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Effect of aerobic exposure before and after ensiling on maize silage quality

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Introduction

- Maize silage is one of the world´s most significant forage
- Air supply before and after the preservation causes spoilage of silage by undesirable microorganisms

<u>Consequences can be:</u>

- Increase in microbial population and temperature
- Loss of dry matter (DM) and nutritive value
- Less aerobic stability
- Impaired feed intake and animal performance

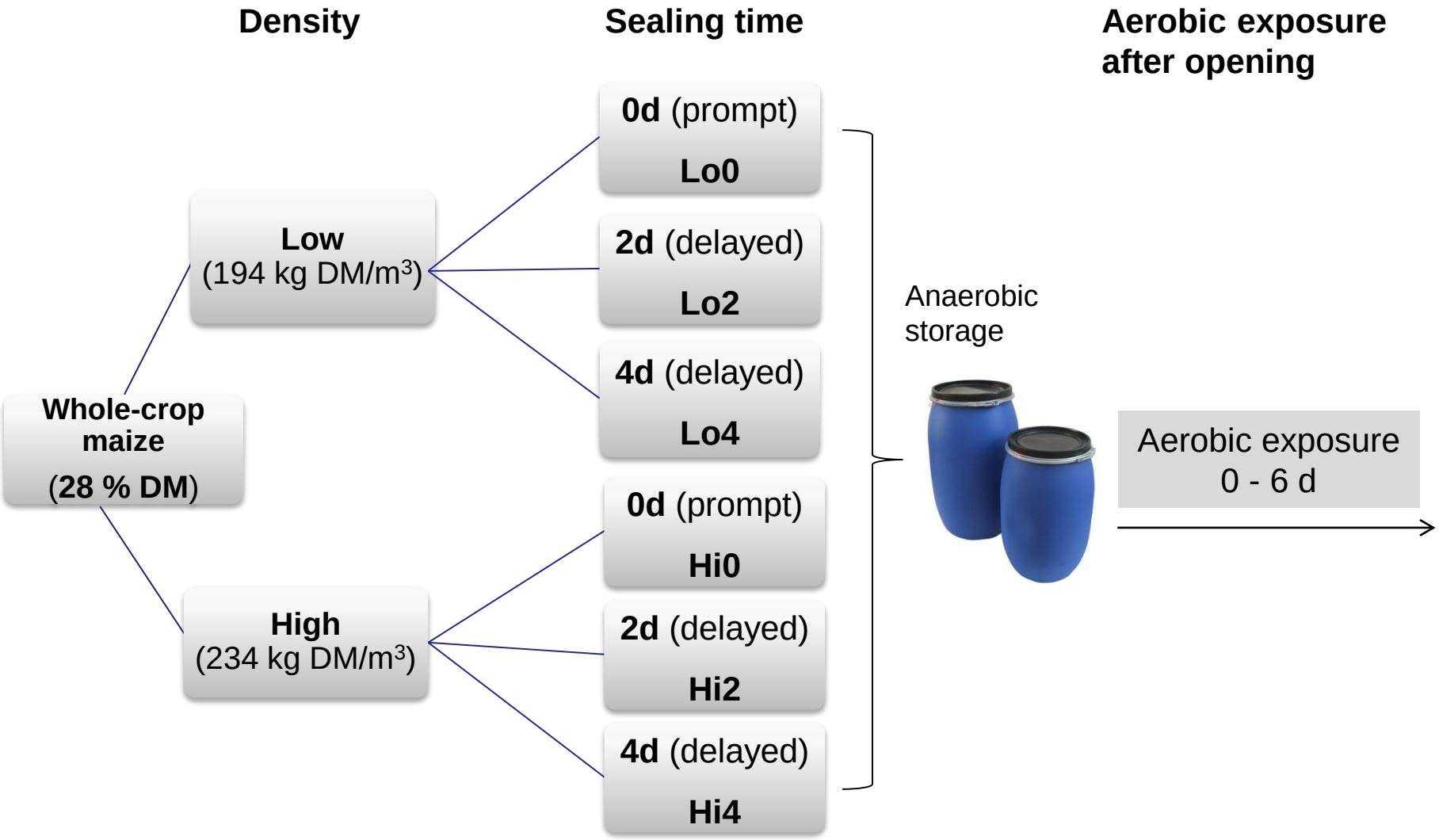
Aim of the study

Evaluation of the impact of aerobic exposure before and after ensiling at two densities on:

