Ensiling characteristics and ruminal degradation of Italian ryegrass with or without wilting and added cell wall degrading enzymes

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Introduction The previous experiment (Yu zhu et al.,1999) has shown that the efficacy of added enzymes varied greatly according to the DM content of the material crop. The silage DM did not alter the effects of enzymes on the in vitro digestion of NDF (Yu zhu et al.,1999, Yu zhu et al.,2000). The aim of this experiment was to study the effect of wilting and enzymes on fermentation quality, chemical composition and *in situ* digestion of Italian ryegrass (*Lolium multiflorum* Lam.) silage.

Materials and methods Primary growth of Italian ryegrass was harvested at the late heading stage. They were chopped into approximately 25 mm length and ensiled in laboratory silos (1 L) directly or after being wilted for 2 h with or without added cell wall degrading enzymes. The enzymes (1:2 mixture of Acremonium and Trichoderma cellulase based on avicelase activity) were added at 0.1 g /kg just before ensiling. Triplicate silos for each treatment were stored for 45 d at room temperature, then sampling for the analysis of fermentation quality (Yu zhu et al.,1999). Three castrated mature goats about 19 kg body weight were used. Nylon bag incubation was conducted using the silages samples and the disappearance of DM and NDF after 0,3,6,12,24,48 and 72 h was determined. The parameters explaining the degradation were estimated by non-linear regression analysis using Syatat (Ver 5.2 for Macintosh) and subjected to two way analysis of variance with wilting and addition of enzymes as main factors.

Results Wilting increased the contents of DM, CP, NDF, ADF, ADL, and the buffering capacity, decreased the WSC content, and had little effects on fructose, glucose and sucrose contents. This difference suggested a significant amount of fructosan. The addition of enzymes increased (P<0.01)the DM, and decreased the NDF and ADF contents, but did not affect the CP and ADL contents of silage. Higher contents(P<0.01) of NDF, ADF and ADL were recorded in wilted rather than direct-cut silage. There remained more WSC (P<0.01) in enzyme-treated silage, while the difference appeared less when treated with wilted crops. The main fermentation quality and degradation characteristic of Italian ryegrass silage were show in Table 1.

Table 1 Fermentation quality and degradation characteristics of silage

	Direct cut		Wilted		Pooled	ANOVA		
Item	-E	+E	-E	+E	SE	E	W	E×W
pH	4.11	3.98	4.88	4.62	0.08	*	**	NS
Lactic acid (g/kg DM)	59.7	67.3	21.3	27.7	7.61	NS	**	NS
Butyric acid (g/kg DM)	17.9	6.43	35.8	32.2	6.05	NS	**	NS
NH3-N (g/kg N)	90.2	93.5	108	97.3	5.43	NS	NS	NS
Dry matter								
Potential degradation (g/kg)	791	801	750	790	17.7	NS	NS	NS
Rate of degradation	0.047	0.045	0.047	0.034	0.006	NS	NS	NS
Neutral detergent fibre								
Potential degradation (g/kg)	702	676	673	693	36.8	NS	NS	NS
Rate of degradation	0.045	0.043	0.043	0.034	0.006	NS	NS	NS

NS; not significant,*;P<0.05,**;P<0.01, –E; no enzyme, +E; with enzyme, W; wilting

The *in situ* degradation of DM was reduced (P<0.01) by wilting. The addition enzymes increased (P<0.01) the degradation at 3, 6, and 12h of incubation, while the effect on the DM degradation was diminished with wilted crops. The degradation of NDF was also enhanced by enzymes (P<0.05) at the initial incubation time. However, at 6 and 12h of incubation, the effect of enzymes was found to be opposite in the silage which was wilted prior to the treatment.

Conclusions Added enzymes may have a potential of enhancing the digestibility of silage, although the benefits would be hindered by wilting. It appeared necessary to consider, in addition to the species, the DM content of the forage, when cell wall degrading enzymes were used to improve the silage utilization.

References

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