



## Soil and slurry contamination



*Unleashing the value of your forage*



## Why should I be concerned about soil and/or slurry in silage?

Soil is a black or dark brown mixture of material typically consisting of organic and inorganic compounds. The organic compounds include plant & animal remains as well as some living organisms such as bacteria, fungi, nematodes, worms and others [1].

The inorganic compounds include minerals which can be divided into macro minerals such as nitrogen, potassium, sodium, magnesium and sulphur which are present in larger quantities and micro minerals such as copper, boron, zinc and manganese which are present in smaller quantities.

Slurry is a semi liquid mixture made up of animal excrement and water containing a wide variety of organic and inorganic compounds with a high concentration of active microbes such as yeast and bacteria.

Soil and slurry can thus be sources of microbial as well as mineral contamination in silage production and can lead to poor silage quality and stability at feeding.

The image to the right shows slurry on the leaf of the grass due to lack of rain to wash in.

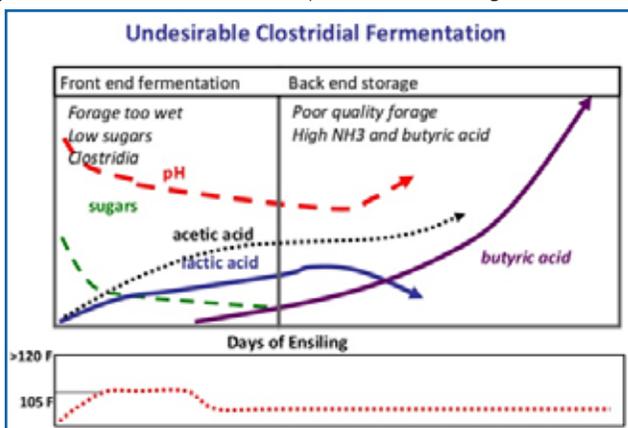


## What happens when silage is contaminated with soil and/or slurry?

Silage is produced when microbes ferment and chemically break down substances in forage. The type of fermentation will be guided by the microbes present as well as their environment and nutrients available.

When forage is contaminated with soil or slurry the microbial and mineral composition of the forage can change significantly. Soil contains bacterial species such as *Enterobacteriaceae*, *Bacillus* and *Clostridium* [2] [3] which will all have a negative effect on fermentation quality.

*Clostridium* bacteria reduce silage quality by causing an increase in pH through lactic acid consumption [2] and butyric acid production, and a decrease in feed value by catabolising protein which also produces biogenic amines such as histidine, putrescine and cadaverine that can affect animal health and production [4]. *Clostridium* bacteria are also associated with diseases such as botulism [2] [5].





A high level of soil contamination can cause problems with the uptake of certain minerals because soil is a rich source of iron it can decrease the availability of copper, high aluminium concentration can also be indicative of soil contamination and may interfere with phosphorous uptake by the animal [5] [7]. The levels of iron and aluminium may be influenced by soil pH, a titanium analysis is the only mineral analysis that will undoubtedly confirm soil contamination as it is present in the soil but not absorbed by the plant [7].

Soil contamination may also bring moulds into the silage and in some cases when stressed these moulds can produce mycotoxins for example some soils will contain *Aspergillus* species which can produce aflatoxin which has been well documented to have negative effects on animal and human health [4].

Contamination of forage with slurry that has a high nitrogen content can lead to poor fermentation due to the high buffering capacity of ammonia produced during the decomposition of nitrate, resulting in a slower pH drop during the ensiling process due to the nitrogen neutralising the acid produced during fermentation. This gives spoilage microbes such as *Clostridia* more time to multiply and exert negative effects on the forage quality [2].

Soil and/or slurry contamination will lead to an increased ash content of the silage and due to the fact that ash does not dissolve in a neutral detergent solution the neutral detergent fibre (NDF) value of the silage will be artificially inflated meaning the actual diet will be lower in NDF which can compromise intake and rumen health [8].

## How to spot soil and/or slurry contamination

It is often easy to spot soil contamination in silage by doing a simple visual appraisal of the silage and smelling the silage. Silage contaminated with soil and/or slurry will be dark and rancid smelling in most cases due to protein degradation and production of butyric acid by spoilage organisms especially *Clostridia*.

There are certain parameters in silage NIR analyses that are also indicators of soil or slurry contamination. Ash content is a measure of the total mineral content of the residue remaining after burning a sample. Values above 10% [9] for grasses or 14% for legumes [8] usually indicated soil contamination of forage. High ammonia levels are indicative of excessive protein breakdown which is a sign of *clostridial* fermentation which is a sign of soil and/or slurry contamination [4].

When looking at a mineral analysis of silage high Aluminium and Iron levels are indicative of soil contamination [7].

Silage that heats quickly after exposure to oxygen can also be an indication of soil contamination because the first organisms that cause heating are spoilage yeasts and these are found in high concentrations in soil [2].



# How to prevent soil and/or slurry contamination

There are some basic steps that can be taken to prevent soil and/or slurry contamination during silage production [10]:

- Check the fields that are due to be cut for mole hills and tractor ruts and roll any that are present
- Before cutting walk the field to check for any slurry residues on the leafy part of the plant and delay cutting accordingly
- Avoid harvesting lodged forage
- Adjust the cutting height of the mower to a cutting height of 6cm to minimize the risk of slurry/soil contamination
- Use flat knives on the disk mower
- Minimize moving the crop horizontally with a rake, rather move two swaths on top of a third in the middle rather than raking it all to one side
- Adjust the height of the tedder so that the rakes tines do not come into contact with the soil when the swath is tilled
- Clean tractor tires that are rolling the clamp
- Consider using a windrow merger as the crop is picked up and moved horizontally on a conveyor instead of rolling on the ground



## Biotol's Crop and Condition Specific Range

Each season can be different in terms of the challenges faced at harvest. We tailor our product range to offer the best solution for your situation. Contact your local RBM for more details.

### References

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