



## ***In Situ* Degradability of Hand Harvested or Extrusa Samples of Tanzania Grass (*Panicum maximum*, Jacq.)**

T. T. Berchielli

*Universidade Estadual Paulista, Brazil*

A. K. D. Salman

*Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil*

R. N. Silveira

*Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil*

W. V. B. Soares

*Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil*

J. R. Nogueira

*Instituto de Zootecnia, Brazil*

*See next page for additional authors*

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/19/9/37>

This collection is currently under construction.

The XIX International Grassland Congress took place in São Pedro, São Paulo, Brazil from February 11 through February 21, 2001.

Proceedings published by Fundacao de Estudos Agrarios Luiz de Queiroz

---

**Presenter Information**

T. T. Berchielli, A. K. D. Salman, R. N. Silveira, W. V. B. Soares, J. R. Nogueira, and S. N. Kronka

***IN SITU* DEGRADABILITY OF HAND HARVESTED OR EXTRUSA SAMPLES OF  
TANZANIA GRASS (*PANICUM MAXIMUM*, Jacq.)**

T. T. Berchielli<sup>2</sup>, A.K. D. Salman<sup>1,3</sup>, R. N. Silveira<sup>3</sup>, W. V. B. Soares<sup>3</sup>, J. R. Nogueira<sup>4</sup>, S. N.  
Kronka<sup>2</sup>

<sup>1</sup> Supported by FAPESP.

<sup>2</sup> Professor of FCAV- UNESP - Jaboticabal. CNPq Researcher. ttberchi@fcav.unesp.br

<sup>3</sup> Graduated student supported by CNPq.

<sup>4</sup> Researcher of Instituto Zootecnia-EEZ-Ribeirão Preto.

**Abstract**

In order to compare the *in situ* degradability of tanzania grass samples obtained as by extrusa or hand plucked, three ruminal fistulated cows were used in a completely randomized block design with split-plot scheme. Five grams of extrusa or hand harvested grasses were placed in nylon bags rumen incubated during 3, 6, 12, 24, 48, 96 and 120 hours. The degradability of DM, CP, NDF and ADF were, in this sequence, 62.59, 80.88, 50.73 and 46.65%, for hand-harvested grass; and 79.53, 90.97, 71.21 and 65.68%, for extrusa. *In situ* degradability data of hand harvested samples were not reliable.

**Keywords:** *in vitro* digestibility, ruminant, square method

## Introduction

In general, the degradability and degradation rate are estimated by *in situ* technique, which is related with some variation factors. Among these, the particle size of sample placed into nylon bags shows the more controverts results, especially when the digestion rates are considered (Nocek and Khon, 1988). Normally, large and gross particles are related with lower digestions rates and higher variations. In the other hand, smaller particles are subjected to greater mechanical losses throughout the nylon bags that could result unreal digestion rates but the variation is more controlled (Nocek, 1988). The ideal particle size for *in situ* trials thought to be those observed after mastication. However, there are few studies discussing about the utilization of esophageal extrusa samples during *in situ* trials. Beauchemin (1992) observed that extrusa samples of Lucerne (*Leucaena leucocephala*) and Orchardgrass (*Dactylis glomerata*) hays increased forage degradation by the increase of degradable potentially dry matter (DM) and neutral detergent fiber (NDF) fractions and by the decrease of lag time but not by the changes of digestion rates. In Pinho (1997) study, the DM and NDF degradability of coast cross grass (*Cynodon dactylon*, (L.) Pres.) hand harvested or by esophageal extrusa methods were evaluated and the degradable insoluble fractions and degradations rates for extrusa were higher than samples harvested by hand. The goal of this study was to evaluate the tanzania grass (*Panicum maximum*, Jacq.), degradability harvested during the rainy season using two sampling methods, by hand and extrusa.

