Influence of different alfalfa-grass mixtures and the use of additives on nutritive value and fermentation of silage

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Introduction Legumes have a high nutritive value but they are known to be difficult to ensile and often result in poorly fermented silage. This is usually due to high buffering capacity and low available sugar concentration. However, the results have shown that silage quality can considerably be improved by using additives or when legume-grass mixtures are ensiled (Lättemäe & Tamm, 2002). Different legume-grass mixtures differ in their ensiling properties and also may affect the fermentation. The objective of this experiment was to study the effect of alfalfa-grass mixtures and the use of additives on nutritive value and fermentation of silage.

Materials and methods In this ensiling study alfalfa cvs. "Jõgeva 118" and "WL 252 HQ" were used in a mixture with timothy cv. "Goliath". In order to obtain different proportions of alfalfa and timothy in the mixture, the seeding rates of both alfalfa were 18 kg/ha and timothy 2 and 6 kg/ha respectively (mixture 1 and 2 with alfalfa "Jõgeva 118"; mixture 3 and 4 with alfalfa "WL 252 HQ"). Nitrogen fertiliser was not used and fertilisers (P16K66 kg/ha) were added in autumn. The grass was mown, chopped to 4-8 cm and ensiled in 3 l glass jars. The following chemical additive treatments were used: untreated control, Niben treated 5 l/t fresh matter (FM) and AIV-2000 treated 5 l/t FM. Niben is based on sodium benzoate and AIV-2000 on formic acid. The spoilage micro-flora prior to ensiling was also used. The silos were sealed with plastic film and kept in room temperature 18-25°C for 130 days.

Results The results of the chemical analyses are presented in Tables 1 and 2. The lowest fermentation quality had untreated silage and when mixtures 1 and 2 were ensiled. Both additives reduced clostridial fermentation, proteolysis and dry matter losses. There were also interaction effects when using additives and different alfalfa mixtures (data not shown). The nutritive value of silages slightly varied. Alfalfa "Jõgeva 118" resulted in higher CP and CF concentrations in the silage.

Table 1 The effect of using additives on the chemical composition and dry matter losses in ensiled alfalfa-grass mixture. The values are averaged across the mixtures

Indicators	Untreated	Niben 5 l/t FM	AIV-2000 5 l/t FM	$LSD_{0.05}$
Dry matter (g/kg)	161	181	183	17.6
Crude protein (g/kg DM)	153	165	173	19.7
Crude fibre (g/kg DM)	310	285	287	24.8
pH	5.7	5.1	5.1	0.3
Ammonia N (% total N)	24.1	10.0	11.5	6.4
Butyric acid (g/kg DM)	11.1	4.2	7.1	3.8
Dry matter losses (%)	15.2	5.6	7.5	2.6

$LSD_{0,05}$- Least significant difference at the 5% probability level, n=8

Table 2 The effect of ensiling different alfalfa-grass mixtures on chemical composition and dry matter losses

Indicators	Mixture 1	Mixture 2	Mixture 3	Mixture 4	$LSD_{0.05}$
Dry matter (g/kg)	170	173	174	182	15.4
Crude protein (g/kg DM)	175	165	170	150	17.2
Crude fibre (g/kg DM)	310	324	276	292	27.2
pH	5.5	5.5	5.0	5.1	0.4
Ammonia N (% total N)	22.7	16.6	8.0	12.9	7.3
Butyric acid (g/kg DM)	9.8	8.0	7.0	5.0	4.0
Dry matter losses (%)	11.3	9.1	7.3	10.1	3.2

$LSD_{0,05}$- Least significant difference at the 5% probability level, n=6

Conclusions The fermentation quality of silage was dependent on the use of additive, species of alfalfa and its mixture with timothy. Both additives improved fermentation whereas Niben was more effective. The nutritive value of silage made of different alfalfa-grass mixtures varied slightly.

References

Lättemäe, P. & U. Tamm (2002). The improvement of lucerne silage quality by using additives and lucerne-grass mixtures. *Journal of Agricultural Science*, 6, 337-341.