- DM losses during ensiling
- Aerobic stability
- Microbial counts
- Chemical composition, especially volatile organic compounds (VOC)
- Feed intake and preference by goats

Source: landesempach-emmen.ch

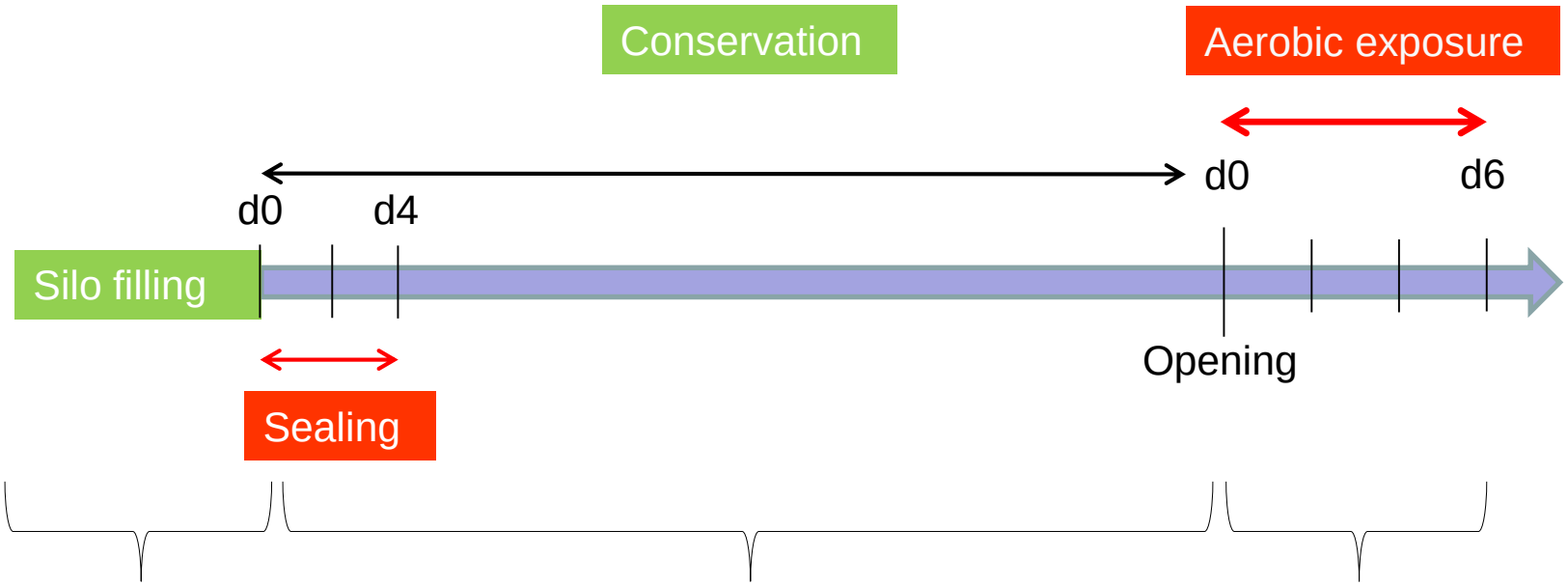
Materials and methods



Materials and methods

- Anaerobic storage under constant ambient temperature
- Opening after > 90 d of ensiling
- Homogenizing of silages
- Aerobic storage – quadratic heap; constant layer height of 12 cm, ambient temperature (20 ± 1.5°C)
- Mixed and sampled per day of aerobic exposure

Materials and methods



- **Microbial counts**
- Chemical composition (**proximate analysis**, fermentation pattern)

- **DM losses (%)**

- **Aerobic stability (h)**
- **Microbial counts**
- Chemical composition (proximate analysis, **fermentation pattern)**

