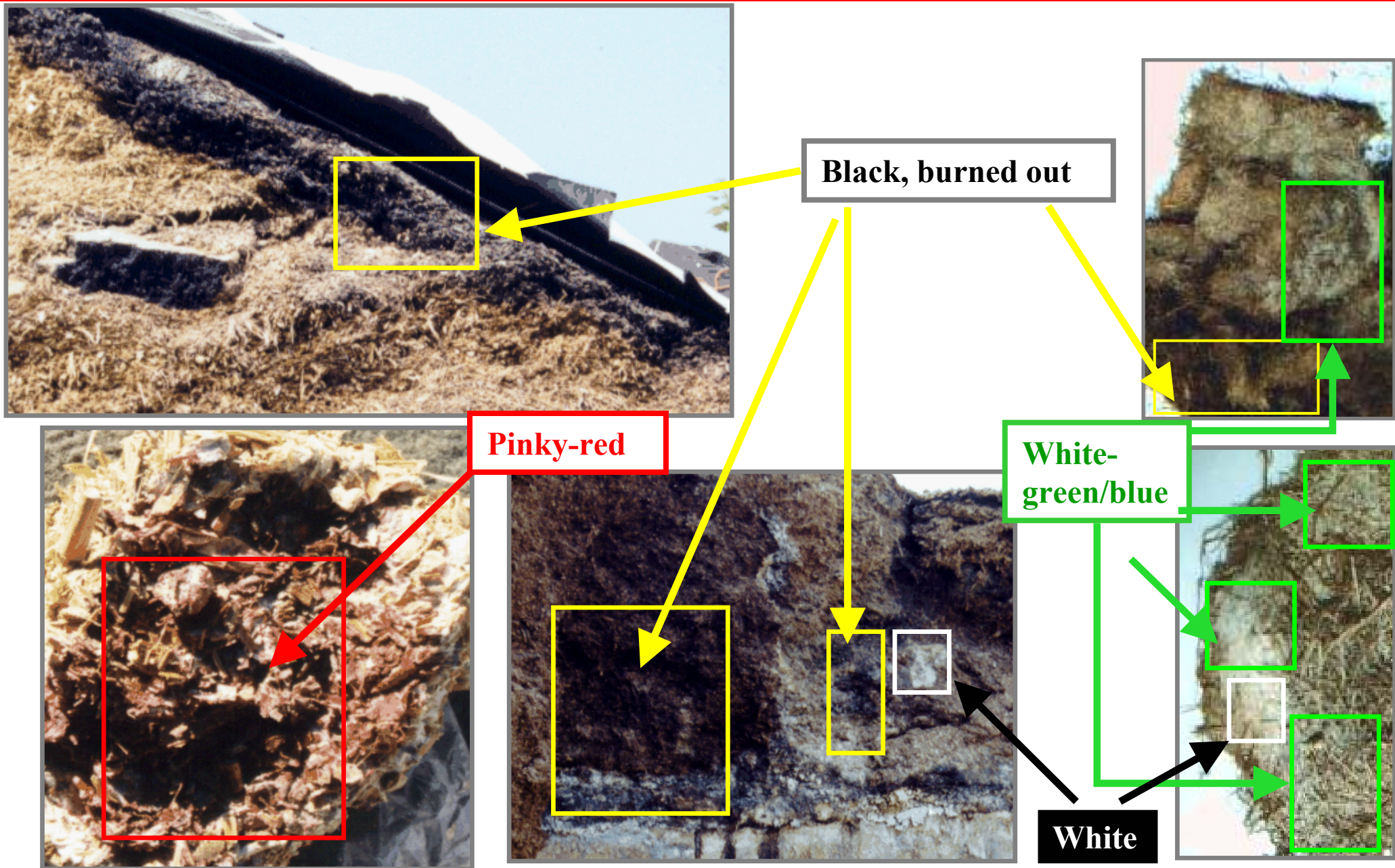


APPEARANCE OF SOME TYPICAL SILAGE AEROBIC SPOILAGE EVENTS



A WORD OF CAUTION!

AVOID FEEDING ANY SILAGE THAT IS OBVIOUSLY MOLDY!

- **It may be a high risk to the animal health and/ or performance, due to toxins**
- **It has already been through the heating process, so the nutritional value is going to be poor anyway, so...**

WHY TAKE THE RISK?

