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A new system for the evaluation of the fermentation quality of silages

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Introduction Depending on the content of nitrate in green forage, the pattern of fermentation products in silages differ significantly (Weiß & Kaiser, 2001). The systems, which are now common in practice for evaluating the quality of silage fermentation, characterise fermentation quality incorrectly because the evaluation is influenced by the chemical composition of green forage. The aim of this work was to derive an evaluation system for fermentation quality, which is independent from the chemical composition of green forage.

Materials and methods Under laboratory conditions, 570 silages were produced from different green forages of known chemical composition. Fermentation quality parameters were selected which were suitable to characterise all stages of fermentation quality independent of the chemical composition of the green forage. An evaluation system was developed on the basis of the relations between the parameters of undesirable decomposition (butyric acid (BA), acetic acid (AA), ammonia (NH₃)) considering recent information of metabolism in silages during the fermentation process. It was applied to 3503 silages from green forages with unknown chemical composition obtained from farms of different regions in Germany.

Results and discussion The results confirmed that all stages of fermentation quality (anaerobic stability, “turn over” of fermentation products and increased spoilage) can be evaluated by BA and AA concentration exclusively (Kaiser *et al.*, 1999, 2000). The parameters pH-value and ammonia content in silages are inappropriate for evaluation, because they are influenced by variation in the chemical composition of green forage (see also Kaiser *et al.*, 2000). The suggested new estimation system is presented in Table 1. The content of 3.0% AA in DM as an upper limit for anaerobically stable silages is derived from its relationship with BA and ammonia. If the content of BA is low, the classes are very narrow because the evaluation of the fermentation quality is strongly influenced by the production of BA in anaerobically unstable silages from green forage low in nitrate.

Table 1 Evaluation system for the fermentation quality of silages from contents of butyric acid and acetic acid

Butyric acid (% DM)	Points	Acetic acid (% DM)	Points (Discount)	Evaluation	
				Score	Mark
0 - 0.3	100	≤ 3.0	0	90 to 100	1
> 0.3 - 0.4	90	> 3.0 - 3.5	-10	72 to 89	2
> 0.4 - 0.7	80	> 3.5 - 4.5	-20	52 to 71	3
> 0.7 - 1.0	70	> 4.5 - 5.5	-30	30 to 51	4
> 1.0 - 1.3	60	> 5.5 - 6.5	-40	<30	5
> 1.3 - 1.6	50	> 6.5 - 7.5	-50		
> 1.6 - 1.9	40	> 7.5 - 8.5	-60		
> 1.9 - 2.6	30	> 8.5	-70		
> 2.6 - 3.6	20				
> 3.6 - 5.0	10				
> 5.0	0				

Conclusions From the evaluation of 3503 silages made under practical conditions, this new system, based only on the content of BA and AA, was able to characterise the fermentation quality of all green forage silages, including maize, more correctly than previous systems.

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