Silage Quality and Preference of Diet Supplemented with Poultry Litter and Urea by Red Sokoto Bucks

Jessica Achi Neyu[1], Abubakar Sadiq Shu'aibu[2] and Shu'aibu Muhammad Ahmad[1]
[1]Department of Agric Education School of Vocational and Technical Education, Nuhu Bamalli Polytechnic Zaria
[2]Department of Animal Production, CAAS/ABU, Mando. Kaduna
Corresponding Author's email: jnachi@nubapoly.edu.ng

Abstract: The study was conducted to determine the silage quality and preference of growing Red Sokoto bucks fed diets supplemented with urea and poultry litter. The experiment was conducted at the teaching and research farm of the department of Agric Education, Nuhu Bamalli Polytechnic, Zaria using twelve males growing Red Sokoto bucks. They were treated against internal and external parasites with ivomectin (ivomec®) and also Tetracycline LA was administered against bacterial infections. The bucks were weighed, grouped and randomly allocated to three dietary treatments, with four bucks per treatment each buck served as a replicate and each group was randomly assigned to one of the three dietary treatments. The bucks in each treatment group were housed in pens made of concrete floors. Bucks were fed 3.5% experimental diets on weight basis. The experimental animals were allotted (n=3) diets T1, T2 and T3 consisting of control (T1) without urea and poultry litter, T2 contained urea and T3 contained poultry litter. The experiment lasted for 90 days. Physiochemical characteristics of urea and poultry treated corncobs were moderately acidic with a choking odor, firm texture and positive fungal growth. There was significant difference ($P<0.05$) in all the parameters with preference of goats fed poultry litter (T2) ranked 1st, it had significantly higher ($P<0.05$) intake (15.97kg), ADI (2.28kg), Coefficient of preference (1.13) and percentage preference (37.81%) respectively. in conclusion, corncobs enhanced poultry litter had better silage quality in terms of colour, temperature and was most preferred by the goats when fed.

Keywords: Bucks, Preference, Poultry-litter, Silage quality, Urea

INTRODUCTION

Bringing different ways to ensure ruminant animals have quality feed materials all through the year is becoming increasingly important and difficult. In the tropical humid zone of West Africa, one of the problems of ruminant animal production is the variation in the season which affects the availability and nutrients of the natural grassland (Oduguwa *et al.*, 2013) and this is worst during the dry season resulting in an on and off growth pattern in the animals which in a long run leads to a decline in productivity of the animals (Babayemi & Bamikole, 2006). This has necessitated concerted efforts on innovative research geared towards cheaper and indigenous feed alternatives that would support the growth performance of ruminant animals during the critical season.

It has been estimated that more than 21-24 million tonnes of plant by-products are produced yearly in Nigeria, some of these are corn crop residues which include; green corn, corn Stover, corn stalk and corncobs (Fajemisin *et al.*, 2012). Corncob silage meal treated biochemically is a highly qualitative feed that contains quite a high amount of energy, protein and some mineral elements. Researches have shown that Urea and poultry litters when used to treat different crop residues like maize straw, rice milling waste, sorghum stover etc has improved feed intake and performance of livestock (Bello and Tsado, 2013; Kolo *et al.*, 2018; Aruwayo *et al.*, 2022; Muhammad *et al.*, 2023). However, research carried out to compare the most preferred between diets supplemented with urea ensiled corncobs and poultry litter ensiled corncobs. This research was aimed at determining the most preferred by Red Sokoto bucks between urea ensiled and poultry litter ensiled corncobs supplemented diets.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Teaching and Research (T&R) farm of the Nuhu Bamalli Polytechnic, Zaria, Kaduna State, Nigeria.

Experimental Diets

Table 1: Percentage composition of maize cobs silage diets fed to Red Sokoto goats

Parameter (%)	T1	T2	T3
Ensiled Maize cobs	45.00	45.00	45.00
Cowpea husk	16.60	16.60	16.60
Wheat bran	10.00	10.00	10.00
Maize bran	22.00	22.00	22.00
Cotton seed cake	5.00	5.00	5.00
Bone meal	0.60	0.60	0.60
Table salt	0.50	0.50	0.50
Premix	0.30	0.30	0.30
Total	**100.00**	**100.00**	**100.00**

T1 = Water treated ensiled maize cobs, T2 = Poultry manure treated ensiled maize cobs, T3 = Urea treated ensiled maize cobs

Experimental design, experimental animals and animal management

A completely randomized design was used for the study. Twelve (12) Red Sokoto bucks within 8 to 12 months of age (determined via dentition) with average weights of 12kg±0.25kg were used for the experiment. The bucks were purchased from Giwa market in Giwa Local Government Area Council, Kaduna state.

