

**BON
SILAGE**



Maize Silage Handbook



Guide to successful maize ensiling



Guide to successful maize ensiling

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- Low raw protein content.
- Lots of fermentable carbohydrates (favourable fermenting properties).
- Low buffering capacity.
- High fermentability coefficient.
- DM content of maize grain and corn cob products in the upper limit area of biological ensilability.
- Extremely high spoilage potential (yeast and mould activity, heating up).

Target values for whole plant maize silage and CCM silages:

| Parameter | | Target value | |
|---------------------------|--------------|--------------|--|
| | | Mais-TPS | CCM |
| Target value | % | 30-35 | 60-65 |
| pH value (function of DM) | | 3.8-4.2 | 3.8-4.2 |
| Starch | % DM | > 30 | > 65 |
| XP | % DM | 8-9 | 9-10 |
| XF | % DM | < 20 | 2,5-3,5 |
| NDF | % DM | 35-40 | 10-12 |
| XA | % DM | < 4.5 | < 2.5 |
| NH ₃ -N | % of total N | < 6 | < 6 |
| ELOS | % DM | > 70 | > 79 |
| Gas formation | ml/200 mg DM | > 52 | > 54 |
| Energy density | MJ NEL/kg DM | > 6.5 | > 15.5 MJ ME (pigs) > 8.2 MJ NEL (cattle) |

Note: high silage quality is the basis for top production performance

2. Harvesting time (silage maize – whole plant)

Recommended harvesting time:

- DM content of whole plant between 29 and 34 %.
- Starch storage in the grain is completed.
- High proportion of cob and readily digestible residual plant.
- Maize is ready for ensiling if the dry matter in the grain has reached a value between 56 and 60 %.
- As a guideline, ensiled crop should have approx. 300 g starch and 40 g sugar (depending on the planned silage share of the ration).

Harvesting at this recommended time will ensure:

- Optimum compaction properties.
- Reduced tendency to heating up and mould formation.
- Less susceptibility to Fusarium toxin formation.
- Good consumption properties.



3. Chop lengths (silage maize – whole plant)

Optimum: 5 to 8 mm
(theoretical chop length)

Following this recommendation will ensure:

- Possibility of optimised compaction (more than 230 kg DM per m³ silage).
- Minimal energy losses during ensiling and removal.
- Increased feed intake (+ 0.7 kg DM intake/day as against 20 mm particles).
- Improved digestibility (attack surface for the rumen microorganisms is increased).
- The optimum chop length of 5 mm also applies to use for biogas.



4. Effects of using silage additive

Aim of using silage additive in silo maize and maize grain products

- Suppression of undesirable microorganisms (Acetobacter, yeasts, mould fungi and other toxin-forming spoilage agents).
- Prevention of heating up and fermentation failure.
- Improved consumption properties (palatability).
- Increased digestibility (substrate disintegration).
- Targeted control of fermentation process (achieving defined quantities of acetic acid, propandiol and lactic acid).
- Dry matter losses reduced from the usual 8-12 % to 2-3 %.

Recommended silage additive (silo maize – whole plant):

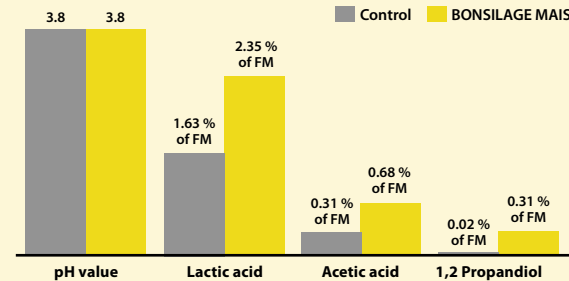
- BONSILAGE MAIS as the standard product.
- SILOSTAR MAIS in case of reduced silo ripening time or in areas of the silo that require special protection against fermentation pests.

Recommended silage additive (CCM/maize grain):

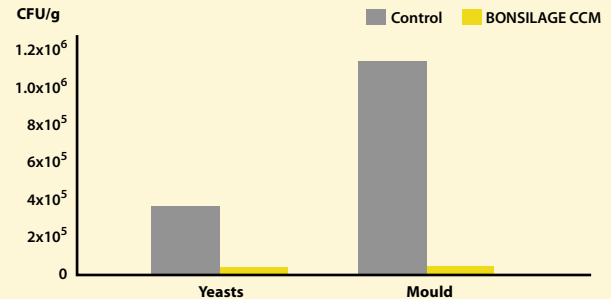
- BONSILAGE CCM
Optimum DM: 58-62 %
Maximum DM: 65 %

BONSILAGE MAIS optimises the course of fermentation, increases the energy density and increases the aerobic stability.

