

Bromatological Composition and Degradation Rate of Mulberry in Goats

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Introduction

Mulberry, traditionally used as feed for silkworm, has been the subject of research at the Faculty of Agrarian and Veterinary Sciences, São Paulo State University (FCAV-UNESP), with the objective of feeding goats, considering its favourable characteristics: high protein content (similar to alfalfa), good green biomass production (5-8 ton/ha/cut) throughout the year, including the dry season, and high intake by goats.

The *in situ* technique allows drawing the degradation curve and to provide information to balance diets, considering that, independently of the degradation potential of a feed, its efficiency of utilisation by the animals is highly influenced by the matching or not of the degradation rates of protein and energy (Russel *et al.*, 1991, cited by Samoaio *et al.*, 1998).

This work had as objective to analyse the nutritional value of mulberry clones, by means of its bromatological composition and its degradation rate in the goat rumen.

Materials and Methods

The research was conducted in the Caprine Section using the mulberry cultivated in the Sericulture Section of the FCAV-UNESP, Jaboticabal Campus.

The bromatological composition of leaves of clones Miura, FM Shima-Miura and FM 86 at 90d of re-growth and of the incubation residue, were determined following the recommendations by Silva *et al.* (1981).

For the incubation, 5 Saanen male goats, of 2 years of age, with a ruminal cannula were utilised. Their diet was Tifton hay and mulberry hay *ad libitum* and 300g of concentrate with 21% protein. After an adaptation period of 21d, the incubations lasted 6,12, 24, 48 and 96h.

The estimates of the degradation rate of dry matter, crude protein and neutral detergent fibre were obtained from percent disappearance in the incubation periods.

The experimental design was randomised blocks, with split plots (mulberry clones) with 5 repetitions (animals) and 5 plots (incubation times). The different parameters studies were compared by the Tukey test at 5% probability.

Results and Discussion

The bromatological composition of the five clones is presented in Table 1. The Miura clone showed the best values ($P < 0.05$) in organic matter (OM), total digestible nutrients (TDN), digestible energy (DE), neutral detergent fibre (NDF), hemicellulose and ash, and lowers contents of acid detergent fibre. Brazão (1992) studying the same cultivars and the same cutting frequency, obtained similar values for DM and crude protein (CP), and an even lower NDF. The high contents of CP (2.7%), TDN (80.1%)

and DE (3.53 Mcal/kg DM) found in mulberry, indicate its high nutritive value. There are few forage plants comparable to mulberry, among them alfalfa with 22% CP. However, the estimated DE values indicate an energy: protein relation of 63.8g of CP: 1Mcal of DE, which is higher than the NRC (1981) recommendation for goats, 32g of CP: 1Mcal of DE, suggest the need to conduct performance trials with mulberry in pure diets and/or like protein supplement in balanced diets.

Table 1. Bromatological composition of the clones on a dry matter (DM) basis.

Parameters	Clones		
	Miura	FM Shima Miura	FM 86
Dry matter	24.6a	25.3a	24.5a
Organic matter	90.9a	89.8b	90.0b
Crude Protein (CP)	23.6a	22.7a	21.7a
Ether Extract	2.1a	2.1a	2.1a
Total Digestible Nutrients ¹	82.9a	77.8b	79.5b
Digestible Energy ²	3.6a	3.5b	3.5b
Neutral Detergent Fibre (NDF)	39.3b	36.6b	30.2a
Acid Detergent Fibre	17.2a	21.7b	20.2b
Hemicellulose	22.0a	14.9b	11.0c
NDF-nitrogen (%CP)	18.8a	19.6a	17.7b
ADF-nitrogen (%PB)	5.8a	5.1a	4.6a
Ash	9.1b	10.2a	10.0a

Values in the same line with the same letter do not differ by the Tukey test ($P < 0.05$)

¹Calculated from $TDN = 102.56 - (\%ADF \times 1.40)$, proposed by Raffler and Sotter (1975), cited by NRC (1989)

²(Mcal/kg DM); calculated from $1 \text{ kg TDN} = 4.409 \text{ Mcal DE}$

From the degradation results, it can be observed that the maximum degradation potential was reached at 48h of incubation. There were no statistical differences ($P > 0.05$) in DM degradation

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among the clones (Table 2). All of them showed high degradation rates, which indicates the great potential of mulberry with a higher degradation rate within the first hours (6-12h), followed by a stabilising phase, reaching, after 48h, a degradation of 93%. There were no differences either ($P > 0.05$) in CP degradation among clones, reaching a mean degradation of 96.8% after 48h. Only in NDF degradation there statistical differences ($P < 0.05$) among clones, being superior the clone Miura which contains less NDF, inversely related to feed digestibility.

The superior qualities of the Miura clone for the studied parameters, does not mean that is the best clone. Other variables should be compared, for instance biomass yield per unit area.

Table 2. Degradation rates of dry matter, crude protein and neutral detergent fibre (NDF) of the clones.

Parameter	Clone	Incubation times(h)				
		6	12	24	48	96
Dry matter	Miura	52.2	81.7	91.8	93.3	91.0
	FM Shima Miura	54.8	78.8	89.1	93.2	92.1
	FM 86	56.7	80.3	91.5	93.0	91.4
Crude protein	Miura	50.7	84.1	94.9	97.3	96.8
	FM Shima Miura	49.8	80.0	90.0	97.0	96.0
	FM 86	50.9	83.1	94.7	96.2	96.3
FDN	Miura	34.2	71.4	83.8	86.8	85.2
	FM Shima Miura	27.0	61.6	76.8	84.9	82.6
	FM 86	27.7	63.3	79.7	83.4	76.9

Conclusions

The mulberry clones studied showed a satisfactory bromatological composition and high degradation rate in the rumen of goats. The values for CP (22.7%), TDN (80.1%) and

NDF (37.7%, of which 44.8% is hemicellulose) stand out. After an incubation of 48h, the material reached the maximum degradation. Other studies should be conducted to determine the best way of utilising mulberry.

References

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