- Statistical analysis: completely randomized design (PROC MIXED of SAS 9.2)

Results – Silage characteristics

Dry matter, chemical composition and microbial counts of freshly chopped whole-crop maize before ensiling (% of DM unless stated otherwise)

Item	Whole-crop maize
DM* (%)	27.7
Ash	3.9
CP	6.9
Ether extract	2.5
aNDFom	44.3
ADFom	22.9
ADL	2.9
WSC	16.0
Yeasts (Log_{10} cfu/g)	6.04
Moulds (Log_{10} cfu/g)	5.63
Aerobic mesophilic bacteria(Log_{10} cfu/g)	>7.30

*corrected dry matter, CP = crude protein, aNDFom = neutral detergent fibre treated with α-Amylase and expressed exclusive residual ash, ADFom = acid detergent fibre expressed exclusive residual ash, ADL = acid detergent lignin, WSC = water-soluble carbohydrates

Results – Silage characteristics

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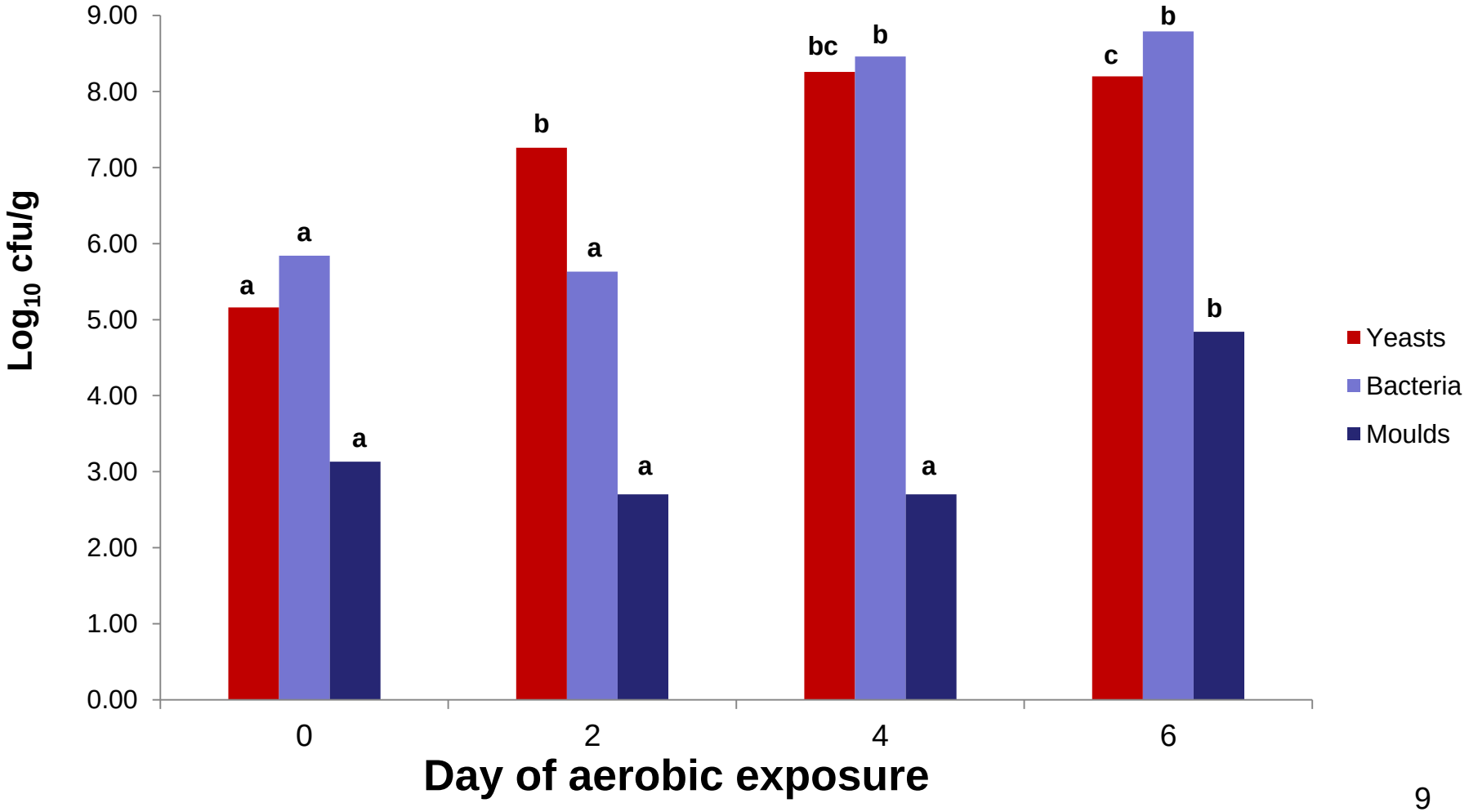
Effect of silage density (D) and sealing time (S) on dry matter (DM) losses during ensiling and aerobic stability of maize silage

