Here’s to farmers.

The ones whose DNA runs in rows,
the ones who value pinky swear as much as handshakes,
and the ones who never wanted to be anything but.

Here’s to farmers.

The ones who don’t believe in man’s work,
the ones who’ve never heard of an 8-hour workday,
and the ones who don’t believe the week ends.

Here’s to farmers.

The ones who stand as tall as their fields,
wipe the dedication from their brow,
and whose hearts span beyond their acreage.

Here’s to farmers who never stop growing.

#NeverStopGrowing
The 5 common questions about yeasts and moulds

Renato Schmidt and Bob Charley for Progressive Dairyman

**AT A GLANCE**

Frequently, producers have questions about nonpathogenic wild yeasts and moulds and how these can affect ensiling, storage and feedout.

Crops in the field have naturally occurring microorganisms growing on them, which can affect the ensiling process. These common questions can help you prepare for a more successful harvest.

1. **Can I ensile corn infected with fungal diseases?**

   Ensuring overall good management practices is a priority when ensiling corn infected with fungal diseases. First, if you do spot fungal infection in the crop in the field, use fungicides to help limit the damage. Consider applying fungicides if there are symptoms on the third leaf below the ear or at least 50 percent of the plants. Plants need to be examined carefully to ensure accurate diagnosis; for instance, the fungal disease northern corn leaf blight can be easily confused with the bacterial infection Goss’s wilt, and application of fungicides will not control bacterial diseases.

   Timely fungicide application can also help with ensiling fermentation. Recent research from Dr. Phil Cardoso’s group at University of Illinois showed that field foliar fungicide application improved the fermentation and chemical characteristics of corn silage. In addition, cows fed silage made from corn treated with fungicide only during the V5 stage of growth tended to produce greater fat- and energy-corrected milk than cows fed corn silage treated with fungicide during both V5 and V8 stages of growth.

2. **How do wild yeasts, molds and temperature interact during the ensiling process?**

   During the early stages of the ensiling process, it is not uncommon to see a rise in temperature. In fact, an increase of about 10°C inside the forage mass is common, even in well-managed silos. Whenever there is oxygen available for plant respiration and growth of epiphytic aerobic bacteria, yeasts and molds, the temperature will increase, indicating nutrient and dry matter (DM) loss. Therefore, it is best to never leave freshly chopped forage in the wagon or delay packing and sealing into the silo (Table 1).

   During feedout, the silage again is in contact with air (oxygen), which can penetrate 1 metre or more into the silage mass, depending on the silage porosity, etc. The presence of air allows wild spoilage yeasts (e.g., candida, pichia and isatschenkia species) that have survived the ensiling process to become active again and start the process of aerobic deterioration in silages, utilizing the remaining sugars and lactic acid present in the silage as a food source. This metabolic activity results in nutrient oxidation and subsequently, heat production.

   The rate of aerobic spoilage and silage heating is linked to ambient temperatures: this is why there are more issues with aerobic spoilage during the warmer months of the year. At the peak of heating, silage temperatures may reach 50°C due to the growth of yeasts.

3. **Should I mould growing on the face of my silage, is my silage beginning to deteriorate?**

   It is a common assumption that the presence of mouldy patches or spots on the silage face is an indication that aerobic deterioration has started. This happens because the mycelium of the moulds can be seen, while yeast cells are invisible to the naked eye.

Moulds have a fuzzy or dusty appearance due to their characteristic filamentous growth and production of masses of spores on structures sticking up out of the filamentous “mat.”

Upon exposure to air, wild spoilage yeasts start using the remaining sugars and lactic acid to grow (and produce heat), leading to a loss of acidic conditions, vital for the preservation of silage. Only then do moulds and other

Continued on page 26

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**TABLE 1**

<table>
<thead>
<tr>
<th>Item</th>
<th>Hours of delayed filling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Yeasts (CFU/g)</td>
<td>398,107</td>
</tr>
<tr>
<td>Moulds (CFU/g)</td>
<td>301,955</td>
</tr>
<tr>
<td>DM loss (%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Hinch and Kung, unpublished

**FIGURE 1**

Effect of feeding a high wild yeast, spoiled TMR on the intake of dairy heifers

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opportunistic microorganisms become active, adding to the spoilage process and resulting in a second increase in silage temperature. So seeing mold on silage is not the beginning of aerobic deterioration. The process is already pretty advanced.

While wild yeasts metabolize soluble sugars and lactic acid, moulds can utilize cellulose and other cell wall components, increasing the already considerable losses of nutrients and DM. Additionally, some specific moulds have the potential for producing mycotoxins and causing other negative health and production effects in the animal.

4 **Are probiotic yeasts like *Saccharomyces cerevisiae* capable of starting the process of aerobic deterioration in silage?**

Wild yeasts are generally undesirable in silages because they have the potential to utilize sugars and organic acids and produce ethanol, resulting in high DM loss.

Several species of yeasts are used as probiotics in rumen diets, but of those, *Saccharomyces cerevisiae* is the most common in commercially available products. The main effects of viable yeast products in the animal are improvement of milk production, feed efficiency or average daily gain. Although *S. cerevisiae* is found in silage, it has a high affinity for sugars (glucose, sucrose and fructose) but not for lactic acid. As previously discussed, lactate-accumulating spoilage yeasts are considered the initiators of virtually all heating events in silages during feedout, and they are very different species to the *S. cerevisiae* used in most active dry yeast probiotics.

5 **What are the consequences of feeding spoiled silage or silage with a high fungal load?**

Although this information would be extremely valuable, there has not been a large amount of research published. Spoiled (or spoiling) silage due to fungal activity may be warm and less palatable to cattle. Lower animal intake has been one of the most common symptoms of feeding silages experiencing aerobic deterioration (Figure 1, page 25). Spoiled silages contain fewer nutrients available to the cow, and the wild spoilage yeasts are a competitor to the rumen microbes for readily available nutrients. They may also produce metabolites that may be detrimental to rumen fermentation.

Reductions in silage quality, specifically neutral detergent fibre digestibility (NDFD), of spoiled silages compared to clean silages have also been reported, causing negative effects on production levels. Moreover, there has been “field evidence” that feeding silages with high yeast populations leads to drops in milk fat yield.

Data from Limin Kung’s group at the University of Delaware showed spiking a TMR sample with increasing levels of the main spoilage yeast they identified, *C. nativae*, proportionally decreased the 12-hour NDFD. At 1 billion colony-forming units/gram of *C. nativae* in the TMR, NDFD was reduced by 23 percent when compared to control.

Although moulds do not always pose a direct threat to healthy animals with proper immune function, they can negatively affect animals that have suppressed immunity, typically by producing spores that cause respiratory problems. However some moulds do produce mycotoxins which can cause negative biological risks, which include liver and kidney toxicity, central nervous system effects and estrogenic effects.

**Summary**

The goal of ensiling a forage crop is to preserve as much as possible of the nutrient and DM contents of the crop at the time of harvest. The exact negative effects of feeding spoiled silages or silages with a high fungal load are not fully understood, thus it is best to anticipate and control the populations of wild yeasts and moulds at the time of ensiling rather than during feedout.

Therefore, treat silage with an inoculant proven to prevent spoilage, fill quickly and pack tightly to exclude as much air as possible, and cover immediately. During feedout, have a removal rate fast enough to be ahead of fungal activity and keep the silo face smooth.

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References omitted but are available upon request.