



## CONVERTING INVASIVE MACROPHYTE-TYPHA INTO SILAGE FEED: AN OPPORTUNITY FOR SUSTAINABLE DEVELOPMENT IN HADEIJA VALLEY (NIGERIA)

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### ABSTRACT

Typha plant might be preserved as silage and used in ruminants feeding particularly in the dry season when other feeds are not available, thus helping reduce the cost of feeding. The research presented here compares the nutritive value and price of Typha silage with a local feed (sorghum straw, *Sorghum bicolor* (L.) Moench) commonly used in sheep feeding. Three experimental diets were compared: a control diet including 30% of sorghum straw and no Typha; R10: control diet with 10% Typha silage, R20: control diet with 20% Typha silage, and R30: control diet with 30% Typha silage. In all diets Typha silage replaced an equal amount of sorghum straw in the diet. Samples of Typha with height between 0.5 m and 1.5 m were collected in the Hadejia Valley Irrigation Scheme (HVIS), and were analyzed fresh and ensiled either with molasses or with both molasses and urea. Typha (fresh and ensiled) had higher ash than that for sorghum straw, indicating that it could supply more minerals to the ruminant. Fresh Typha had similar neutral detergent fiber (NDF) content than sorghum straw (72.2% and 70.0%, respectively), while ensiled Typha had lower NDF than of sorghum straw (60.2% and 69.8%). Ensiled Typha had similar acid detergent fiber (ADF) content to sorghum straw (47.6% both of them). The added value price of Typha was calculated from the price of sorghum straw (₦35 per kg). The addition of molasses and urea increase the price of the Typha silage (₦15 and ₦20/kg for the silage with molasses and with molasses and urea, respectively). Therefore, the livestock farmers in HVIS could save (₦ 4,000/ton) by using Typha silage as a replacement for sorghum straw. The use of Typha could be economically interesting and sustainable, but further studies are needed to investigate animal performance with Typha feeding.

**Key Words:** *Typha*, ruminant feeding, feeding costs

### INTRODUCTION

More than two-third of the Nigerian population, which is 184 million people, rely heavily on ruminant animals as their main source of animal protein (Butterworth, 2002 and World Bank, 2019). A population of sheep and goat were estimated to be 57.3 and 38.5 million (Food and Agriculture Organization, 2013). The majority of the small ruminants in Nigeria about 70% are found in the northern part of the country (RIM, 1992). Feed constraints have been reported as of the main challenges to livestock farming in Hadejia Valley (HVIS; Iglesias et al., 2018). Reduction of feeding costs is critical for livestock production in HVIS because of the high cost of the conventional feedstuffs. Typha (*Typha domingensis* Pers.) is an uncontrolled and invasive weed in the irrigation channels, rivers and agricultural land of the HVIS (Ismaila et al., 2016). Typha (*Typha domingensis* Pers.) biomass is a highly available material and its nutritive contents can be improved by ensiling. Typha's green part can be fed to sheep fresh or ensiled especially during the dry season but it is not currently used for animal feeding, however, there are potential uses of all parts of the plant biomass in animal nutrition (Dehghani et al., 2012). The chemical and mineral composition of Typha leaves revealed that the plant can be incorporated in feed formulation for sheep and goats, as contains significant amounts of fibre, protein, ash and



some mineral elements (Hassan *et al.*, 2018). The dry season is real challenge in the northern Nigeria and the HVIS in the Sahel Savannah region. High cost of conventional feed and shortages in the dry season have rendered sheep production an expensive venture in Nigeria (Ndamitso *et al.*, 2010). Therefore, the objective of this paper is to compare nutritive value and economics of Typha silage with that of sorghum straw for sheep feeding.

## MATERIALS AND METHODS

The Typha samples were collected from plants between 0.5 meter and 1.5 meter fresh at HVIS. Silage was prepared following the protocol stated by (Alao *et al.*, 2018). In addition, sorghum *Sorghum bicolor* (L.) Moench) straw (SS) was used because it is highly available in the market. The selling price of sorghum straw, molasses and urea were obtained from local farmers and local suppliers in the market. Currency exchange rate was 405.5 NGN = 1 euro (Field survey, 2018). The added value of Typha silage was calculated by subtracting the cost of molasses and urea used for ensiling of Typha from the price of sorghum straw. Sorghum straw was used for this calculation because it has similar nutritive composition to Typha according the results previously reported by Alao *et al.* (2018) and De Evan *et al.* (2019). The control diet used for the calculations consisted of 70% concentrate (groundnut haulms, cowpea hulks, cotton seed cake, bone meal, ruminant premix and salt) and 30% sorghum straw. As shown in Table 1, the R10, R20 and R30 diets consisted of the control diet with 10, 20 and 30% of Typha silage, respectively, in replacement of the same amounts of sorghum straw.

