**Subtheme: Ruminant Production. Poster presentation**

**NUTRITIVE VALUE OF TYPHA FOR RUMINANTS**

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**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](https://www.google.es/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjWsMr_j47XAhWD64MKHdRgB-4QFgguMAA&url=https%3A%2F%2Fservices.anu.edu.au%2Fplanning-governance%2Fgovernance%2Fanimal-experimentation-ethics-committee&usg=AOvVaw3bCNhWiUJz4Qc3OBXTuvGm) 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 cheesecloth, and mixed independently with the culture medium of Goering and Van Soest (1970; without trypticase) in a 1:4 proportion at 39ºC under CO2 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 (DMD120) was determined by weighing 300 mg of DM of each sample into polyester bags which were incubated in an Ankom Daisy II incubator 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 had low DM content, which was lower in the stem (14.0%) compared with the leaves (33.6%). The whole plant had high neutral detergent fiber (NDF; 67.9%) and average crude protein (CP; 8.84%) content (DM basis). Wingching-Jones (2014) reported lower DM content (14.6%) and slighlty lower organic matter, CP, NDF and acid detergent fiber contents (88.4, 7.83, 61.8 and 37.0%, respectively) in a 4-month regrowth sample 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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | 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 lower (P<0.05) PGP than all other tested feeds, which indicates lower potential rumen degradability (Table 2). Fractional rate of gas production (*c*) of Typha was similar to that of oat hay, but lower (P<0.05) than that of barley straw and corn grains, whereas *lag* time for Typha was lower (P<0.05) than that for barley straw and corn grains indicating that fermentation of Typha started more rapidly. The DMED of Thypa was similar to that of barley straw, but lower than the DMED of oat hat and corn grains.

**Table 2.** Parameters of gas production kinetics (PGP, *c* and *Lag*) and dry matter effective degradability (DMED) of Typha, oat hay, barley straw and corn grains incubated in batch cultures of sheep rumen micro-organisms

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Item1 | Typha plant | Oat hay | Barley straw | Corn grains | SEM2 | P = |
| PGP (ml/g dry matter) | 138a | 286c | 219b | 381d | 4.8 | <0.001 |
| c (%/ h) | 2.45a | 2.66a | 3.38b | 5.20c | 0.138 | <0.001 |
| *Lag* (h) | 3.32b | 0.68a | 9.57c | 4.89b | 0.546 | <0.001 |
| DMED (%) | 18.0a | 30.0b | 19.8a | 45.4c | 0.93 | <0.001 |

a, b, c, d Within a row, means without a common superscript letter differ (P < 0.05; LSD test).

1 See text for the meaning of gas production parameters 2 SEM: standard error of the mean.

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.

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