- **Also be careful when handling dusty hay: wear a mask and avoid stirring up the dust as much as possible. Some of the molds causing the dust may cause respiratory diseases (e.g. Farmer's Lung) or allergic reactions.**

GUIDE TO SOME COMMON SPOILAGE MOLDS

Color of mold patch	Possible ID	Occurrence	Possible toxins & other problems
White	<i>Mucor</i> spp.	White-grey hyphae, black spores. Found in soil, manure	None
	<i>Rhizopus</i> spp.	Appearance similar to <i>Mucor</i> , common bread mold	None
White-Green/Blue	<i>Penicillium urticae</i>	Hyphae tend to be white, spores green/ blue	Patulin: can cause hemorrhaging in lungs & brain
	<i>P. citrinin</i>	Found in corn & small grains	Citrinin: kidney damage, poor performance, weight loss.
	<i>P. roquefortii</i>	Deep blue spores, tends to dominate air-tight grain storage	Very high level of spores can cause severe respiratory problems
	<i>P. viridicatum</i>	Found in corn & small grains	Ochratoxin A (see below)
Yellow-Green	<i>Aspergillus ochraceus</i>	Very yellow spores	Ochratoxin A: kidney damage in monogastrics, little effect on ruminants
	<i>A. flavus</i>	Hyphal growth not very detectable. Powdery spores, found in drought-stressed corn, cottonseed and peanuts	Aflatoxins: carcinogenic, cause hemorrhaging, depressed intake, poor performance, diarrhea. Possible transmission through food chain.
	<i>A. fumigatus</i>	Found in corn silage	Causes lung damage, reduced intakes, diarrhea and abortions. Unidentified toxin.

GUIDE TO SOME COMMON SPOILAGE MOLDS (2)

Color of mold patch	Possible ID	Occurrence	Possible toxins & other problems
Pinky-red/ purple	<i>Fusarium graminearum</i>	Occurs in cereal grains	Zearalenone: can cause reproduction problems, especially in pigs.
	<i>F. tricinctum</i>	Found in cereal grains. White, fluffy, powdery through to red	Trichothecenes: diarrhea, poor performance
	<i>Giberrella zea</i>	Red-orange spores	Vomitoxin: feed refusal, hemorrhaging, reproductive disorders. Mainly affects pigs.
Brown-black	<i>Aspergillus niger</i>	White hyphae, black spores. Found in corn silage, especially diseased cobs	Can produce large amounts of spores, a respiratory hazard
	<i>Claviceps purpurea</i>	Most common in grasses. Also cereals.	Ergot alkaloid: not secreted into forage, remains in mold mass. Can cause tremors, convulsions and hoof necroses.
	<i>Rhizoctonia leguminicola</i>	Very common in clover	Siaframmine: salivation, bloat and diarrhea.

SILAGE TROUBLESHOOTING: 1. YOU CAN TELL A LOT FROM THE SMELL!

Smell	Possible causes & diagnostics	Management Issues
Sweet acid	Strong lactic fermentation: check pH, could be too low	Could have stability problems when fed out. Check yeast & mold levels
Acetic/ vinegar	Elevated acetic acid level: check VFA's etc. 1. High lactate, acetate and propionate: good, stable silage, feeds well 2. Lower lactate, some ethanol, maybe some butyric, iso-butyric (messy VFA profile), also some ammonia. Classic slow fermentation: may or may not be stable, intakes not ideal, lower performance.	Type 1. Excellent silage, feeds well, animals perform well Type 2. Silage may not be stable, potential palatability problems, animals do not perform ideally
Faecal	Clostridial silage: slow fermentation and/ or contamination (ash >8%) has resulted in Clostridia dominating the fermentation and producing butyric acid (classic smell is mouse droppings), ammonia, amines. Silage will be wet, pH may be elevated or may be low.	Silage will be very stable, but intakes will be low. Forcing high intakes can cause health and fertility problems. Feed as low proportion of ration, mask with a suitable flavor (e.g. caramel).
Dead/ decaying	pH elevated, low level of lactic acid, low levels of VFA's generally: 1. Yeasts: consuming lactate, raising pH: may have some ethanol and/or some iso-butyric acid. 2. Enterobacteria: very messy VFA profile, a bit of everything! Silage generally wet, ash may be high (>8%) due to slurry	Type 1. May not be stable, watch feed out rate and adjust to keep ahead of the heating. Type 2. Probably stable. Both safe to feed, but will not perform ideally due to energy lost.
Earthy	Bacillus growth: pH will be high	Silage will heat and may also go moldy. Must be fed quickly, removing moldy material. Consider treating TMR.
No smell to alcoholic odor	Yeast growth, consumption of VFA's. pH will be elevated, may be some alcohol on analysis. Micro will probably show high yeast levels.	Silage very likely to be warm/ hot or likely to heat. May also go or be moldy. Feed carefully as above.
Tobacco/ burnt odor	Silage has undergone excessive heating, due to yeast and/ or Bacillus growth. May be also moldy. Analysis shows little or no VFA's or other volatiles. May have a high level of bound/ heat damaged protein (ADIN): this will indicate temperatures have been well in excess of 100F.	May have reasonable/ high intake (cows like the taste) but will not perform well since most of the energy has already gone.