## Material and Methods

The tanzania grass pasture was grazed by two animals/ha in a rotational system with three of occupation, and 39 days resting periods. The annual fertilization was done with 150 kg of nitrogen/ha. The grass sampling was carried out by hand using the square methodology or extrusa

methods. For extrusa's harvesting were utilized four esophageal fistulated cows. For both sampling methods, the chemical composition, *in vitro* dry matter digestibility (IVDMD) and *in situ* degradability of samples were determined. For *in situ* trials were used three-crossbred dry cow rumen fistulated, which stayed, during whole experimental period, in tanzania grass pasture. Approximately five grams of by hand harvested forage (pieces  $\pm$  2 cm length) or extrusa dried samples were placed into nylon bags that were incubated into the rumen during 3, 6, 12, 24, 48, 96 and 120 hours. Before each incubation period, the nylon bags were immersed in 39 °C buffer solution (McDougall, 1939) during one hour. This procedure was done for soluble fraction determination in zero time, than the bags were dried at 55 °C in forced air oven. The incubation residues, extrusa and harvest by hand grass samples were evaluated for crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF) according to Silva (1990). The potential degradability was calculated by Mehrez and Ørskov (1977) model. The randomized block design with split-plots and three time replications in a 2 x 7 scheme was used. The averages of residues percentage in different incubations times were compared by 5% Tuckey test.

## **Results and Discussion**

The percentages of CP, NDF and ADF of grass samples hand harvested using square method were 7.6, 81.9 and 46.6, respectively; and for extrusa samples were 12.1, 78.8 and 42.6, respectively. The degradable soluble (a) and degradable potential insoluble (b fractions), potential degradability (PD) and degradation rate of b fraction (Kd) of hand harvested grass and extrusa dry matter (DM) is showed in Table 1. The a and b fractions of hand harvested were lower than those of extrusa grass samples. It agrees with Pinho (1997), although this author had found differences more marked: 9.86 x 16.18% and 51.21 x 74.36%, for a and b fractions of hand

harvested grass and extrusa, respectively. It could be related with the fact that this author had used a different species of grass (*Cynodon dactylon*) with morphological characteristics, which was different from the specie utilized in this work. Another difference found between these two investigations is related with the way that the soluble fraction was determined. Pinho (1997) immersed zero time bags at room temperature water during one hour while in this study the bags were immersed in McDougall (1939) buffer at 39 °C for one hour (Olubobokum *et al.*, 1990). The PD and Kd of hand-harvested grass DM were lower compared with extrusa (62.59 x 79.53% and 2.81 x 3.82%, respectively). The Table 2 shows the values of degradable soluble (a) and degradable potential insoluble (b) fractions, potential degradability (PD) and degradation rate of b fraction (Kd) of hand harvested and extrusa crude protein (CP). Although the b fractions and degradation rates of CP had been similar, the smaller a value of hand-harvested grass compared to extrusa could be responsible for the lower potential degradability of CP in this kind of sample. The value observed by Pinto *et al.* (1998) for a fraction protein of tanzania grass samples ground at 5 mm was 13.35%, which was between the values found for hand harvested and extrusa in this work. The Table 3 shows the b fraction, PD, Kd and lag time (L) of fiber components. For all these components, were observed higher b and PD values in extrusa samples, and the lower difference between the two kinds of samples was observed for hemicellulose. The b fraction of NDF was similar to the ones observed by Pinho (1997) (54.13 and 76.45% for hand harvested and extrusa samples, respectively). But they were lower than those found by Pinto *et al.* (1998) (78.95%) for ground tanzania grass. The PD of NDF was similar to those observed by Pinho (1997) (54.86 and 70.75% for hand harvested and extrusa samples, respectively). The Kd of NDF, 2.78 and 3.73 %/h, were higher than those found by Pinho (1997), 1.82 and 2.71%/h, for hand harvested and extrusa samples, respectively.