	Silage Density							Effects		
	Low			High						
Sealing time (d)	0	2	4	0	2	4	SEM	*D*	*S*	*D x S*
DM losses (%)	**3.7^{a}**	**5.7^{a}**	**10.7^{b}**	**5.5^{a}**	**5.8^{a}**	**9.0^{b}**	0.3 - 0.7	*NS*	***<.001***	***0.018***
n	6	5	5	6	5	5				
Aerobic stability (h)	**64^{bc}**	**48^{ab}**	**47^{a}**	**65^{c}**	**57^{ac}**	**52^{ac}**	3.1 - 4.4	*NS*	***0.016***	***NS***
n	3	5	6	6	4	5				

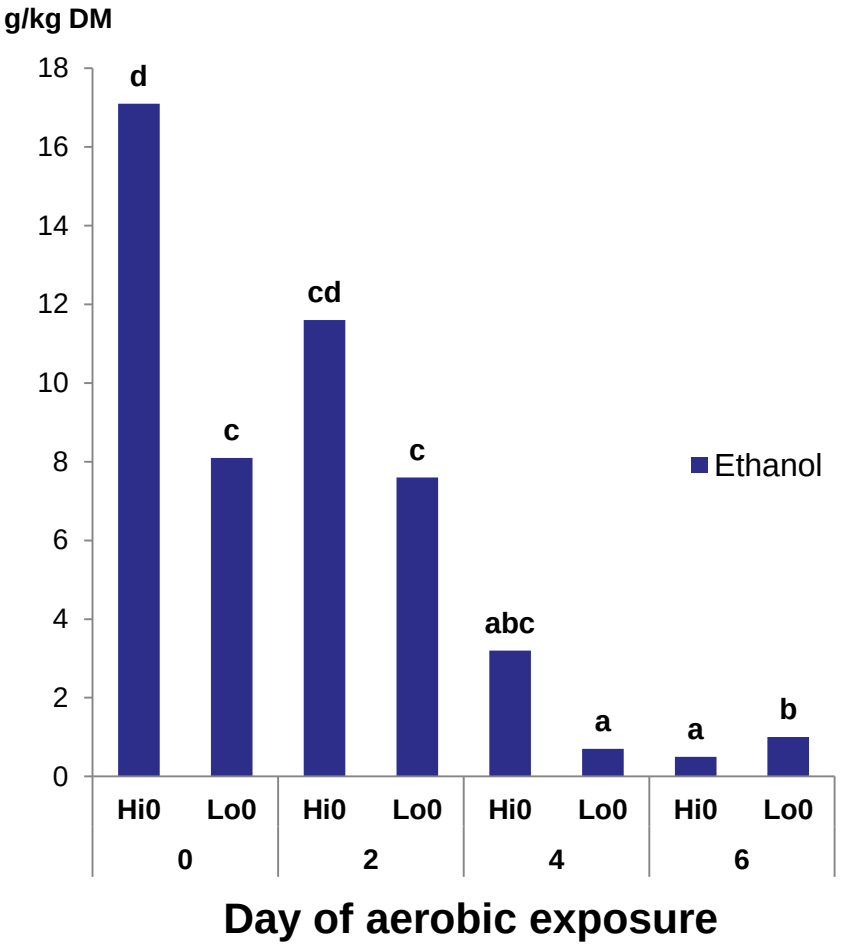
Results – Microbiology

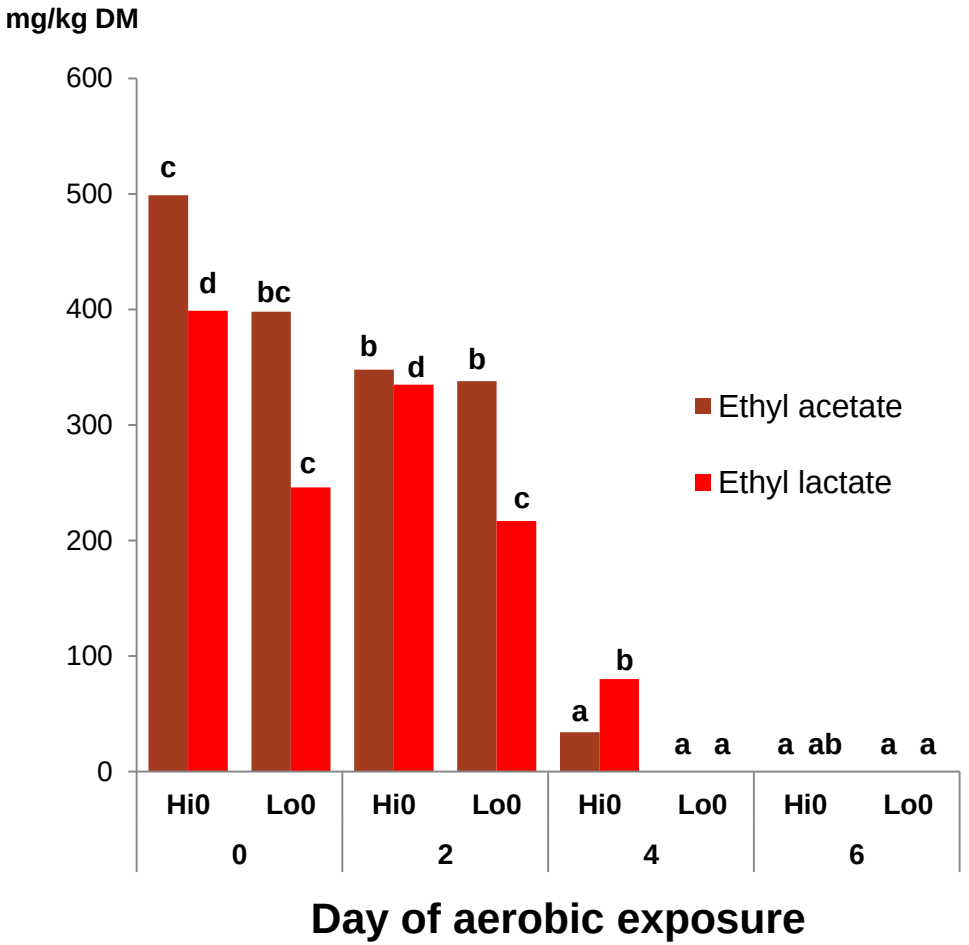
Effect of aerobic exposure on yeast, aerobic mesophilic bacteria and mould counts (n = 6 per day; cfu = colony forming units)



Results – Ethanol and ethyl esters

Effect of silage density and aerobic exposure on contents of ethanol and ethyl esters in promptly sealed silages (n = 6 per treatment)





Summary

- Delayed sealing by 4 d caused high DM losses and low aerobic stability
- The longer the aerobic exposure the more pronounced was the microbial development
- The highest contents of ethanol and ethyl lactate were found in the high density silages on the day of opening
- With increasing aerobic exposure the contents of ethanol and ethyl esters decreased

Conclusions

Prolonged air supply

- before (sealing time, density) and
- after (aerobic exposure) ensiling

Source: topagrar.de

can cause a **decline** of the quality of the silage in terms of DM-losses, aerobic stability and microbial counts

Avoid air supply through good agricultural practice!

Thank you for your attention!

Source: landesempach-emmen.ch