BONSILAGE MAIS optimises the fermentation process for more energy



BONSILAGE CCM reduces yeasts and mould in maize grain meal silage, 67% DM (ISF, Wahlstedt)



5. Ensiling CCM/maize grain meal

Biological ensiling

- Avoid high proportions of cob (target: < 10 %).
- Degree of milling: > 80 % of particles < 2 mm.
- Storage density: > 500 kg DM/m³.
- Precise application of 1 g BONSLAGE CCM in 0.5-4 litres water per tonne maize meal.
- Minimum storage time: 6-8 weeks (silo ripening time).
- The higher the DM content, the longer the ripening time that must be allowed.

Preserving with acid

Acid metering for storage in plastic:

- 56-67 % DM = 5 l SCHAUMASIL EXTRA / SCHAUMASIL SUPRA NK
- 67-75 % DM = 8 l SCHAUMASIL EXTRA / SCHAUMASIL SUPRA NK
- If the hygiene of the starting material is compromised (e.g. smut) or in case of contamination, the measured dose should be increased by 0.1-0.3 %.

Technological tips:

For successful ensiling/preservation it is important to determine the dry matter in the starting material accurately. In principle, the moisture content of each batch delivered should be determined, especially if large quantities at different stages of ripening are delivered.

- Always use acid-resistant measuring containers to measure acid.
- Carry out precise adjustment before using the equipment ('gauging by litres').
- Always observe the safety precautions. The specific safety data sheets for the product must be available (HACCP concept).
- The walls and base of the storage unit that come into contact with the treated silage must be coated with an acid-resistant product or protected by acid-resistant sheeting.
- Overheating during milling should be avoided to prevent spoilage caused by heat (browning or blackening of the maize product, Maillard reaction).

6. Ensiling additives



**Great silage,
easy handling**



Group 2

Active ingredients: Homofermentative and heterofermentative lactic acid bacteria

Aim of use: Optimised course of fermentation, increased energy density, aerobic stability

Area of use: maize whole plant silage, cereal TPS

Pack size: granules 25 kg, liquid 100 g powder

Dose/t: granules 0.25 kg/t ensiled material, liquid 1 g/t ensiled material

Recommended compaction: at least 200 kg DM/m³

Minimum storage time: 6-8 weeks



**Nutrient protection
for maize grain silage
and corn cob mix**



Group 2

Active ingredients: Homofermentative and heterofermentative lactic acid bacteria

Aim of use: optimised fermentation acid pattern, more reliable energy retention, high storage stability

Area of use: CCM, maize grain silage, husk cob meal

Pack size: granules 25 kg, liquid 50 g powder

Dose/t: granules 0.25 kg/t ensiled material, liquid 1 g/t ensiled material

Recommended compaction: > 500 kg DM/m³

Minimum storage time: 6-8 weeks



**The biological ensiling
agent for valuable cereals**

Active ingredients: Combination of homofermentative and heterofermentative lactic acid bacteria strains

Aim of use: optimum fermentation acid spectrum, stability of milled cereal and grain maize in the silo or roll, even with higher DM contents up to 75 %.

Pack size: liquid, 100 g

Dose/t: liquid, 2 g

Recommended compaction: > 500 kg DM/m³

Minimum storage time: at least 8 weeks



The turbo starter among ensiling agents



Group 2

Active ingredients: homofermentative and heterofermentative lactic acid bacteria strains, active ingredient additive
Aim of use: accelerated silo ripeness
Area of use: silo maize, TPS, CCM
Dose: 1 kg granules/t ensiled material
Minimum storage time: 3 weeks



The liquid alternative, also for complete treatment



Active ingredients: combination based on sodium benzoate and sodium acetate
Aim of use: inhibiting yeasts and mould, low-loss silo surfaces; complete treatment effectively prevents heating up (non-corrosive, user-friendly)
Area of use: grass, maize and cereal TPS and industrial byproducts
Dose: surface treatment: 0.3-0.5 l/m² in 10-15 cm layer thickness. Complete treatment: depending on type of silage and DM content: 3-5 l/t
Minimum storage time: 2 weeks



