your forage while they are wet, begin feeding them as soon as the active fermentation phase is complete (about two weeks).
- Do not feed more than 50g of butyric acid per head per day. For instance, if your forage is 1.75% butyric acid on a dry matter basis, limit feeding to 6.31lbs of dry matter per head per day. If necessary dilute forages high in butyric acid with other feeds to minimize the exposure.
- Prior to feeding it is possible to decrease the amount of butyric acid in forages by spreading the forage out for a few days and allowing the butyric acid to volatilize. The forages will not decay as butyric acid makes silage very aerobically stable.
- Dispose of silages very high (>2.0% of dry matter) in butyric acid. These forages can become good fertilizers.

With the challenge of unprecedented rainfall, wet fields and wet forages ensiling hay crops at appropriate dry matter levels may prove difficult. If it becomes necessary to utilize silage with butyric acid, it is recommended to test to understand the levels present and to feed hay crops in a manner to minimize the impact on animal productivity and health.

References:

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