ZOOTECNIA BRASIL
Centro de Convenções da PUC-GO | Goiânia-GO
27 a 30 de agosto de 2018

55ª REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA

ZOOTEC 28º CONGRESSO BRASILEIRO DE ZOOTECNIA

CONSTRUINDO SABERES, FORMANDO PESSOAS E TRANSFORMANDO A PRODUÇÃO ANIMAL

# QUANTIFICATION OF THE DIGESTIVE FRACTIONS OF ETHER EXTRACT AND NON-FIBER CARBOHYDRATE OF SMALL RUMINANTS' DIETS

Vinícius de Amorim MENESES*[1], Cláudia Horne da CRUZ[2], Stefanie Alvarenga SANTOS[3], Gleidson Giordano Pinto de CARVALHO[4], Lays Débora Silva MARIZ[5], José Augusto Gomes AZEVEDO[6], Edenio DETMANN[7], Manuela Silva Libanio TOSTO[8]

*autor para correspondência: meneses.vini@gmail.com
[1]Federal University of Bahia, Salvador, Bahia, Brazil
[2]Doctoral student in zootechny UFBA, Salvador, Bahia, Brazil
[3]EMEVZ – UFBA, Salvador, Bahia, Brazil
[4]EMEVZ – UFBA, Salvador, Bahia, Brazil
[5]EMEVZ – UFBA, Salvador, Bahia, Brazil
[6]DCAA – UESC, Ilhéus, Bahia, Brazil
[7]DZO – UFV, Viçosa, Minas Gerais, Brazil
[8]EMEVZ – UFBA, Salvador Bahia, Brazil

**Abstract:** A predição das frações digestíveis do extrato etéreo (EE) e dos carboidratos não fibrosos (CNF) é importante para se quantificar o conteúdo energético das dietas de caprinos e ovinos. No entanto, estes estudos ainda são limitados sob condições tropicais. O objetivo do estudo foi desenvolver equações, para estimar as frações digestíveis do EE e CNF de dietas de pequenos ruminantes. Foi realizada uma meta-análise a partir de 27 experimentos (21 com ovinos (n=766), e seis com caprinos (n=156)). Coeficientes de digestibilidade verdadeira e contribuição fecal metabólica foram os principais parâmetros ajustados aos modelos. Componentes não fibrosos foram avaliados pelo teste de Lucas para obtenção de coeficientes de digestibilidade verdadeira. Não houve efeito das espécies sobre o coeficiente de digestibilidade verdadeira ou contribuição fecal nas equações que estimaram o EE e CNF digestíveis. Dessa forma, um único modelo conjunto foi gerado para caprinos e ovinos. Os modelos propostos foram: EEd = 0.8418 x consumo de EE (g) - 1.8171; e CNFd= 0.8706 x consumo de CNF (g) -

14.3927. Conclui-se que os moldelos propostos são adequados para serem aplicados sob condições tropicais.

**Palavras-chave:** caprinos; fração digestível; entidade nutricional; ovinos

## Introduction

Equations to estimate the total digestible nutrients (TDN) of small ruminants' diets from chemical composition, in tropical conditions, are still not available. Considering that the digestible fractions of ether extract (EE) and non-fiber carbohydrate (NFC) are related to the energy content available in feeds, prediction equations could be fit based on this principle, estimating energy availability from chemical composition of feeds, since the chemical analysis are fast, cheap and executed routinely (Cappelle et al, 2001).

The main objective of this study was to develop equations, by means of a meta-analysis, that predict the digestible fractions of EE and NFC from different goat and sheep diets under tropical conditions, from the chemical composition of feed.

## Material and Methods

This study was composed by two sub models to estimate nutrient apparent digestibility. The original database used in this meta-analysis consisted of a total of 902 animals from 27separate studies with goats (6 studies; n=156 treatment means) and sheep (21 studies; n=766 treatment means) conducted in Federal University of Bahia, Bahia Southwest State University, and Santa Cruz State University facilities between 2013 and 2016.Data were collected regarding species, performance, dietary composition (% of DM), nutritional fractions intake (g/day) and apparent digestibility (%).

