



Proximate Composition of Sun-Dried Rumen Digesta from Goat Slaughtered in Zuru Central Slaughterhouse, Kebbi State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. The first author AMS designed the study, wrote the protocol and the first draft of the manuscript. The second author SMI handled the literature searches while the third author AUH managed the statistical analysis and the fourth author UZS handled the laboratory analysis. All authors read and approved the final Manuscript.

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ABSTRACT

Biochemical studies with a view to assess the organic and inorganic content of Sun-Dried Rumen Digesta from goat slaughtered in Zuru central slaughterhouse were carried out. Four values for each nutrient were collected according to samples analyzed. The results of mean percentages showed that the samples contained 5.51 ± 0.28 moisture, 15.35 ± 0.35 crude protein, 5.51 ± 0.29 lipids, 14.44 ± 0.82 ash, 18.44 ± 0.58 fiber, and 40.70 ± 4.22 Nitrogen Free Extract. The inorganic contents were 2.46 ± 0.02 sodium, 0.64 ± 0.01 potassium, 0.83 ± 0.03 magnesium, 0.57 ± 0.03 calcium and 1.29 ± 0.02 phosphorus. The results indicated that rumen digesta from goat slaughtered in Zuru central slaughterhouse has nutritional qualities that could provide livestock producers with organic and inorganic nutrients for enhanced livestock nutrition. Therefore the Sun-Dried Rumen Digesta from goat is recommended for feeding livestock in the study area.

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1. INTRODUCTION

A direct relationship exists between Population growth and increasing demand for the animal protein needed for human consumption and slaughtering of animals is one way of producing essential protein in form of meat for human consumption [1]. This operation is usually carried out in the abattoir, which is a registered place for hygienic slaughtering and processing of meat for human consumption [2]. However, processing of meat for human consumption produces a series of wastes that constitute a serious environmental pollution due to improper practices, disposal and hygiene [3,4].

The wastes produced as a result of abattoir operations are generally termed as abattoir wastes. These wastes include condemn carcass, bones hair, aborted fetuses, faeces and rumen digesta [5]. Rumen digesta is an abattoir waste that is a partially digested forage material found in the rumen. It is fairly rich in nutrients especially the crude protein that is essential for animal nutrition [6]. Sun-dried rumen digesta has been reported to contain 11.18% crude protein, 22.99% crude fiber, 1.22% ether extract, 21.54% ash, 0.20% calcium and 0.45% phosphorous [7]. Sakaba et al. [2] also reported the composition of 5.83% moisture, 15.52% crude protein, 5.17% lipids, 48.73% fiber, 11.00% ash, 19.98% soluble carbohydrates, 19.98% sodium, 4.37% potassium, 0.42% magnesium, 0.45% calcium and 4.37% phosphorous from sun-dried rumen digesta. Furthermore, Agbabiaka, Anukam and Nwachukwu, [6] have reported 5.37% moisture, 18.58% crude protein, 3.77% crude fat, 34.44% crude fiber, 24.81% nitrogen free extracts and 18.40% ash from sun-dried bovine rumen content.

The feed value of sun-dried rumen digesta has been reported by Agbabiaka, Madubuike and Amadi [8]. The use of rumen digesta as feed supplement could reduce cost, maximize profit, increase available animal protein for human consumption and provide an environmentally benign disposal of abattoir waste. Unfortunately, this useful practice has not been exploited in the study area. Proximate analysis is a biochemical analysis that gives an estimate of individual component of feed or food material [9]. This could help achieve the use of rumen digesta as feed ingredient. However, lack of information on the nutrients content of rumen digesta from small

ruminants has limited its utilization as livestock feed ingredient in the study area. Therefore this study was designed to determine the organic and inorganic nutrients composition of rumen digesta obtained from goat slaughtered in Zuru central slaughterhouse with a view to explore its potentials as an alternative feed resource for livestock.

