



What can silage smell tell you?

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Can you tell the quality of silage by smell? The answer is sometimes “Yes”, but sometimes “No”. We often refer to a pasture silage which has undergone a desirable lactic acid fermentation as being a sweet, pleasant smelling silage and this is often the case. This is usually a fermentation dominated by lactic acid bacteria.

However, sweetness is in the nose of the beholder! It is possible that the “sweet” smell of some silages could be arising from high concentrations ethanol (produced by spoilage yeasts) mixed with acetic acid. These silages will have a sweet, fruity alcoholic odour.

Unfortunately a high concentration of ethanol, usually easily detected in maize silage and high moisture maize, is an indicator that a significant amount of dry matter and nutritive value may have been lost. Another undesirable side effect of this silage is that it will most likely heat very rapidly in the stack at feed out.

A rank, rancid, and sometimes fishy (due to protein degradation) smelling silage is one that has produced butyric acid during its undesirable fermentation. This smell is commonly associated with forage that was too wet at harvest, less than 30 per cent dry matter (DM) content in bulk silage or well under about 40 per cent in baled silage.

It is ironic that silage with high butyric acid content (Figure 1) is very stable when exposed to air and will not heat, but will be low in energy content and have undergone substantial DM losses. It will often be of low palatability to cattle.

Silage that has a “vinegar” smell which is acetic acid, is a sign that a less desirable type of fermentation occurred. “Vinegary” smelling silages also tend to be stable when exposed to air but the high concentrations of acetic acid can sometimes depress dry matter intake in cattle. Generally these have been made below optimum DM contents or after a prolonged wilting period. However, the acetic acid will also minimise mould growth and heating in the stack at feed out.

A “tobacco/caramel” type of smell is often associated with over-dry silages (usually greater than 45-50 per cent DM in bulk silage). This smell is a product of a “non-enzymatic browning reaction” which comes from excess heating that has caused proteins to bind with fibre and sugar molecules. A mildly, sweet tobacco/molasses type smell is okay in lucerne silage but any hint of this smell in corn or pasture silage is a definite indicator of heat-damaged protein.

When the smell turns from tobacco-like to burnt in all silages, you can be sure that excessive heating has taken place. An acid-detergent insoluble nitrogen (ADIN) test for excessively heated silages can indicate the extent of bound protein so that protein requirements can be adjusted accordingly in rations, if necessary. Heated silages are very palatable to stock but very low in nutritive value.

A “musty- mouldy” smelling silage is commonly associated with silages that have undergone aerobic spoilage. Air has entered the silage storage at some stage. This may have occurred at ensiling with poor compaction, via holes in plastic during storage but is most common at feed out. These silages are usually hot and steamy but may have already gone through the heat stage. Mouldy silage is rarely an indication of mycotoxin formation, but does occasionally occur. In addition to extensive losses in nutrients and dry matter, such silages are very unpalatable and may occasionally cause abortions.

Table 1 lists some management options to avoid producing these undesirable smelling silages in future. However, all of these undesirable smelling silages will be avoided if forage is wilted to the correct DM content as quickly as possible, harvested rapidly, compacted densely and sealed airtight within hours after completion of harvest. Use of various silage additives can be helpful but won’t replace good management.

Table 1. Silage smells and what to do about them.

Silage smell	Management Option (in addition to correct management)
Mild, pleasantly acidic, sometimes natural yogurt smell (lactic acid)	Desirable lactic acid fermentation. Fermentation enhancing and other suitable silage additives could lead to higher quality silage, reduced losses
Sweet, fruity alcoholic smell (ethanol)	Wilt to recommended DM contents Avoid soil contamination Pack tightly and quickly Use a suitable silage additive Compact stack/bale densely
Rancid butter, putrid odour, fishy (butyric acid)	Wilt to recommended DM contents Bulk silage: long chopped 30% – 35% DM, precision chopped 30% – 40%, Round bales 40% – 50%, Large rectangular bales 45% – 60% Use a suitable silage additive to obtain a more desirable fermentation, allow for increased rate if forage is wetter than recommended
Sour vinegar smell (acetic acid)	Wilt to recommended DM contents (See above) Use a suitable silage additive
Strong tobacco, caramel or burnt sugar smell (Maillard or Browning Reaction)	Wilt to recommended DM contents Shorten chop length in over-dry forages Pack tightly and quickly Seal airtight within hours of harvesting
Mouldy, musty odour	Compact stack/bales densely Increase feed out rate (Bales in rings eaten by end day 2) Regularly inspect and repair holed plastic immediately Remove mouldy silage from base of feeders regularly Use aerobic spoilage inhibitor type additives in maize, whole-crop cereal silage, silage stacks with very wide feeding faces which regularly heat, TMR’s loaded overnight



Figure 1. Over-wet silage