A highly effective combination for specific silo protection

Aim of use: to protect the silo surface from mould and yeasts
Area of use: silage surface and edge treatment
Dose: 2-5 g granules/t or 200 g/m² (surface treatment)



Active ingredients: organic acids
Area of use: preservation of CCM, maize grain silage
Dose: 5-8 l/t when stored in plastic sheets; 8-10 l/t for maize meal not stored in plastic sheets
Minimum storage time: 2 weeks



Active ingredients: organic acids; buffered
Area of use: preservation of CCM, maize grain silage
Dose: 5-8 l/t when stored in plastic sheets; 8-10 l/t for maize meal not stored in plastic sheets
Minimum storage time: 2 weeks

7. Dosing technology

WEDA UED for BONSILAGE products



Application: liquid
Design: electronically controlled compact unit. Standard unit: 2x5 l tanks for bacterial concentrate. Dosing by ultra-fine misting. Ready for operation with all accessories.

Output: choice of 180 l/h or 270 l/h

Drive: 12 V DC

Area of use: forage harvesters

Other liquid or granule dosing equipment on enquiry.

SCHAUMANN acid dosing equipment

SDG 450 E / SDG 800 E



Application: liquid
Design: self-priming pump with flow meter, 2.5 m intake hose with foot filter, 5 m delivery hose with nozzle holders and set of nozzles. All parts stainless steel, with On/Off switch and emergency switch.

Output:
SDG 450 E: 40-450 l/h
SDG 800 E: 80-800 l/h

Drive: 230 V AC

Other units on enquiry, both electric and pneumatic.

8. Compacting

Silo maize – whole plant

- Intensive compacting = basic requirement for optimum ensiling
- Layer thickness when compacting: 25 to 30 cm before rolling
- Slow travel (2-3 km/h) with high rolling pressure (2.5-3 bar tyre pressure)
- At 28 % DM: 230 kg DM/m³
- At 33 % DM: 250 kg DM/m³
- Over 35 % DM, for each additional percentage point DM approx. 10 kg DM/m³ higher density

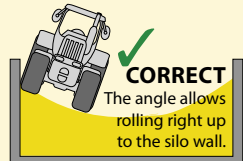
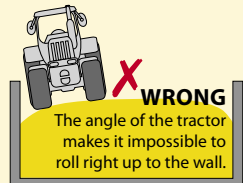
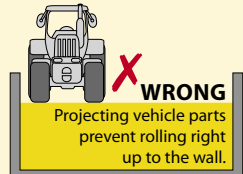
For CCM/maize grain meal

- Storage density: > 500 kg DM/m³
- A removal rate of approx. 10-15 cm per day is recommended.

For the top edge and cover layers

Use of organic acid mixes in liquid or dispersible form

- SCHAUMASIL EXTRA (1 litre per m² diluted with 3 litres water)
- SILOSTAR PROTECT (0.2-0.5 kg per m² or 2-5 kg/t) worked into the top layer



9. Sealing and removal

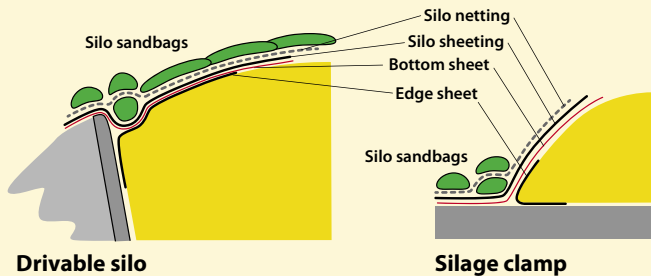
Sealing

- Bottom sheet, adheres directly to the silage (thickness: 0.04 mm).
- Main sheet, must be gasproof (thickness: 0.15-0.25 mm).
- It is advisable to cover over temporarily during extended breaks in ensiling (6 hours or longer).
- SCHAUMANN silo netting protects the sheets from mechanical damage and provides additional weighting.
- SCHAUMANN silo sandbags as weighting for a snug fit. Airtight barriers can be created 5 m apart.
- Side wall sheeting should be used for side walls.

