PHYSICAL FEATURES AND CHEMICAL COMPOSITION OF ENSILED MAIZE STOVER AND GROUNDNUT HAULMS FOR SUSTAINABLE RUMINANT PRODUCTION

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ABSTRACT

The study assessed the physical features, proximate composition and fibre fractions of ensiled maize stover and groundnut haulms for sustainable ruminant production. Maize stover and groundnut haulms were collected, wilted for 3 – 4 days, chopped and ensiled in different proportions to make three 3 treatments (T1: 100% maize stover; T2:100 % groundnut haulms; T3:50 % maize stover and 50 % groundnut haulms) and replicated four (4) times in glass Bamma® bottles for 30 days. Physical features and chemical composition of the silage were examined. Results showed that the colour of the silage were cream, greenish brown and light brown for T1, T2 and T3. Texture was smooth for T1, coarse for T2 and slightly coarse for T3. All the silage were moist with pleasant aroma. The pH and temperature value ranges from 3 – 4.5, 30 – 31.5^{o}C, respectively. There were significant differences (P<0.05) in the proximate compositions and fiber fractions of the silage. Treatment 3 T3 had highest (P<0.05) content for the proximate composition and fiber fractions except the hemicellulose which was similar (P>0.05) in T2 and T3. Conclusively, the silage exhibited good physical features, appropriate proximate composition and fibre fractions that justified its potential in solving the challenges of dry season feed scarcity for ruminant production. Treatment 3 (50% maize stover and 50% groundnut haulms) is recommended for farmers based on the proximate composition and fibre fractions.

Key words: Chemical composition, groundnut haulms, maize -stover, ruminant, silage,

INTRODUCTION

In Nigeria, fodder scarcity is considered a major limiting factor to ruminant production. Lamidi *et al*. (2009) reported that available forage for most part of the year is low in crude protein, this leads to marked decreases in voluntary intake and digestibility and causes marked weight loss of animals, and economic return of the venture.

Crop-livestock farming is an integrated agricultural production system in which crop products especially wastes can be used as feed resources for the animals. Also the dung and urine of the animals can be used to improve the soil fertility. Increase in crop production will consequently lead to increase in the production of crop waste which will transform to feed for animal production.

The best way to maximally utilize crop wastes is to convert them to useful materials such as feed resources for animals, especially ruminant animals. Silage production has been used as a means of adding value to different crops waste.

Maize stover is a left over when maize cob has been harvested by the farmers. It can be a waste if left on the farm to dry off, it can also be ploughed back into the soil or destroyed by rodents or insect.

Groundnut haulms is the entire groundnut plant after groundnut were removed after harvesting, it is made up of the leaves, stem and root. It is also crop wastes which were left on the farm. Some were dry when the weather was conducive as hay; where weather is not favorable, it is left on the farm and wasted. Groundnut haulms have a higher crude protein content (11-17%) compared to (2 - 8%) in cereal residues. Addass *et al*. (2011) reported 91% DM, 8.30% ash, 10.90% CP, 31.80 CF and 1.31% EE for groundnut haulms.

This study intends to examine the physical features and chemical composition of ensiled maize stover and groundnut haulms for sustainable ruminant production.

MATERIALS AND METHODS

Experimental site and collection of experimental materials: The experiment was conducted at Forage Science Laboratory, Department of Animal science, University of Port Harcourt, Port Harcourt, Rivers State. Maize stover was collected from the Faculty of Agriculture Demonstration Farm after maize cobs were harvested. Groundnut haulms were gathered after groundnut seeds were harvested and haulms, cleaned of soil from the root. Both crop wastes were allowed to wilt for 2-3 days.

Silage production: The wilted maize stover and groundnut haulms were chopped with forage chopper machine separately and later weighed on percentage bases as: T1(100 % maize stover), T2 (100% groundnut haulms), T3(50 % maize stover+ 50 % groundnut haulms), replicated 4 times in glass bottles to have 12 Bamma® bottles and ensiled for 30 days

Data collection, chemical and data analysis: Physical features were monitored as reported by Lamidi and Akhigbe (2018). Chemical analysis was according to AOAC (2000). The experimental design was a completely randomized design (CRD), in which the experimental treatments were the only source of variability.

The model of analysis is as follows: $Xij = \mu + Ti + \sum ij$

Where Xij = value of observation; μ = population mean; Ti = treatment effect; $\sum ij$ = error term

All data obtained were subjected to the analysis of variance (ANOVA). Means were separated using Least Significant Difference (LSD) SAS (1999) package.

