Effect of Biological Additives in Red Clover – Timothy Conservation

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Introduction Red clover at early flower bud formation is difficult to ensile. For efficient improvement of the quality of leguminous silages, chemical additives are used. The present research focuses on the effectiveness of biological additives with different composition on the fermentation and quality of clover silage.

Materials and methods The chemical composition, nutritive value and quality of silage, prepared from red clover-timothy mixture (50% red clover variety 'Jõgeva 433') at early bud formation stage, were investigated. For this purpose test silages were prepared. Raw material for silage was cut at the height of 5 cm, wilted for 24 h, chopped into 2 cm pieces, supplemented with chemical (AIV) or 4 variants of biological additives containing combinations of 4 *Lactobacillus* sp. belonging into facultative and obligatory heterofermentative groups and conserved into 3 l jars. In 90 days the jars were opened. Silage was analysed for dry matter (DM), crude protein (CP), crude fibre (CF), neutral detergent fibre (NDF), acid detergent fibre (ADF), pH and ammonia-N in total N, according to generally accepted methods; ethanol, volatile fatty acids, lactic acids (LA) were analysed with gas chromatograph. Biological additives were the following: I-1, I-2, I-3 and I-4.

Results DM losses during fermentation were the lowest in the silage treated with AIV additive (4.8%), in silages treated with biological additives these values were I-1 5.2%, I-2 10%, I-3 11.6%, I-4 9.7%, respectively and in untreated silage (17.4%). The chemical compositions of silages are presented in Table 1. The quality of silages, treated with biological and chemical additives, was high, compared to that of the untreated silage. Figure 1 illustrates the content of lactic acid (LA), acetic acid (AA), butyric acid (BA) and ethanol (E). Lactic acid concentration was higher in the silages inoculated with biological additives (within the range of 96.4 and 127.5 g/kg in DM) compared to that in the AIV treated silages (44.3 g/kg in DM) or the untreated silages (73.7 g/kg in DM). The content of AA in studied silages remained between 8.15 to 9.7 g/kg in DM. The content of BA in DM was 23.9 g/kg in the untreated silage and below 0.4 g/kg in the remainder of the silages. Biological additives favoured lactic acid fermentation by increasing LA content. However, as to the nutrition of ruminants, such a high LA content does not play a significant role in animal metabolism, as normally the ruminal LA content is low (McDonald *et al*., 1991).

Table 1 Chemical composition of silages

Item	Untreated	I-1	I-2	I-3	I-4	AIV
DM (g/kg)	256	294	279	274	279	295
Crude protein (g/kg DM)	178	167	170	172	174	172
Crude fibre (g/kg DM)	209	204	195	192	189	185
Nitrogen-free extract (g/kg DM)	467	496	497	497	499	506
ME (MJ/kg DM)	10.0	10.1	10.2	10.1	10.2	10.1
NH_3–N (% total N)	6.3	1.5	1.6	1.6	1.7	3.9
pH	5.0	4.2	4.2	4.2	4.2	4.8

Conclusions The use of biological additives in ensiling pre-wilted material, rich in red clover, improved fermentation and silage quality, also decreased DM losses.

References
McDonald, P., A.R. Henderson & S.J.E. Heron (1991). The biochemistry of silage. Chalcombe publication, UK, 340 pp.

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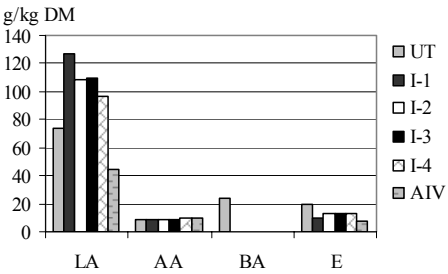

Figure 1 The content of lactic-, acetic- and butyric acids, and ethanol in the test silages