2. METHODOLOGY

2.1 Experimental Site

This study was conducted in the Department of Animal Health and Production, College of Agriculture Zuru, Kebbi State, Nigeria. Zuru is located within latitude 11° 35' and 11° 55' North and Longitude 4°45' and 5° 25' East of the equator approximately [2].

2.2 Sample Collection

A total of 24 samples of rumen digesta were collected from goats slaughtered in Zuru central slaughterhouse between April and August 2017. The collection of digesta was done at the beginning of the rainy season. In this period, farmers in the area sell their goats for the purchase of farm input, therefore, made goat available for slaughter in the slaughterhouse. The digesta collected was spread in plastic trays after the sun rise and then taken indoors at sunset till the following day. This was done for seven days to ensure complete drying under the sun. All the foreign materials such as pieces of irons, stones and plastics were removed. The samples of the digesta were then taken to the laboratory for proximate analysis.

2.3 Analytical Procedure

2.3.1 Determination of organic nutrients

The proximate composition of sundried rumen digesta from goat was analyzed as described by AOAC [10]. Four samples were analyzed for each nutrient. In order to determine the moisture content of the digesta, it was oven dried using Hot Air Drying Oven (Galenkamp England) at 105°C to obtain a constant weight. The rumen content was burnt into ash in order to determine the ash and fiber using Lenton Furnace, England. The crude protein was determined through micro kjeldahl method using Macro Kjeldhal Digestion and Distillation Apparatus

(Gerhardt, Germany) and by multiplying the nitrogen content with a factor 6.25. Crude fat was also determined using Soxhlet extraction method while Nitrogen Free Extract (NFE) by subtracting the sum of % ash, % crude fiber, % crude fat and % crude protein from 100. That is: $NFE = 100 - (\%ash + \%crude\ fiber + \%crude\ fat + \%crude\ protein)$.

2.3.2 Determination of minerals

The mineral contents of the digesta were analyzed as described by AOAC [10]. Potassium and sodium were determined by Photometric method using FP 640, Jeumeay while phosphorous was determined through Vonado molybdate Yellow method using spectrometer Jenway 1315 UK (UV-visible). Calcium and magnesium were determined using Atomic Absorption Spectrometer (Buck 210, AAS).

2.3.3 Data collection and statistical analysis

The nutrients analyzed in the laboratory were divided into organic and inorganic and expressed as percentages of mean, these were then analyzed for descriptive statistics using Statistic Package for Social Students (SPSS) 20th version. The results were expressed as percentages of mean and standard error of mean as described by Aliyu et al. [11].

3. RESULTS AND DISCUSSION

The results for organic and inorganic composition of sun-dried rumen digesta from goat slaughtered in Zuru central abattoir are presented in Table 1 and 2 above. The moisture (5.51 ± 0.28) and lipid (5.51 ± 0.29) content of the digesta from goats for this study (Table 1) are comparable to 5.83% reported for the moisture content of sun-dried rumen digesta by Sakaba et al. [2]. The values for moisture are however lower than 14.64% and 17.48% reported by Gebrehawariat et al. [7] and Agbabiaka, Madubuike, and Amadi [8]. Variation in the moisture content of the digesta for this study could be attributed to the processing method of the digesta. The amount of moisture for this study has however indicated that the digesta can be kept for a long period of time without deterioration when properly dried. The value for lipids was, however, higher than 1.22% and 1.69% reported by Gebrehawariat et al. [7] and Agbabiaka, Madubuike, and Amadi [8]. Variation in the lipid content could be attributed to the diversity and the stage of maturity of the forage

material consumed and activity of rumen micro-organisms in the production of fat that might have added to the lipid content of the digesta.