The chemical composition and *in vitro* digestibility of the diet selected by animal (extrusa) are different from those hand harvested in a pasture. The selection and the mastication have significant effects on DM, CP and fiber degradation of tanzania grass. So *in situ* degradability trials carried out with grass samples not selected by animals and incubated chopped couldn't show reliable results.

### References

- Beauchemin, K.A.** (1992). Effects of ingestive and ruminative mastication on digestion of forage by cattle. *Anim. Feed Sci. Tech.*, **40**:41-56.
- Mc Dougall, E. I.** (1939). Studies on ruminant saliva. I. The composition and output of sheep's saliva. *Bioch. J.*, **43**:99-109.
- Mehrez, A.Z., and Ørskov E.R.** (1977). A study of the artificial fiber bag technique for determining the digestibility of feeds in the rumen. *J. Agric. Sci.*, **88**:645-65.
- Nocek, J.E., and Kohn R.A.** (1988). *In situ* particle size reduction of alfalfa and *timothy* hay as influence by form and particle size. *J. Dairy Sci.*, **71**:932-45.
- Nocek, J.E.** (1988). *In situ* and other methods to estimate ruminal protein and energy digestibility: A review. *J. Dairy Sci.*, **71**:2051-69.
- Olubobokun, J.A., Craig W.M., and Pond K.R. (1990). Effects of mastication and microbial contamination on ruminal *in situ* forage disappearance. *J. Anim. Sci.*, **68**:3371-81.
- Pinho, M.N.G.** (1997). Avaliação da degradabilidade ruminal *in situ* de capim coast cross (*Cynodom dactylon* (L.) Pers.) comparando-se dois métodos de colheita. Jaboticabal,

SP:FCAV. 40p. (Trabalho de graduação). - Faculdade de Ciências Agrárias e Veterinárias/UNESP.

**Silva, D.J.** (1990). Análise de alimentos (métodos químicos e biológicos). 2 ed. Viçosa:UFV, Imprensa Universitária, 165p.



**TABLE 1** - Degradable soluble (a) and degradable potential insoluble (b) fractions, potential degradability (PD) and degradation rate of b fraction (Kd) of hand harvested and extrusa samples.

| Samples        | Dry matter    |       |       |                |
|----------------|---------------|-------|-------|----------------|
|                | a             | b     | PD    | K <sub>d</sub> |
|                | %             |       |       | %/h            |
| hand harvested | 5.28          | 61.44 | 62.59 | 2.81           |
| Extrusa        | 6.40          | 75.05 | 79.53 | 3.82           |
|                | Crude protein |       |       |                |
|                | a             | b     | PD    | K <sub>d</sub> |
|                | %             |       |       | %/h            |
| Hand harvested | 5.59          | 76.84 | 80.88 | 4.06           |
| Extrusa        | 16.28         | 76.04 | 90.97 | 4.20           |

**TABLE 2** - Degradable potential insoluble (b) fraction, potential degradability (PD), degradation rate of b fraction (K<sub>d</sub>) and lag time (L) of hand harvested (HH) and extrusa NDF, ADF, cellulose and hemicellulose.

| Parameters           | <b>NDF</b> |         | <b>ADF</b> |         | <u>Cellulose</u> |         | <b>Hemicellulose</b> |         |
|----------------------|------------|---------|------------|---------|------------------|---------|----------------------|---------|
|                      | HH         | Extrusa | HH         | Extrusa | HH               | Extrusa | HH                   | Extrusa |
| b (%)                | 54.50      | 73.26   | 51.11      | 67.72   | 46.04            | 66.26   | 42.24                | 64.98   |
| PD (%)               | 50.73      | 71.21   | 46.65      | 65.68   | 42.52            | 64.65   | 36.47                | 55.19   |
| K <sub>d</sub> (%/h) | 2.78       | 3.73    | 2.54       | 3.65    | 2.68             | 3.88    | 4.15                 | 3.94    |
| L (h)                | 4.90       | 1.27    | 7.86       | 1.15    | 9.96             | 4.55    | 2.42                 | 1.04    |