The animals were quarantined for two (2) weeks when brought from the market. They were treated against internal and external parasites with ivomectin (ivomec®) and also Tetracycline LA was administered against bacterial infections. The bucks were weighed, grouped and randomly allocated to three dietary treatments, with four bucks per treatment each buck served as a replicate and each group was randomly assigned to one of the three dietary treatments. The bucks in each treatment group were housed in pens made of concrete floors. Bucks were fed 3.5% experimental diets on weight basis, the feed offered was administered once at 8:00am daily and left over feed was measured and recorded. Fresh clean water was given *ad libitum* daily throughout the research. Experiment lasted for 90 days.

Determination of silage quality

At the end of 30 days of ensiling, the silage bags used for fermentation were opened and the volatile fatty acid was determined. Quality characteristics assessment was carried out to determine the colour, aroma and texture using the method of Olufemi *et al.*, 2019. Silage pH was determined as described by (Falola *et al.*, 2013). Visual assessment was used to carry out the colour assessment of the silage 6 different people carried out the aroma assessment of the silage categorized into pleasant, fruity and pungent. Samples of the silage were taken for dry matter determination. The samples were oven dried at 65^0C until a constant weight was reached using a sensitive weighing scale. They were milled and stored in cellophane bags for chemical analysis

Acceptability trial:

Acceptability of the silages by Red Sokoto bucks was carried out using 10 bucks in a cafeteria experiment which lasted for a period of 7 days after 5 days of feed adaptability using the method described by Babayemi and Bamikole, (2006). Using the cafeteria feeding, about 4kg of the diet was given on a daily basis in different feeding troughs giving each animal the opportunity to freely access the feed. The positioning of the silages was changed daily to prevent bias by the animals in recognizing part of the pen for a particular silage. The amount of silage consumed was monitored for four hours daily. Feed preference was determined from the coefficient of preference (CoP) value (Falola, *et al.*, 2013).

The acceptability of silage was determined using the coefficient of preference (CoP) formula, given as the ratio of individual silage intake to the average intake of all the silages (Babayemi *et al.* 2006). This was calculated both on the daily basis and for the entire trial

period. The percentage of preference was calculated as the ratio of individual intake to total intake multiplied by 100. Silage was considered acceptable/preferred when its CoP value is greater than unity (1) or rejected if it is < 1 (Babayemi *et al.* 2006), while ranking was based on percentage of preference.

$$\text{CoP} = \frac{\text{Intake of individual feed offered}}{\text{Mean intake of all the feed offered}}$$

RESULTS AND DISCUSSION

Physio-chemical characteristics of ensiled corncobs

Table 2 shows result of physio-chemical characteristics of ensiled corncobs. In terms of color, the control diet was dark yellow, T2 (diet treatment with poultry litter) was dark brown and T3 (diet treated with urea) was yellowish brown. The odor of T1 was fairly pleasant had a positive fungal growth, a pH of 5.2 making it moderately acidic and a temperature of 27.6^0C. The odor of T2 was fairly choking, positive fungal growth, a pH of 5.7 and a temperature of 29.2^0C. T3 had a choking odor, positive fungal growth, a pH of 6.8 and a temperature of 28.5^0C. All silages were firm in texture.

pH is one of the fastest and easiest ways of evaluating silage quality. Kung and Shaver (2002) reported that silage with pH values range between 4.3 - 4.7 has a good quality and aroma. This study recorded a pH range of 5.2-6.8 (moderately acidic). This result agrees with Babayemi *et al.*, (2010) who recorded a range of 5.51 – 7.21 pH values when *Pennisetum pedicellatum* hay was ensiled with varying proportions of poultry litter and Muhammad *et al.* 2023 with pH range of 4.5 - 5.5 who ensiled rice milling waste enhanced with urea and poultry litter. These pH values were acidic to moderately acidic which is an indication of proper fermentation and good keeping quality (Menenses *et al.*, 2007) pH values higher than the normal range might be an indication of lack of organic acids generation during fermentation.

