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SILAGE TROUBLESHOOTING – PART I:
Silo control measurement of physical aspects

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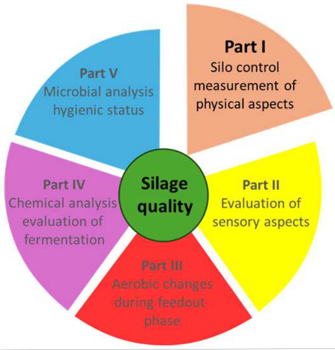


Introduction

- Physical parameters affect fermentation of silage and spoilage losses at the silo face.
- Particle size and DM are important factors to compaction of silage
- Proper covering is essential to minimize air infiltration during the storage phase.
- At the open silo face compact silage minimizes the gas exchange.
- The feedout rate determines the time of air exposure at the silo face.

Indicators

- Visual signs for leakages in the covering, e.g.:
  - Mouldy silage in areas near the surface (Fig. 4 a);
  - Wet silage because of water ingress.
- Elevated silage temperature at the silo face reveals zones where aerobic deterioration has been initiated (Fig. 1 a; 4 b-c).
  Leakages and parts of low density often show reheating.
- Longer particles in combination with high DM result in lower compaction during silo filling. Chop length and cracker adjustment have impact on particle size.
  Assessment of particle size can be done visually or more accurately by sieving (Fig 1 b; 5).

Fig. 1 a. Top: Thermal camera.
b. Bottom: Sieves of different screen sizes.

- Silage compaction can be measured using core samples of a specific volume or with specialised tools like the hand penetrometer (Fig. 2).

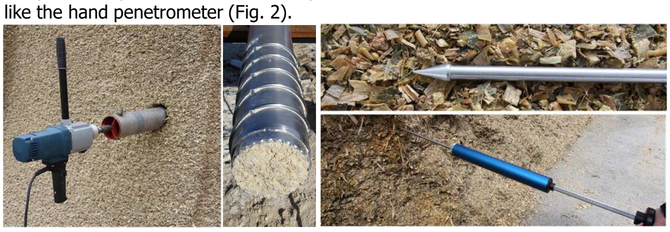


Fig 2. Core sampler (4L volume) and penetrometer to estimate silage density

The indicators below are used to evaluate silage quality, ranked from 0 to 4 (Fig. 3). The physical parameters particle size, porosity/compaction (Fig. 6 as an example), and feedout rate have effects on warming of silage and feed intake.

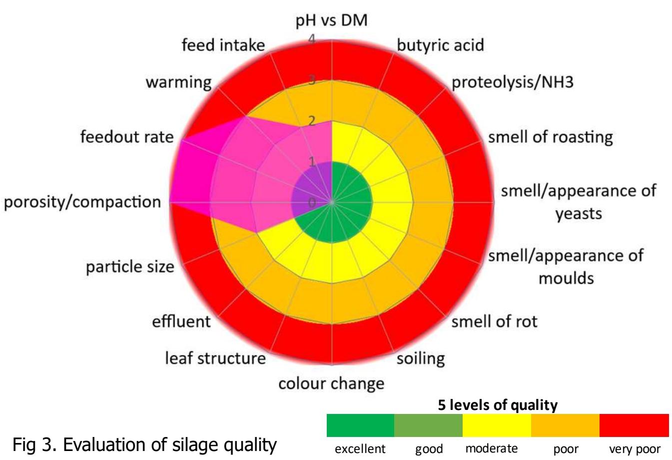
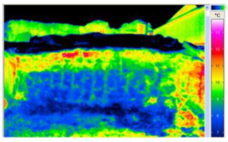


Fig 3. Evaluation of silage quality

Conclusions

- Physical aspects of silage quality can be measured directly at the silo face.
- Particle size and DM affect crop compaction and bulk density.
- Short chopping (maize <10mm, grass< 40mm) facilitates compaction.
- Low bulk density leads to faster air infiltration, which accelerates warming of silage.
- Warming of silage increases avoidable DM losses and often leads to mould growth at the silo face**.**

Fig. 4 a. Leakage in film caused massive air influx and mould growth.



b. Thermogram shows areas of increased silage temperature at the silo face.

c. Elevated silage temperatures show warming and aerobic deterioration of silage.

Fig. 5. Freshly chopped maize of one field, chop length of 3-8-11-17 and 23 mm
The pictures show the shift to longer formed particles of leaf and stem

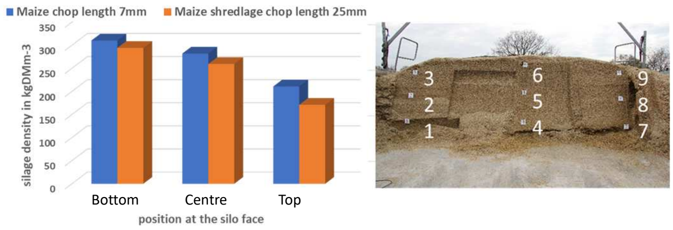


Fig. 6. Average bulk density of maize harvested at the same time (short-chopped compared to shredlage) measured at different positions of the silo face: position 3, 6, 9 = top layer; position 2, 5, 8 = central layer; position 1, 4, 7 = bottom layer.
In the top layer (Fig. 6), the density was 30% lower than in the centre of the silo. Shredlage shows 10-15% lower density, especially in the top layer.

MEASURES

- ➢The improvement of physical parameters is a key challenge for next silage making!
- ➢Leakages in the film have to be repaired immediately especially in areas not yet close to feedout.
- ➢If spoilage is found as result of low density and low aerobic stability, the feedout should be accelerated to minimize losses.
- ➢The application of silage additives (e.g. formic acid or propionic acid) at the silo face has limited effect, as these substances do not penetrate deeply into the silage.

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