Table 1. Organic composition of sun-dried rumen digesta from goats

Nutrient	Composition
Moisture	5.51 ± 0.28
Crude protein	15.35 ± 0.35
Lipids	5.51 ± 0.29
Ash	14.44 ± 0.82
Fiber	18.44 ± 0.58
Nitrogen free extract	40.73 ± 4.22

Values presented in means and standard error of means (Means \pm SE)

Table 2. Inorganic composition of sun-dried rumen digesta from goats

Minerals	Composition
Sodium	2.46 ± 0.02
Potassium	0.64 ± 0.01
Calcium	0.57 ± 0.03
Magnesium	0.83 ± 0.03
Phosphorous	1.29 ± 0.02

Values presented in means and standard error of means (Means \pm SE)

The protein content (15.35 ± 0.35) of the digesta for this study as shown in Table 1 above compares well with 15.52% for sun-dried rumen digesta from sheep slaughtered in Zuru central abattoir reported by Sakaba et al. [2]. This value is, however, higher than 11.80% reported by Gebrehawariat et al. [7] but lower than 18.58% reported by Agbabiaka, Anukam and Nwachukwu [6]. Variation in the values of crude protein could be attributed to the diversity and the quality of the forage material consumed by the animal and the nutrient status of the soil to which the plants derived their nutrition. It could also be due to the population and activities of micro-organism in the rumen, pre-slaughtered feeding regimen and chemical composition as well as variation in the species of the forages consumed by the animal before slaughter [12,13]. The level of protein in sun-dried rumen digesta for this study indicates ability of the digesta from goat to supplement protein for animal nutrition.

The fiber content (18.44 ± 0.82) from rumen digesta for this study was greater than 11.00 reported by Sakaba et al. [2]. This value was lower than 22.99% and 34.91% reported by Gebrehawariat et al. [7] and Agbabiaka,

Madubuike, and Amadi [8]. The value (14.44 ± 0.82) for Ash in sun-dried rumen digesta from goat for this study is lower than 48.73% reported by Sakaba et al. [2], and 21.54% by Gebrehawariat et al. [7]. The difference in the values for ash and fiber could be explained by the maturity stage of the forage material consumed and the feeding habit of goats and the nature of tropical forage materials which increases in fiber as the mature [8]. The amount of Nitrogen Free Extract (40.73 ± 4.22) of the rumen content for this study is higher than 19.98% and 32.27% reported by Sakaba et al. [2] and Agbabiaka, Madubuike, and Amadi [8] respectively, this indicates the sparing effect of sun-dried rumen digesta from goat for livestock nutrition.

The calcium (0.57 ± 0.03) and magnesium (0.83 ± 0.03) content of the sun-dried rumen digesta for this study (Table 2) were higher than 0.20% for calcium and 0.42% for magnesium reported by Sakaba et al. [2]. However, the values for sodium (2.46 ± 0.02), potassium (0.64 ± 0.01) and phosphorus (4.29 ± 0.02) content of rumen digesta (Table 2) for this study were lower than 19.98%, 4.39% and 4.73% for sodium, potassium and phosphorus respectively, for sun-dried rumen digesta from sheep reported by Sakaba et al. [2]. The lower levels of inorganic content of the rumen digesta for this study indicate the inability of the rumen content from goat to provide the minerals needed for normal physiological activities of livestock. Therefore supplementation is required to meet the body requirement for normal body function.

4. CONCLUSION AND RECOMMENDATIONS

The values for organic and inorganic compositions obtained from the Sun-Dried Rumen Digesta from goats slaughtered in Zuru central slaughterhouse indicated the ability of the digesta to provide the nutrients particularly protein required by animals for normal physiological activities. The digesta is however deficient in inorganic nutrients for livestock nutrition; thus supplementation becomes necessary.

From the above conclusion, farmers in the study area can use the Sun-Dried Rumen Digesta from goats slaughtered in Zuru central slaughterhouse for livestock feeding trials. Also, the study recommends further investigations on the

proximate and anti-nutritional composition of the digesta from large ruminants kept for dairy and beef purposes.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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