Removal

- Minimum removal rate: cold weather: 15-20 cm/day
hot weather: 30-35 cm/day
- Maximum exposed silo face: 1 m² for every 10 cows
- Recommended reserve volume: 20 m³/cow

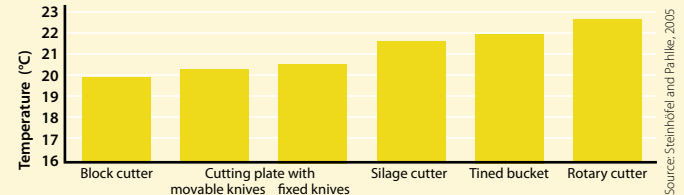
Examples of good cover:



10. Silo face

The minimum removal rate to avoid heating up should be 1.5 m per week in winter and 2.5 m per week in summer. The removal technique should be designed to do as little damage as possible to the exposed face and to minimise air ingress.

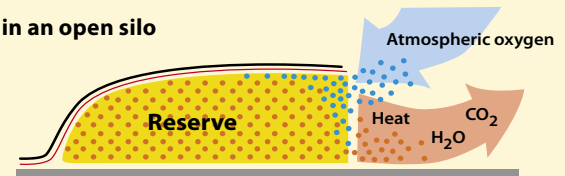
Effects of removal technique on silo face temperature (after 20 hours, 20 cm back from the face)



Preventing heating up

- Create summer silos with a smaller silo face.
- Do not have the face of the silo facing into the prevailing wind.
- Leave the silo sheet in place until near the time of silage removal.
- Calculate the silo length and removal rate according to the herd size.
- Optimise the removal technique.

Air flow in an open silo



Note: to avoid heating up, the silo face should be adapted to the requirements of the farm.

11. Economic efficiency



On the winning side with BONSILAGE MAIS



Group 2

A model calculation has been used to illustrate the increased economic efficiency of maize silage production using BONSILAGE MAIS as an ensiling agent.

Harvest yield: 50 t fresh matter per hectare with 35 % DM equivalent to 17.5 t dry matter per hectare

Energy content: silo maize, start of dough-ripe stage, high proportion of cob: 6.7 MJ NEL/kg DM

The energy yield in MJ NEL/ha is increased by using

BONSILAGE MAIS

DM losses cut by 8% when using BONSILAGE MAIS.

The higher energy content of maize silage

with BONSILAGE MAIS is disregarded. 1 kg milk = 3.3 MJ NEL

| | Control | | BONSILAGE MAIS | |
|------------------------|---------------------|---------------|---------------------|----------------|
| | Energy MJ NEL/ha | Milk kg/ha | Energy MJ NEL/ha | Milk kg/ha |
| Harvest yield | 117,250 | 35,530 | 117,250 | 35,530 |
| Losses | 15,242 | 4,619 | 5,862 | 1,776 |
| Yield | 102,007 | 30,911 | 111,388 | 33,754 |
| Increased yield | | | + 9,381 | + 2,843 |

Potential challenge feeding saving

| | | |
|--|----------------------|-------------------|
| Potential challenge feeding saving (challenge feeding with 7.0 MJ NEL/kg) | 9.381 ÷ 7 = 1.340 kg | |
| Cost reduction with ch. feed prices of | 17 €/dt | 24 €/dt |
| | 228 € | 322 € |
| Ensiling agent cost | - 59 €/ha | - 59 €/ha |
| Additional yield with BONSILAGE MAIS | + 169 €/ha | + 268 €/ha |

12. Product range



BONSILAGE

The basic product for all types of green silage. Rapid lowering of pH value.



Group 1b



BONSILAGE PLUS

For the upper DM range of all types of green silage. Improved stability and digestibility.



Groups 1c, 2, 4b



BONSILAGE FORTE

For the lower DM range of all types of green silage. Inhibits Clostridia.



Groups 1b, 5a



BONSILAGE EXTRA

For all types of green silage with a high proportion of sugar-rich grasses.



BONSILAGE MAIS

For maize silage and TPS. Improved stability and digestibility.



Group 2



BONSILAGE CCM

For maize grain meal and CCM. Protects against uncontrolled yeast multiplication.



Group 2



BONSILAGE GRAIN

The biological solution for wet milled cereals.



SILO STAR MAIS

Biological/chemical ensiling agent for maize, CCM and TPS. Shortens the silo ripening time.



Group 2



SILO STAR PROTECT

For surface and edge treatment. Inhibits yeast and mould fungi at the edges.



SILO STAR LIQUID

The liquid chemical alternative, also for complete treatment.



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