RESULTS AND DISCUSSION

Table 1: Physical features of ensiled maize stover and groundnut haulms

Parameters	Experimental treatments		
	T1	T2	T3
Colour	Cream	Greenish brown	Light brown
Texture	Smooth	Coarse	Slightly coarse
Wetness	Moist	Moist	Moist
Aroma	Mild sweet	Mild sweet	Mild sweet
pH	3.5	3	4.5
Temperature (^{0}c)	32	30	31.5
Mouldiness	No mould	No mould	No mould

T1: 100% maize stover; T2:100 % groundnut haulms; T3:50 % maize stover and 50 % groundnut haulms.

The physical features of ensiled maize stover and groundnut haulms are indicated in Table 1. The colour of the silage were cream, greenish brown and light brown for T1, T2 and T3. Texture was smooth for T1 and coarse for T2 and slightly coarse for T3. All the silage was moist with pleasant aroma. The pH and temperature value ranges from 3 – 4.5, 30 – 31.5^{o}C, respectively.

The colour of the silage was close to the original colour of the grass, which was an indication of good quality silage that was well preserved (Oduguwa *et al*., 2007). The range of pH value (3 – 4.5) recorded in this study was within the value reported (3.81 - 4.90) by Akinbode *et al.* (2017) when sugarcane top was ensiled with broiler litter. Generally, the mild sweet aroma perceived in all the silage is an indication of normal physical characteristics of good silage (Lamidi and Akhigbe, 2018).

Table 2: Proximate composition and fiber fractions of ensiled maize stover and groundnut haulms

Parameters	Experimental treatments				
	T1	T2	T3	SEM	LOS
Dry matter	86.96^b	87.07^b	87.24^a	0.05	**
Crude protein	11.67^c	12.18^b	12.69^a	0.15	**
Ether extract	2.12^c	2.23^b	2.37^a	0.04	**
Crude fibre	13.21^c	13.35^b	13.67^a	0.07	**
Ash	6.56^c	6.78^b	6.89^a	0.05	**
Neutral detergent fibre	47.39^c	49.23^b	51.15^a	0.54	**
Acid detergent fibre	25.67^c	27.12^b	29.05^a	1.35	**
Nitrogen free extract	52.33^b	52.47^b	51.15^a	0.07	**
Acid detergent lignin	8.59^c	8.76^b	9.23^a	1.00	**
Cellulose	17.75^c	18.36^b	19.82^a	0.36	**
Hemicellulose	21.72^b	22.10^a	22.11^a	0.07	**

[a, b, c] Means on the same row with different superscripts differ significantly (P<0.05).

SEM= standard error of mean; T1= 100% Maize stover; T2=100% Groundnut haulms; T3=50% Maize stover + 50% Groundnut haulms.

There were significant differences (P<0.05) in all the proximate composition and fiber fractions of the silage across the experimental treatments. The T3 had highest (P<0.05) content for proximate composition and fiber fractions except the hemicellulose which was similar (P>0.05) in T2 and T3.

The CP contents of the silage (11.67 – 12.67%) were above the critical lower limit (7% CP) which forage intake by ruminants and rumen microbial activity could be negatively affected (Norton, 2003). It implies that the silage would provide the adequate nitrogen requirement for the rumen microorganisms to maximally digest the main components of dietary fibre leading to the production of volatile fatty acids (Lamidi and Ogunkunle, 2016) this in turn facilitate microbial protein synthesis (Lamidi and Aina, 2013) and improve the production of meat, milk, skin and hide for man uses. Higher levels of NDF and lignin have been reported to have negative effect on DM intake and digestibility (Bakshi and Wadhwa, 2004). However, the NDF (47.39 – 51.15 %) values observed for the silage were less than 60% which is considered safe for acceptable intakes of forage in ruminants (Meissner *et al*., 1991).

CONCLUSION AND RECOMMENDATION

Conclusively, ensiled maize stover and groundnut haulms had good physical features of a silage. The proximate composition and the fibre fractions further justified its potential T1: 100% maize stover; T2:100 % groundnut haulms; T3:50 % maize stover and 50 % groundnut haulms in solving the problem of dry season feeding for ruminant production. Treatment 3 (50% maize stover and 50% groundnut haulms) is recommended for farmers based on the proximate composition and fiber fractions.

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