True digestibility coefficients and metabolic fecal contribution were the main parameters fitted to the models. Non-fibrous components were evaluated by the

Lucas test to obtain true digestibility coefficients. Sub-models for EE and NFC followed the same presupposition based on Lucas Test (Lucas & Smart,1959).

The models were evaluated on the basis of Akaike's information criterion (AIC) and root mean square error (RMSE) adjusted to random study effect according to St, Pierre (2001). The comparison between mathematical adjustments was performed using MES program (Model Evaluation System, version 3.1, Texas A&M University) according to Tedeschi (2006). Predicted and observed values were considered to be similar when the null hypotheses were not rejected. All statistical procedures were performed using 0.05 as critical level for Type I error occurrence.

## Results and Discussion

There were no effects of species on the slope coefficient of the equation of digestible EE (P = 0.11) indicating that the true digestibility of these components remains regardless of the animal species. Thus, according to the estimates, one equation was obtained for both sheep and goat:

$$dEE = 0.8418 \times EEI\ (g) - 1.8171\ (r^2 = 0.9580;\ AIC = 1858.6)$$

where: dEE= digestible EE, 0.8418 = estimate for the true digestibility coefficient of EE, EEI = ether extract intake, 1.8171 = estimate for the metabolic fraction contribution of EE on both sheep and goat.

The NFC equation indicates that the true digestibility of this component, represented by the slope coefficient, also does not depend on the animal species (P = 0.27). The metabolic contribution was not different for sheep and goat, therefore representing joint equations for digestible NFC, as follows:

$$dNFC = 0.8706 \times NFCI\ (g) - 14.3927\ (r^2 = 0.8774;AIC = 1962.6)$$

where: dNFC= digestible NFC, 0.8677 = estimate for the true digestibility coefficient of NFC, NFCI= non-fiber carbohydrate intake, 14.3927 = estimate for the metabolic contribution of NFC fraction for sheep and goat.

The accuracy of EE and NFC estimates were confirmed by the high aggregation of the data points for the constructed animal data, even with the adoption of a joint intercept and slope coefficient (Figure 1).

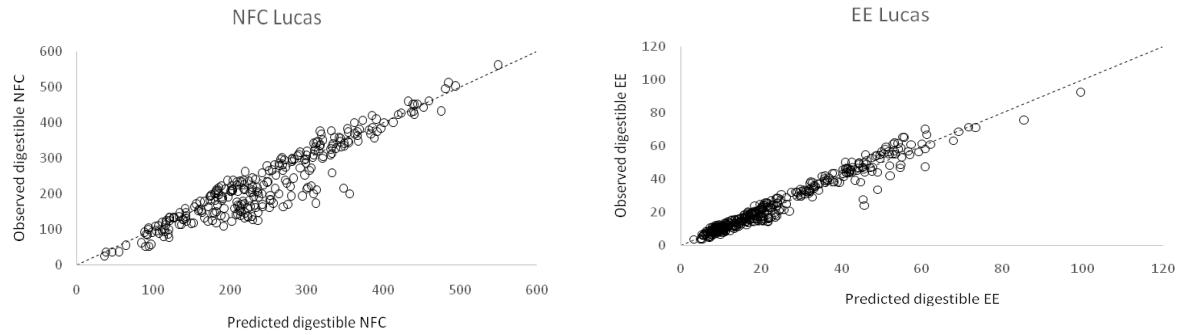


Figure 1 Relationship between predicted and observed values of the diet content (g/kg dry matter) of apparently digestible non-fibrous carbohydrates and ether extract

## Conclusion

The sub-models proposed for estimate the dEEd and dNFC in diets for goats and sheep are adequate to be applied under tropical conditions.

## Acknowledgments

Financial support for this research was provide by Coordination of Improvement of Personal Higher Education (CAPES) and Foundation for Research Support of the State of Bahia (FAPESB).

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