

Fermentation Analysis - What do the numbers mean?

Knowing the acid profile of the silage or haylage and understanding what it means can help you improve your forage production.

	Target Levels		
	Corn Silage	Alfalfa Silage	High Moisture Corn
pH	<4.0	<4.5	<4.2
Lactic Acid, % DM	>3.0	>3.0	>1.0
Acetic Acid, % DM	<2.0	<2.0	<1.0
Propionic Acid, % DM	<1.0	<1.0	<0.1
Butyric Acid, % DM	<0.1	<0.1	<0.1
Iso-Butyric Acid, % DM	<0.1	<0.1	<0.1
Ethanol, % DM	0	0	0
Ammonia Nitrogen, % of CP	<10	<10	<10
Lactic:Acetic Ratio	>3:1	>3:1	>3:1

pH: of a silage measures the degree of acidity. A pH higher than normal means the silage did not ferment well or is unstable. This could be due to:

- High yeast levels
- Low moisture content of harvested forage
- Lack of sufficient substrate for bacteria to make acids
- Undesirable fermentation such as clostridial fermentation
- Oxygen entering the silage mass (i.e. poor packing)
- Cold environmental conditions (late fall harvesting)
- Unstable forage – poor bunk life

Lactic Acid: is the most abundant acid produced during an ideal fermentation. Moderate levels of lactic acid are an indication of a good fermentation. The smell of lactic acid is described as either the lack of a smell or a sweet fresh smell.



Acetic Acid: is commonly associated with silages that smell like vinegar. Silages with high concentrations of acetic acid are often stable when exposed to air, but high concentrations may depress dry matter intake. High levels of acetic acid indicate an inefficient fermentation and loss of dry matter. An exception to this is silages where a more “controlled” fermentation has occurred due to inoculation with *Lactobacillus Buchneri*.

Butyric Acid: is an indication of poor fermentation and is commonly associated with silages that smell like “rank, rancid or fishy”. Silages with higher butyric acid content have low dry matter intakes, lower energy, loss of forage dry matter and can undergo extensive protein degradation resulting in a loss of protein quality. Butyric acid fermentations occur when ensiling a high protein, low sugar forage, such as alfalfa, that is too wet (< 30 percent DM). These forages when fed can cause ketosis.

Iso-Butyric Acid: should be less than 0.1 percent on a dry matter basis for all silages. At this point, researchers have not reached a consensus on the effect of iso-butyric acid on silage fermentation, but many believe it has similar effects as butyric acid.

Lactic:Acetic Ratio: is a good indicator of the efficiency of the silage fermentation. The ratio should be at least 3:1, higher is better.

Ethanol: can also be found in silage and is associated with silages that smell “yeast-like.” Silages that have higher levels usually indicate high yeast levels. Although the energy value of such silages is generally good, it does result in large losses of nutrients. These silages will have a tendency to heat rapidly when exposed to air and have a short bunk life. When feeding in the summer months, it may help to add BunkLife prior to feeding.

Ammonia: concentration is expressed as a percentage of the crude protein. High concentrations of ammonia are an indicator of extensive protein degradation. This commonly happens in wet silages (< 30-35 percent DM). High ammonia levels may cause intake, production and reproduction problems.

