Evaluation of Potential and Effective Degradation and Fractions of Mulberry Clones in Goats

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Introduction

Mulberry has shown to have a considerable potential for feeding goats, both from the biological and economic points of view, since it is well accepted by these animals, has high contents of crude protein (CP) and total digestible nutrients (TDN), good green biomass production per unit area, with deep root system, which allows good production throughout the year including the dry period (TAKAHASHI, 1998).

Currently the "in situ" degradation technique has been extensively used to determine the rate and the dynamics of feed degradation in the rumen, allowing to identify the soluble, microbial degradable and undegradable fractions as well as the time required for this to happen, and from this potential degradability (PD) and effective degradability (ED) can be estimated.

Feed degradation rate can be used to predict nutritional value since it is related to voluntary feed intake (Aguiar *et al*., 1997). Feeds with higher degradation remain less time in the rumen allowing a greater intake.

The objective of this study was to analyse the potential and effective degradation and the fractions of the equation by Orskov (1979) of three mulberry clones.

Materials and Methods

The research was conducted in the Goat Husbandry Section of the Faculty of Agrarian and Veterinary Sciences, São Paolo State University, Joboticabal Campus using the mulberry cultivated by the Sericulture Section. Leaves with 90d of re-growth from the clones Miura, FM Shima Miura and FM 86 were used.

For the incubation 5 two-year old Saanen wethers with a rumen cannula kept in a group pen were used. Their diet consisted of Tifton hay, mulberry hay and 300g of a concentrate with 21% crude protein (CP). After an adaptation period of 21d, the ground leaves were incubated for 0, 6, 12, 24, 48 and 96 hours.

Analysis of dry matter (DM), CP and TDN were made on the material to be incubated and on the residue (SILVA *et al*. 1981). The estimation of fractions “A”, “B” and “c” were based on the recommendation by Ørskov (1988), and were used to calculate the degradation by means of the equations $PD = A + B\ (1 - e^{ct})$ and $ED = A + (B * c) / (c + kp)$.

The experimental design was random blocks with split plots (mulberry clones) with 5 repetitions (animals) and 5 plots (incubation times). The various parameters were subjected to the Tukey test at 5%.

Results and Discussion

Table 1 presents the values of the fractions studied. Compared to the commonly used forages for goats, mulberry clones showed a large soluble fraction (A) with a mean value of 31.4% and a large potential degradable fraction (B) with a mean value of 61.8%. There was only a small undegradable fraction (U) of 6.8% and a high degradation rate (c) of 15.0%/h. For the protein, mulberry leaves presented a smaller A fraction (17.7%) in relation to fraction B (79.3%), with a small undegradable fraction (U) of 3.2%, which indicates the importance of microbes in the degradation of the CP. In relation to the neutral detergent fibre (NDF), a large B fraction was observed (85.0%) with a reasonable fraction U (15.0%) and a high fraction c (14.0%/h), indicating the large utilisation potential of mulberry fibre.

Table 1. Soluble (A), potentially degradable (B) and undegradable (U) and degradation rate (c) of dry matter (DM), crude protein (CP) and neutral detergent fibre (NDF) of the mulberry clones.

Parameter	Clone	Fractions			
		A (%)	B (%)	U (%)	c (%/ h)
DM	Miura	34.0	59.4	6.8	0.16
	FM Shima Miura	29.3	64.0	6.8	0.13
	FM 86	31.0	62.0	7.0	0.16
CP	Miura	24.3	73.3	2.7	0.18
	FM Shima Miura	11.3	85.7	3.0	0.14
	FM 86	17.4	78.9	3.8	0.16
NDF	Miura	0.0	86.8	13.2	0.17
	FM Shima Miura	0.0	84.9	15.1	0.12
	FM 86	0.0	83.4	16.7	0.14

For the estimation of the degradation potential of DM, CP and NDF, the results of the incubation for 48h were utilised, since the maximum degradation had been obtained by this time.

There were no differences ($P > 0.05$) for PD and ED of the DM at the passage rates (kp) considered, but they were all high (Table 2). This can be explained for the fact that only leaves were used. There were no differences either among clones on CP ($P > 0.05$). The values observed in this study were a little smaller than those found by Vasconcelos (1994), which obtained a value for PD of 96.7% and ED of 71.1% of DM for kp 4.4%, which could be explained by the lower "c" value found by this author. At the same time when the values of PD for DM and CP are compared with the published *in vivo* and the *in vitro* digestibility coefficients, it is clear that there is an overestimation of the *in situ* method. The PD values for NDF in this study are close to the ones found by Hara (1993) and Basaglia (1993).

Table 2. Potential (PD) and effective degradation (ED) of dry matter (DM), crude protein (CP) and neutral detergent fibre (NDF) of the mulberry clones.

Parameter	**Clone**	**PD**	**ED**		
			kp 0.02	**kp 0.05**	**kp 0.08**
DM	Miura	93.3	86.4	85.8	85.4
	FM Shima Miura	97.2	84.0	77.6	76.9
	FM 86	86.7	85.8	71.6	70.8
CP	Miura	92.7	89.3	80.2	72.7
	FM Shima Miura	95.8	84.3	71.7	63.0
	FM 86	83.5	87.5	77.5	70.1
NDF	Miura	93.0	76.8	65.7	57.5
	FM Shima Miura	96.2	71.3	58.1	49.2
	FM 86	83.2	72.6	61.0	52.67

The NDF was not different (P>0.05) among clones, neither in PD and ED, values considered acceptable for the fibre fraction. This parameter did not have an A fraction, since it does not dissolve in water and depends exclusively on the microbes for its disappearance from the bags.

Conclusions

Considering the high values of the soluble and potentially degradable fractions, as well as the potential and effective degradation of leaves of the mulberry clones studied, it is confirmed that this feed shows a high nutritive value with large potential for feeding goats.

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