Degradability of wheat silages and corn silages with or without the gene B*t* (*Bacillus thuringiensis*)

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Introduction Roughage degradability in the rumen can influence animal performance due to effects on intake, differences in rumen fermentation and digesta kinetics. The objective was to evaluate DM degradability in wheat silages, with or without bacterial inoculant (*Lactobacillus plantarum* and *Pediococcus acidilactici*), and in conventional corn silages or genetic modified corn (*Bacillus thuringiensis*).

Material and Methods The experiment was carried out at Central Western Paraná State University (UNICENTRO) and Maringá State University (UEM). The treatments were wheat silage (WS), wheat silage with bacterial inoculant (WSI), conventional corn silage (CCS) and genetically modified corn silage (GMCS). For *in situ* incubation, six bovines were used, rumen-fistulated, averaging 530 kg in weight, three of which were kept on wheat silage and three on corn silage. Incubation times lasted 0, 6, 12, 24, 48, 72 and 92 hours. The DM disappearance data were fit by non-linear regression, which predicts the potential degradability of diet items through the model proposed by Mehez and Orskov (1977). The Orskov and McDonald model (1979) was used to estimate effective degradability (ED). Statistical analysis was carried out by Bayesian inference. To compare the treatments, multiple comparisons were carried out between the *a posteriori* distributions of the parameters of interest averages. Treatments whose credible intervals for the average differences do not contemplate the value zero are regarded as different, at 5% significance.

Results and Discussion In the readily available DM fraction (a), GMCS silage showed the highest values ($P<0.05$). However, wheat silage inoculation provided lower disappearance of the readily available fraction (Table 1). Other studies, involving barley inoculation (Addah et al., 2011), did not observe an effect of the inoculation on the disappearance of the DM fraction (a). While evaluating corn hybrids with or without the modified gene, Trava (2013) observed that the hybrid with the modified gene showed lower reduction in the degradation of fraction (a), when compared to its counterpart without the modified gene.

With regard to the potentially degradable fraction (b), CCS showed higher values ($P<0.05$) than the other silages. Wheat silage inoculation did not influence the potentially degradable fraction. For their part, Addah et al. (2011) observed that the potentially degradable fraction was larger in barley silage than in corn silage. The higher the degradation percentage in fraction (b), the greater will the use potential of the fibrous fraction by ruminants be, resulting in a higher amount of energy available after rumen degradation (Bumbieris Jr. et al., 2011).

In this aspect, among the probable explanation for inoculation failures would be the specificity of the inoculant to the culture, competition from epiphytic flora, DM and soluble

carbohydrate contents. Thus, the effect of the use of biological additives is conditioned both to biological viability of the inoculant, and to the intrinsic characteristics of the plant to be ensiled.

For the degradation rate (c), treatments GMCS and WSI showed the highest values compared to the others (P<0.05). Trava (2013) reported that silages of genetically modified corn hybrids showed greater differences between hybrids than the genetically modified one, which did not negatively affect the kinetics of DM degradation.

In effective degradability (ED), GMCS silage showed the highest degradation (P<0.05) compared to the other treatments. Wheat silage inoculation influenced (P<0.05) ED, in relation to the treatment without the added microbiological additive. The results of the present study indicate that adding the modified gene inoculant influenced the kinetics of DM disappearance in the rumen.

Table 1 Values average and standard deviation of the soluble fraction (*a*), potentially degradable insoluble fraction (*b*), rate of disappearance of *b* (*c*) and effective degradability of dry matter (ED)

Parameters	DM			
	WS[1]	WSI[2]	CCS[3]	GMCS[4]
a	43.38[a]	42.08[c]	41.89[bc]	46.69[a]
	(1.09)	(0.87)	(2.31)	(1.27)
b	27.53[c]	26.28[c]	41.64[a]	35.25[b]
	(1.90)	(1.06)	(7.08)	(1.76)
c (/h)	0.03[b]	0.04[a]	0.03[b]	0.04[a]
	(0.006)	(0.005)	(0.009)	(0.006)
ED (5%)[5]	53.58[c]	54.32[b]	55.53[b]	61.67[a]
	(0.58)	(0.44)	(1.18)	(0.64)
Standard deviation	1.94	1.08	8.44	2.47

Different letters in the row indicate significant differences between treatment averages, through Bayesian comparisons at 95% credibility.
[1] WS = Wheat silage; [2] WSI= Wheat silage with inoculant; [3] CCS= Conventional corn silage; [4] GMCS= Genetically modified corn silage.
[5] Effective degradability calculated at ruminal particulate passage rate of 5%/h.

Conclusions The genetically modified hybrid showed greater DM degradability. Bacterial inoculation influenced effective DM degradability.

References

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