SILAGE TROUBLESHOOTING: 2. PROBLEMS, CAUSES AND SOLUTIONS

Problem	Causes	How to manage around it and avoid in the future
High pH silage	<p>A number of possible causes here:</p> <ol style="list-style-type: none"> 1. Slow fermentation - smell & look at VFA profile for indicators (butyric etc.) 2. Yeast growth: again look for indicators in smell (no smell or slightly alcoholic), VFA profile and microbial analyses. 3. Bacillus growth: earthy smell, may be heating. 	<p>Managing around it is largely down to what else is going on. If the silage is heating, feed rate needs to be high and/ or a TMR treatment used. If silage is butyric, then feed rate must be carefully controlled. Performance is likely to be compromised in any event due to energy lost from silage.</p> <p>Avoidance: Total management approach - harvest stage, chop length, speed of fill, pack rate, plus use of a good additive.</p>
Silage heating or heated	<ol style="list-style-type: none"> 1. Yeast growth (main initiators of heating) 2. Bacillus growth 3. Acetobacter growth: rare, usually only in cereal silages. 	<p>Managing around heating silage needs feed rate to be high, good face management, maybe also use of a TMR treatment.</p> <p>Avoidance: Again means focus on management - packing, speed of fill, chop length etc., plus the use of a proven aerobic spoilage preventing additive (with Buchneri 40788).</p>
Moldy silage	<p>All mold comes in from the field & grows in the silage because air is present. Air can be because of poor packing (e.g. balls or lumps of mold in silage mass), delays during filling (e.g. bands of mold in silage: fill lines), poor sealing (mold at top and/or sides) or slow feedout (mold across face). Large mold patches may be because of diseased areas in the field at harvest.</p>	<p>Be very careful!! If in any doubt, throw the moldy silage away: by the time it is moldy it has lost most of its available energy anyway. See also LAN Mold Guide.</p> <p>Avoidance: Management to exclude air in the silage, plus also proper use of fungicides in the crop in the field. Plus use a proven aerobic spoilage preventing additive (with Buchneri 40788).</p>
Silage pH too low	<p>This usually results from the activity of “wild” lactobacilli naturally present in the silage and often results after a slow initial fermentation (usually a fast fermentation will prevent the wild lactobacilli becoming established).</p>	<p>May need to be careful what is fed with the silage to avoid acidosis, etc.</p> <p>Avoidance: Again largely management (fill rate, packing etc.) plus use of a proven inoculant containing a fast, efficient homolactic LAB (e.g. <i>Pediococcus pentosaceus</i>).</p>
High ammonia	<p>Some lactic bacteria (<i>Enterococcus/ Streptococcus faecium</i>) break down protein, so can cause a higher ammonia level in otherwise well preserved silage. High ammonia can also result from a Clostridial silage (strong faecal smell will give this one away) or from Enterobacteria.</p> <p>However, high ammonia can also result from over application of fertilizers (total crude protein will be unrealistically high).</p>	<p>Again, requires care when feeding. If silage is butyric then be careful rate of inclusion in ration. If not butyric, then be careful level of NPN in ration.</p> <p>Avoidance: If fertilizer problem, manage fertilization better. If Clostridia, be careful about soil inclusion (ash should be <8%), harvest silage drier (>30% DM) and use a proven inoculant containing a fast, efficient homolactic LAB (e.g. <i>P. pentosaceus</i>).</p>