**Table 1. Experimental diets with different inclusion levels of Typha silage replacing sorghum straw.**

Item	Control	R10	R20	R30
Concentrate (%)	70	70	70	70
Sorghum straw (%)	30	20	10	0
Typha silage (%)	0	10	20	30
Total	100	100	100	100

## RESULTS AND DISCUSSIONS

According to Alao *et al.* (2018), fresh Typha and ensiled Typha with molasses have lower crude protein (CP) than sorghum straw (5.26, 6.61 and 8.63%, respectively) while ensiled Typha with molasses and urea had higher CP (11.7%) due the addition of urea (see Table 2). Fresh and ensiled Typha had lower ether extract and crude fiber than SS, as well as higher ash content, which indicates that it could supply more minerals to ruminants. Fresh Typha had similar neutral detergent fiber (NDF) content to sorghum straw (72.0 and 70.0%, respectively) while ensiled Typha have lower NDF (60.2 and 69.8%). Ensiled Typha and sorghum straw had also similar acid detergent fiber (ADF) content (47.6% both of them). Fresh Typha had similar lignin to sorghum straw (12.2 and 13.0%), but both Typha silages had lower lignin content. De Evan *et al.* (2019) reported greater CP and ether extract contents for fresh Typha than those determined by Alao *et al.* (2018), but lower NDF content.


**Table 2. Chemical composition (g/100 g of dry matter) of the feeds compared in this study**

Item	Fresh Typha		TS	TSM	TSMU	SS
	Alao et al. (2018)	De Evan et al. (2019)				
Crude protein	5.26	8.84	6.61	6.94	11.70	8.63
Ether extract	0.35	2.00	0.80	0.60	0.23	1.91
Crude fibre	31.30	-	13.70	22.00	27.10	45.60
Ash	10.30	-	3.55	10.50	9.98	4.51
Neutral detergent fiber	72.20	67.90	35.10	60.20	69.80	70.00
Acid detergent fiber	41.70	41.90	18.60	33.40	47.60	47.60
Lignin	12.20	-	5.60	9.40	11.60	13.00

TS = Typha silage without molasses and urea; TSM = Typha silage with molasses; TSMU = Typha silage with molasses and urea; SS = Sorghum straw.

The added value price of Typha was calculated from the price of sorghum straw (₦35 per kg). As shown in Table 3, the addition of molasses and urea increase the cost of the Typha silage, reducing its added value. A reduction in the cost of forage in the diet by using increasing levels of Typha silage replacing sorghum straw will be achieved due to the large availability of this plant, which is freely available to farmers. Typha silage could be used as a replacement of sorghum straw, as both have a similar nutritive value for ruminants and if farmers only harvest the Typha which is available at the HVIS. The replacement of conventional feed ingredients with unconventional feed ingredients to reduce the cost of feeding has been also noticed by other researchers (Adegbola and Okonkwo, 2000). It can be calculated that livestock farmers feeding sheep with 30% of Typha silage with molasses and urea could save ₦ 4,000 per ton of feed by replacing 30% of sorghum straw in the diet. This is because the added value of T3 is ₦12,000 and it is used at 30% in the daily diet. Moreover, farmers feeding sheep with 30% of Typha silage without molasses and urea or Typha silage with molasses would save ₦ 10,500/ton or ₦ 6,000/ton, respectively.

**Table 3. Added value of Typha silage depending on the inclusion and price of molasses and urea.**

Added Value	Price ₦/kg	TS	TSM	TSMU
Cost of Molasses	150	0	-15	-15
Cost of Urea	250	0	0	-8
Cost of Sorghum Straw	35	35	35	35
Value added of Typha	-	35	20	12

T: Typha silage; T2: Typha silage + 10% molasses; TSMU: Typha silage + 10% molasses and 3% urea.



## CONCLUSION

The inclusion of 30% of Typha silage in the diet of sheep would reduce the cost of feeding by ₦ 4,000/ton. Typha could be utilized to improve animal production and ensure food security in Nigeria. Typha silage could be cost effective and sustainable since Typha is available, cheap and can be preserved as silage. This would be of great relevance during the dry season because of the low availability and high prices of feeds. Typha could be a good alternative because it is available and do not require importation. Typha silage could be cost effective and sustainable.

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