



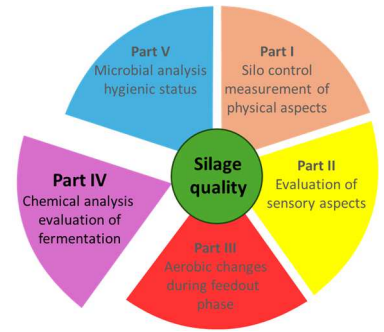
SILAGE TROUBLESHOOTING – PART IV: Evaluation of fermentation quality based on chemical results

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Introduction

- To identify optimisation potential in silage management, silage samples should be analysed in a laboratory for fermentation quality:
 - ⇒ A simple classification of the results is important.
- DLG (2006) evaluation key:** A widely used tool in German-speaking Europe for assessing silage quality based on butyric acid, acetic acid, pH and dry matter (DM).

Procedure of evaluation



Results of the
laboratory analysis



1. Assessment of the butyric acid and acetic acid content:

Butyric acid content [†]		Acetic acid content [‡]	
Butyric acid (% DM)	Points	Acetic acid (% DM)	Points
0 – 0.3	90	≤3	0
>0.3 – 0.4	81	>3 – 3.5	-10
>0.4 – 0.7	72	>3.5 – 4.5	-20
>0.7 – 1.0	63	>4.5 – 5.5	-30
>1.0 – 1.3	54	>5.5 – 6.5	-40
>1.3 – 1.6	45	>6.5 – 7.5	-50
>1.6 – 1.9	36	>7.5 – 8.5	-60
>1.9 – 2.6	27	>8.5	-70
>2.6 – 3.6	18		
>3.6 – 5.0	9		
>5.0	0		

[†]Butyric acid content is the sum of i-butyric acid, n-butyric acid, i-valeric acid, n-valeric acid, and n-caproic acid.
[‡]Acetic acid plus propionic acid.

2. Consideration of the pH value:

<30% DM		30 – 45% DM		>45% DM	
pH	Points	pH	Points	pH	Points
≤4.0	10	≤4.5	10	≤5.0	10
>4.0 – 4.3	5	>4.5 – 4.8	5	>5.0 – 5.3	5
>4.3 – 4.6	0	>4.8	0	>5.3	0
>4.6	-5				

3. Evaluation:

Total score [†]		Fermentation quality	
Points	Grade	Judgement	
100 – 90	1	● excellent	
89 – 72	2	● good	
71 – 52	3	● in need of improvement	
51 – 30	4	● poor	
<30	5	● very poor	

[†]Sum of Table 1 and 2

Conclusions

- The DLG (2006) evaluation key is a practical tool for assessing silage fermentation quality based on a few laboratory parameters.
- For nearly two decades, it has effectively supported farmers in understanding and optimising silage quality.
- The current challenge is to integrate the evaluation of ethanol content, incorporate indicators of protein degradation, and update the classification of acetic acid for practical feeding value evaluation.

Discussion

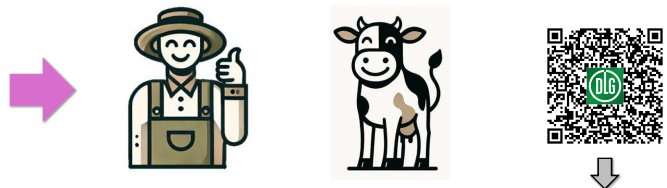
The DLG silage assessment system:

- Simplifies the results into a format that is easy for farmers to understand ⇒ increasing the rate of practical implementation.
- Complements sensory evaluations of silage (see part II) in daily operations by allowing farmers to calibrate their own senses against objective measures.
- Further complements troubleshooting sections provided by parts I, III, and V as part of a holistic silage assessment system.
- Applies broadly to all types of forage silage, regardless of ensiling methods or dry matter content.
- Requires only a few parameters (dry matter, pH, acetic acid, and butyric acid), making it a practical approach that avoids needing more complex analyses while providing a comprehensive assessment.

Being such a simple classifying system, certain aspects are not taken into account:

- Protein degradation (ammonia, biogenic amines)
- Acetic acid levels attributable to the activity of heterofermentative lactic acid bacteria
- Extent of aerobic instability
- Alcohol and esters, amount of alcoholic fermentation
- Total acid content
- Soil contamination
- Residual sugar content

⇒ The addition of further parameters would increase the informative value, but also the analytical effort and would lead to a more complex evaluation.



DLG [German Agricultural Society], 2006. Forage evaluation. Part B - DLG key for assessing the fermentation quality of ensiled forage based on the chemical analysis.