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### **The Smells from Silages: What They Can Tell You**

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There are several common odors that one can detect when smelling silages. These odors can tell you what happened in the silo and are often related to silage quality. This fact sheet will describe the significance of these odors.

A very “sweet” smelling silage is not always an indicator of the best fermentation because the “sweet” smell is probably coming from high concentrations of alcohols produced by spoilage yeasts and undesirable bacteria. High concentrations of alcohols are commonly found in both high moisture corn and corn silage, and are usually associated with a significant amount of dry matter loss. These silages are also very likely to heat when exposed to air in the silo or bunk.

In contrast, a “foul” smelling silages is a pretty good indicator that something has gone wrong. There are several “foul” types of smells that one may encounter in silages. First, the butyric acid smell (baby puke!) is common in grass and alfalfa silages that are high in moisture content and this acid is produced by bacteria called clostridia. In addition, these silages may also smell “fishy” or “ammonia-like” because of excessive breakdown of protein. You probably will never smell these odors in silages if the dry matter content is greater than 35 to 40 percent because clostridia do not grow well in dry silages. Ironically, silages with high butyric acid content are very stable when exposed to air and will not heat but are also characterized by large losses in dry matter, high ammonia, high soluble protein, poor digestion, and low energy. Consumption of

large quantities of silage with a high concentration of butyric acid may sometimes lead to sub clinical acidosis.

Another “foul” smell is the “musty-moldy” odor that comes when silages have undergone aerobic spoilage (rotten socks!). Excessive amounts of air (as a result of poor packing, poor covering, slow feed out rate, or poor face management) lead to an explosion of spoilage yeasts that is then followed by rapid growth of molds and spoilage bacteria. Moldy silages should not be fed to cows because sometimes, but not always, this silage may have high concentrations of mycotoxins. Silages that smell moldy are usually hot and steamy (or have already gone through a heat). Feeding aerobically spoiled silage can also lead to depressed intakes and production.

Sometimes silages have a very “sharp” smell of vinegar. Vinegar is the common name for acetic acid, which is an end product of many organisms that are active in silage fermentations. Extremely wet corn silages often have high concentrations of acetic acid. In the past, silages that were high in acetic acid because of a “wild fermentation” were considered undesirable because there was some evidence that such silages depressed intake. However, we now know that if the smell of acetic acid is high because the silage was inoculated with the bacterium called *Lactobacillus buchneri* that this is not a concern. Silages inoculated with *L. buchneri* have undergone a “controlled acetic acid fermentation” to help with improved aerobic stability and when fed they do not depress intake.

In dry alfalfa silages (usually greater than 45 to 50 percent dry matter) sometimes a “tobacco/molasses” type of smell can be detected. This smell occurs when excess heat has caused proteins to bind with fiber and sugar molecules via the “non-enzymatic browning reaction”. A mildly, sweet tobacco/molasses type smell is okay in alfalfa silage, but any hint of this smell in corn silage is a definite indicator of heat-damaged protein. Normally, heat-damaged protein in corn silage is only a problem if the dry matter (DM) is in excess of 45 percent. In all silages, when the smell turns from “mildly tobacco-like” to “burnt”, you can be sure that excessive heating has taken place. Silages suspected of having excess heat-damaged protein should be tested for bound nitrogen, also known as unavailable nitrogen or acid-detergent insoluble fiber (ADIN) and the protein requirements should be adjusted accordingly. Silages that are extremely heat damaged have low protein and fiber digestibility.

In some corn silages, a “nail polish” like smell may be present. Compounds like phenyl-acetic acid may be responsible for this smell. To date, we are unsure of the significance of this smell in silage.

So, what should ideal silage smell like? Well, the best type of silage fermentation – called homolactic acid fermentation – should have little or no distinct smell because the dominant acid produced via this process, lactic acid, has almost no smell.

Overall, silage should be wilted to the correct moisture, chopped to the correct length, and silos should be filled rapidly, packed tightly and sealed quickly, Kung concludes. Use of various silage aids can be helpful, but should not be used in lieu of good management.

Table 1 lists some things that can be done when silage has a particular smell.

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

Silage Smell	Management Check
Vinegar, acetic acid	<ul style="list-style-type: none"> <li>- Use a homolactic acid based microbial inoculant next season to obtain a more desirable fermentation.</li> </ul>
Butyric acid, rancid, fishy	<ul style="list-style-type: none"> <li>- Check silage DM. Wilt to &gt; 30 percent DM next season.</li> <li>- Use a homolactic acid based microbial inoculant next season to obtain a more desirable fermentation.</li> </ul>
Ethanol	<ul style="list-style-type: none"> <li>- Pack more densely next season.</li> <li>- Use a microbial inoculant designed to improve aerobic stability (e.g. <i>L. buchneri</i>) or propionic acid-based preservative on next season's crop.</li> </ul>
Moldy, musty	<ul style="list-style-type: none"> <li>- Increase feed-out rate.</li> <li>- Use a microbial inoculant designed to improve aerobic stability (e.g. <i>L. buchneri</i>) or propionic acid-based preservative on next season's crop.</li> <li>- Use a propionic acid-based preservative in the TMR (a temporary fix).</li> </ul>
Strong tobacco, burnt smell	<ul style="list-style-type: none"> <li>- Check silage DM. Lower moisture content of silage.</li> <li>- Check chop length, pack tightly, and pack quickly.</li> <li>- Use a microbial inoculant designed to improve aerobic stability (e.g. <i>L. buchneri</i>) or propionic acid-based preservative on next season's crop.</li> </ul>