

WE-120

First estimation and validation of a new model to predict dry matter loss based on temperature changes – IV. Validation of model in a short fermentation regime.

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INTRODUCTION

It was recently demonstrated that a linear regression correlation exists, between dry matter (DM) loss and temperature development during aerobic stability challenge (Pires et al. 2018). The model was validated and proved useful to estimate DM loss in different storage structures mini silos and big bales (Witt et al. 2018a) and across different crops (maize and alfalfa/grass) (Witt et al. 2018b). Based on this, it was concluded that the method could be applied to both easy and difficult to ensile crops when silages had fermented for up to 120 days. While it was demonstrated that aerobic stability could be improved using SiloSolve[®] FC in both maize (Witt et al. 2015) and alfalfa silage (Copani et al. 2017) after short fermentation time, it was unknown if the model could be applied to crops when ensiled for a shorter time.

“ The purpose of this study was to test how the model could be used for DM loss prediction in maize and alfalfa silages during aerobic spoilage when ensiled for 8, 16 and 32 days vs. the model described by McDonald et al. (1991), using the difference between recorded temperature in the silo and the ambient temperature. ”

MATERIAL AND METHODS

Alfalfa (34.2% DM) & Maize (34.4% DM)



Untreated control (C)



SiloSolve[®] FC (SSFC)
150,000 cfu/g of forage

Lactobacillus buchneri LB1819 DSM22501
Lactococcus lactis O224 DSM11037

n=5

Mini silo

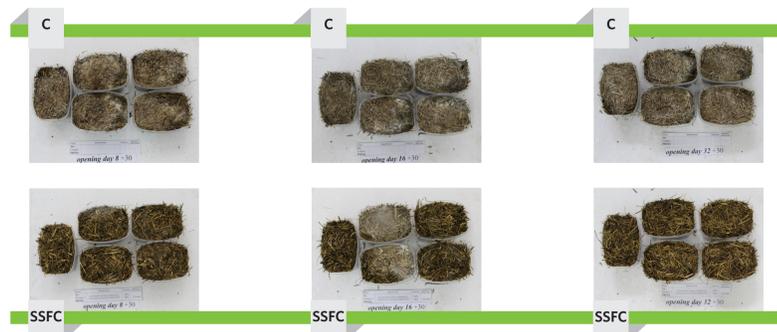
3 l, (1.8-1.9 kg forage)/silo

n=5

Fermented 8, 16 or 32 days

Aerobic stability (AS) test after fermentation

Fermented 8 days 30 days aerobic challenge Fermented 16 days 30 days aerobic challenge Fermented 32 days 30 days aerobic challenge



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RESULTS

Table 1. DM loss recorded vs. calculated using 2 different models based on temperature in the difficult to ensile alfalfa/grass crop, comparing 2 different treatments (TRT) (untreated (C) and SiloSolve[®] FC (SSFC)).

Crops	Ambient T at max T during AS test (°C)	Max T (°C) reached after [hours] of AS test		DM loss (%) recorded after AS test (std. dev.)		Calculated DM loss (%) using delta vs. ambient T *		Calculated DM loss (%) using linear regression model** (std. dev.)	
		C	SSFC	C	SSFC	C	SSFC	C	SSFC
Mini silo	TRT								
Maize 8 d	21.0	28.9 [120]	27.3 [144]	3.8 (+/- 0.14)	2.6 (+/- 0.14)	15	10	4.3 (+/- 0.4)	3.5 (+/- 0.4)
Maize 16 d	21.1	29.1 [126]	28.1 [168]	3.3 (+/- 0.17)	2.2 (+/- 0.17)	15	10	4.4 (+/- 0.4)	3.9 (+/- 0.4)
Maize 32 d	20.8	30.6 [120]	26.9 [168]	2.9 (+/- 0.18)	1.8 (+/- 0.18)	15	10	5.1 (+/- 0.4)	3.3 (+/- 0.4)
Alfalfa 8 d	20.2	36.9 [420]	25.9 [696]	10.8 (+/- 0.19)	5.7 (+/- 0.19)	15	10	8.2 (+/- 0.4)	2.8 (+/- 0.4)
Alfalfa 16 d	20.8	31.8 [516]	24.5 [684]	7.5 (+/- 0.15)	4.9 (+/- 0.15)	15	10	5.7 (+/- 0.4)	2.2 (+/- 0.4)
Alfalfa 32 d	20.3	30.1 [588]	25.2 [720]	7.3 (+/- 0.17)	5.02 (+/- 0.17)	10	3	4.9 (+/- 0.4)	2.5 (+/- 0.4)

* according to McDonald (1991) ** according to Pires et al. (2018)

Adapting the linear correlation model to temperature scores in alfalfa and maize silage at short fermentation regime demonstrated a vast improvement in the estimation of dry matter loss during aerobic challenge compared to previous step logic model (Table 1). In addition, it was demonstrated that ensiling with SSFC ($P < 0.01$) reduced the DM loss and improved aerobic stability (data not shown) in both maize and alfalfa silages at all fermentation times after aerobic challenge. The old model, the new model and actual DM loss were evaluated, and the new model more accurately aligned with DM loss recorded in the trial across both crops and ensiling times.

DISCUSSION

Submitting real time temperature recordings to the newly established model (Pires et al. 2018), yielded a significantly ($P < 0.001$) better prediction of DM loss vs. the step logic (McDonald et al. 1991) previously used also at shorter fermentation regimen (8, 16, and 32 days of fermentation).

CONCLUSION

Although silages are usually fermented for a minimum of 60 days to become stable, **ensiling maize and alfalfa with SiloSolve[®] FC for 8, 16, and 32 days resulted in a significantly enhanced stability.**

“ Even at such **short fermentation regime** it was demonstrated that **the recently developed model gave a better fit to the DM loss** when estimating this **from real time temperature recording** during aerobic exposure. ”

