NUTRITIVE VALUE OF TYPHA FOR RUMINANTS

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Abstract

Samples from a 2-m height Typha plant in a preblooming state (without flowering spike) were collected at Hadejia riverside in the Hadejia valley (northern Nigeria) in January 2018. The sample was separated in leaves and stem (without roots), and both fractions were dried (45ºC, 48 h) to determine dry matter (DM) content. Samples of locally available feeds (oat hay, barley straw and corn grains) were used for comparative purposes. All samples were ground (1 mm pore size) before analysis of chemical composition and *in vitro* incubations. A total of four adult rumen-fistulated sheep were used as rumen fluid donors for the *in vitro* incubations to assess gas production kinetics. The results show that Typha plant had similar DM degradability to that of barley straw indicating that it could replace low-quality forages, such as cereal straw, in ruminant diets. However, studies measuring voluntary intake and *in vivo* digestibility are needed to confirm these results.

Keywords: typha, ruminants, nutrition, *in vitro*, fermentation

Introduction

Thypha domingensis (Typha) is a colonizer plant with invasive growth that is a major problem in the Hadejia valley in northern Nigeria. Typha growth affects negatively the productivity of rice fields, blocks water channels, impedes the flow of rivers, hinders navigation and fishing, increases flooding risks, and affects negatively the biodiversity of these ecosystems favoring the persistence of waterborne diseases (Iglesias *et al*., 2018).Typha might be used for ruminant feeding, thus contributing to sustainability of local livestock farms, but information on its nutritive value is scarce. The aim of this work was to determine chemical composition and *in vitro* ruminal fermentation of a Typha sample, and to compare the obtained values with other locally available feeds.

Materials and methods

Samples from a 2-m height Typha plant in a preblooming state (without flowering spike) were collected at Hadejia riverside in the Hadejia valley (northern Nigeria) in January 2018. The sample was separated in leaves and stem (without roots), and both fractions were dried (45ºC, 48 h) to determine dry matter (DM) content. Both fractions were then quantitatively mixed to obtain enough material for analyses. In addition, samples of locally available feeds (oat hay, barley straw and corn grains) were used for comparative purposes. All samples were ground (1 mm pore size) before analysis of chemical composition (AOAC, 2000) and *in vitro* incubations. Four adult rumen-fistulated sheep were used as rumen fluid donors for the *in vitro* incubations to assess gas production kinetics. Experimental procedures were approved by the Animal Experimentation Ethics Committee of the Comunidad Autónoma de Madrid (Approval number PROEX 035/17). Two hundred mg of dry matter (DM) of each sample were accurately weighed into 60 ml

glass vials. Ruminal contents from each sheep were obtained immediately before the morning feeding, strained through 4 layers of cheese cloth, and mixed independently with the culture medium of Goering and Van Soest (1970; without trypticase) in a 1:4 proportion at 39ºC under CO_2 flushing. Vials were filled with 20 ml of the mixture, capped and incubated at 39ºC for 120 h. Gas production was measured using a pressure transducer and a calibrated syringe at 2, 4, 6, 8, 12, 15, 22, 26, 30, 38, 48, 60, 72, 96 and 120 h and the gas produced was released after each measurement. Vials without substrate (blanks; 2 per ruminal inoculum) were included to correct the gas production values for the gas released from endogenous substrates. Degradability of DM after 120 h of incubation (DMD_{120}) was determined by weighing 300 mg of DM of each sample into polyester bags which were incubated in an Ankom Daisy IIincubator with the mixture of ruminal liquid and the culture medium before described. After 120 h, the bags were washed with tap water, dried (70ºC, 48 h), and weighed.

Gas production data were fitted to the exponential model: gas = PGP (1 - $e^{(-c\ (t-Lag))}$), where PGP is the asymptotic gas production, *c* is the fractional rate of gas production, *Lag* is the initial delay before starting gas production, and t is the time of gas measurement, by an iterative least squares procedure using the NLIN procedure of SAS (version 9.2; SAS Inst. Inc., Cary, NC, USA).The DM effective degradability (DMED) was estimated assuming rumen particulate outflow (*Kp*) of 0.03 per h.Gas production data were analyzed as a mixed model using the PROC MIXED of SAS, with feed effect as fixed effect and that of the inoculum as random effect. Means comparison was performed by LSD test.

Results and Discussion

Typha stem had low DM (14.0 %) content compared with the leaves (33.6 %). The whole plant had high NDF (67.9%) and low CP (8.84 %) contents on DM basis. Wingching-Jones (2014) reported lower DM content (14.6 %) and relatively low OM, CP, NDF and ADF values of 88.4, 7.83, 61.8 and37.0 % respectively in a - 4 monthregrowth simple of Typha from Costa Rica. Factors such as plant maturity, soil characteristics, climate etc. can influence Typha chemical composition.

Table 1. Chemical composition (g/100 g dry matter, unless otherwise stated) of Typha plant, oat hay, barley straw and corn grains

Parameters	Typha plant	Oat hay	Barley straw	Corn grains
Dry matter (g/100 g fresh matter)	25.8	91.2	97.4	87.1
Organic matter	89.5	93.6	92.8	98.8
Crude protein	8.84	4.79	3.73	6.81
Neutral detergent fibre	67.9	57.9	78.7	9.8
Acid detergent fibre	41.9	31.1	43.2	2.1
Ether extract	2.00	1.89	1.64	4.13

Typha had the lowest significant ($p<0.05$) pgp value among the tested feeds, which indicates least potential rumen degradability (Table 2). Fractional rate of gas production (c) of Typha and oat hay were similar while

significant differences occured between barley straw and corn grain. Similarly, lag time (h) and DMED of the feeds samples were significantly ($p<0.05$) different from each other.

Table 2: Gas production kinetics and dry matter effective degadability of typha plant, oat hay, barley straw and corn grains incubated in batch cultures of sheep rumen micro-organisms

Parameters	Typha plant	Oat hay	Barley straw	Corn	SEM	P =
PGP (ml/g dry matter)	138[a]	286[c]	219[b]	381[d]	4.8	<0.001
c (%/ h)	2.45[a]	2.66[a]	3.38[b]	5.20[c]	0.138	<0.001
Lag (h)	3.32[b]	0.68[a]	9.57[c]	4.89[b]	0.546	<0.001
DMED (%)	18.0[a]	30.0[b]	19.8[a]	45.4[c]	0.93	<0.001

[a, b, c, d] Within a row, means without a common superscript letter differ (P <0.05; LSD test).
SEM: standard error of the mean.

The results showed that Typha plant has similar DMED compared to barley straw, therefore, it could replace low quality forages such as cereal straw in ruminants diet. However, studies measuring voluntary intake and *in vivo* digestibility are needed to confirm these results.

Acknowledgements

Funding from TRIMMING (Transforming Irrigation Management in Nigeria), the Federal Ministry of Water Resources of Nigeria, the World Bank, the Technical University of Madrid (Cooperation Funds) and the Spanish MINECO (Project GL2016-75322-C2-1-R) is gratefully acknowledged.

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