Silage quality and colour is highly affected by temperature. McDonald *et al.* (1998) stated that temperatures above 30°C make silages to become dark, due to caramelization of sugars in the forage. A good silage must be cooled at opening or be at room temperature. The temperature range of $27.6\text{-}29.2^0$C disagrees with *et al.*, 2023 who had a slightly higher temperature range of $28.9 – 31.0^0$C but was similar to the temperature ranges between $28.3\text{-}29.1^0$C and $25.0\text{-}27.5^0$C reported by Babayemi *et al.* (2010) and Akinwande *et al.* (2013) respectively. Bolsen *et al.* (1996) reported that any excessive heat production can lead to Millard or browning reaction which can lead to reduction in digestibility of protein and fibre components. The useful proteins and carbohydrates will form complexes and this will make them less digestible. Temperature is one of the essential factors affecting silage colour. Lower temperature makes the silage better and causes less colour change.

During this study, the colours obtained were different from the original colour of the corn cobs used. This finding was similar to that of Oduguwa *et al.* (2007), Babayemi *et al.* (2010) and Abdullahi *et al.* (2019) using similar procedure though with different feed materials. The positive fungal growth recorded may be due to the moderated pH and suitable temperature maintained in the silage. Growth of micro-organisms is determined by environmental factors such as temperature, moisture content, pH and nutrition (Amodu and Abubakar, 2004).

Table 2: Physio-chemical characteristics of the ensiled maize cobs

	Treatments		
Parameter	T1	T2	T3
Colour	Dark yellow	Dark brown	Yellowish brown
Odor	Fairly pleasant	Fairly choking	Choking
Texture	Firm	Firm	Firm
Fungal growth	+	+	+
pH	5.2	5.7	6.8
Temperature (°C)	27.6	29.2	28.5

T1 = Water treated ensiled maize cobs, T2 = Poultry manure treated ensiled maize cobs, T3 = Urea treated ensiled maize cobs

Preference of Red Sokoto bucks fed urea or poultry manure ensiled corncobs.

Table 3 shows result of preference of Red Sokoto bucks fed urea or poultry manure ensiled maize cobs. There was significant ($P<0.05$) different in all the parameters with diet treated with poultry manure having highest preference values across all the parameters observed.

The coefficient of preference (CoP) value, calculated from the ratio between the intakes of the silages divided by the average intake of the silages and the percentage of preference was calculated as the ratio of individual intake to total intake multiplied by 100. Therefore, silages were referred to be relatively acceptable when CoP was equal or greater than one (1) and assumed to be unacceptable when CoP is less than 1. In this study, T1 had CoP less than 1. The CoP varied between 0.87-1.13. Percentage of preference ranged from 28.97% to 37.81%. The ranking was based on percentage of preference and the order was T3>T2>T1.

The high ADI and the total intake recorded by T2 (2.28kg and 15.97kg) compared to the other two treatment is an indicator of higher preference for the diet by the animals.

There was no significant difference in Coefficient of preference, dry matter intake and percentage preference in all the silages. When CoP is equal or above one, the silage is considered to be acceptable and when CoP is below one, the silage is assumed to be unacceptable to livestock. Preference indices showed that goats prefer silages with poultry litter and urea were above one (1.31 and 1.01respectively) while T1 without poultry litter or urea had CoP below one (0.87) indicating that they were poorly accepted by the animals. This result disagrees with findings of Binuomote *et al.* 2019 who reported that when animals were fed ensiled elephant grass enhanced with poultry litter and cassava peels, animals treated with poultry had less performance

Table 3: Preference of Red Sokoto goats fed urea or poultry litter treated ensiled corncobs

	Treatments				
Parameter	T1	T2	T3	SEM	LS
Intake (kg)	12.23	15.97	14.03	0.536	NS
ADI(kg)	1.75	2.28	2.01	0.084	NS
CoP	0.87	1.13	1.01	0.09	NS
Preference	28.97	37.81	33.23	1.388	NS
% Preference	3rd	1st	2nd	NA	NA

Means with different superscript on the same row are significantly different ($P < 0.05$). LS = level of significant, NA = not applicable, * = significantly differed, ADI= Average daily intake, CoP= coefficient of preference

CONCLUSION

Enhancement of corncob residue with urea and poultry litter has a huge benefit in improving the silage physiochemical qualities as pH of 5.2-6.8 (moderately acidic) and temperature range of 27.6-28.5^{0}C were observed. Corncobs enhanced with poultry litter (T2) was shown to be most preferred by the bucks as it ranked 1st in terms of percentage preference, with highest values in terms of intake (15.9kg) and co-efficient of preference (1.13). The study recommended that Poultry litter at the appropriate quantity (1 kg poultry litter / 1 kg corncobs) should be used by farmer in diets supplementation for Red Sokoto Bucks as it possessed good physiochemical properties and better preference.

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