Physio-Chemical Characteristics and Nutritive Value of Corncob-Poultry Dropping Silage

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ABSTRACT
The study was carried out to evaluate the physio-chemical characteristics, dry matter acceptability and nutrient digestibility of Corncob-Poultry Dropping silage by West African dwarf rams. The silage mixture comprises of T1: (Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%), T2: (Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%), T3: (Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%), T4: (Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%). Sixteen (16) rams were used in a completely randomized design, comprising of 4 per treatment in metabolic cages for digestibility while Acceptability and preference of sheep among the silage mixtures were determined in a cafeteria feeding method.
Result showed that the colour, smell and texture of the mixtures showed that all silages had acceptable physical attributes. The pH of silage varied from 4.77-5.54, Dry matter (DM) content of silage was 42.79, 33.09, 41.81, 44.37% while crude protein (CP) content was 8.40, 6.95, 4.13, and 4.02% for silage from T1, T2, T3, and T4 respectively. Crude fibre ranged from 25.68- 31.08 %, Neutral Detergent Fiber (NDF) 59.71- 69.84% and acid detergent fiber (ADF) from 37.05 – 41.73%. The result for dry matter acceptability showed that T2 had the highest value for dry matter intake (514.86g/d); coefficient of preference (1.17) and percentage of preference (29.32%). The coefficient of preference (CoP) and percent preference showed that silage from T2 and T1 was more acceptable and preferred by sheep than other silage mixtures. Significant ($p<0.05$) difference were obtained for the digestibility percentages of all the proximate nutrients. The digestibility values recorded for T1 was the highest ($P<0.05$) for DM (73.97%), CP (78.39%), EE (68.94%).
The study showed that ensiling of poultry dropping with corn cob will improve and sustain ruminants during period of forage scarcity.

Keywords: **Dry matter acceptability, digestibility, corn cob, poultry droppings, WAD rams**

1.0 INTRODUCTION

Crop residues are secondary plant materials obtained after harvesting the primary products for which the crop was cultivated. Prominent amongst the crop by-products used for feeding livestock such as small ruminants in Nigeria are yam, sweet potato, Irish potato, cassava, banana and plantain and cocoyam peels, rice bran, cowpea, rice and corn husk (Adamu *et al.*, 2010). The yields of these crop residues and their availability tend to increase with increasing demand for crops in the food chains by humans. Thus, it has been observed that several tons of crop by-products from corn, cassava, groundnut and rice cultivation are generated each year in the rural communities of Nigeria but these have not yet been put to good use as livestock feeds (Kalio and Ayuk, 2011). Nadeem *et al*. (1993) and Alam *et al.* (2008) demonstrated that agricultural and industrial wastes can be used for ruminants during the period of feed scarcity especially in the dry season.

Corncobs are crop residues obtained after harvesting and processing of corn. They are relatively low in digestible nutrients but are important source of energy in ruminant nutrition. In many tropical countries, fresh corncob is either utilized as an alternative roughage or raw material in silage production for ruminant feeding especially in dry season. Although, corncob has low protein and poor digestibility, its nutritional value can be improved with protein sources in order to enhance their utilization in ruminant feeding (Adegbola, 2002).

Poultry droppings are a mixture of poultry manure and feathers which is an economical and safe source of protein, minerals and energy for ruminants. The use of poultry manure would decrease the cost of feed and its polluting effects. Poultry manure is a form of non-protein nitrogen supply with crude protein (CP) content ranging between 15-30% (Nadeem *et al.*, 1993). More than half of this CP is true protein, while the other half is non – protein nitrogen (Ajayi *et al.*, 2016). A greater component of nonprotein nitrogen in poultry manure is in the form of uric acid, which ruminant animals are able to utilize. This is possible through the rumen microbes that convert nitrates to ammonia (Ajayi *et al.*, 2016). Ammonia is then absorbed by microbes for their own rumen microbial protein synthesis, with excess being absorbed into the blood stream or excreted as urine. Poultry manure can be dried to remove moisture from the manure so that it is near equilibrium with atmospheric air and it minimize the rate of deterioration from chemical and biological activity and environmental problems associated with raw manure. Drying also removes manure stickiness and hence allows for easier handling (Bernhart and Fasina, 2009). Dried poultry manure is used as an animal feed for ruminants (Alam *et al*., 2008). Dried poultry manure has been used to feed goats (Reddy *et al.*, 2012; Ajayi *et al.*, 2016) sheep (Bello and Tsado, 2013) and cattle (Alam *et al.*, 2008) with positive results.

Ensiling roughages with poultry waste improved the crude protein content (Owen *et al*., 2008a&b) because litter supplies mainly NPN, it is most valuable as an additive to cereal (high energy, low protein) silage, i.e. increasing its protein content. Poultry manure ensiled with whole corn or sorghum forages have been reported to improve fermentation quality, feeding value, palatability and digestibility in cattle, goats and sheep (Kim *et al*., 2000). The fermentation process in silage destroys pathogens within three weeks, improves palatability, removes smells and minimises nutritive losses.

The ensiling of crops has been a preferential method in maintaining the energy nutrient content of crops, ensuring a good nutritional value when used as feed (Vervaeren *et al.*, 2010). Because of the fact that crop residues are seasonally produced, there is need to embrace silage production which is a good conservation technique to ensure feeding value and also aids adequate supply of feed. Maize cobs are difficult to ensile owing to the high DM content and low levels of water-soluble carbohydrate (WSC) concentrations required for lactic acid production (McDonald *et al.*, 1991). Khan *et al*. (2006a) ensiled maize cobs (913 g/kg DM) with acidified molasses and urea, and reported improved nutrient digestibility and nitrogen utilization in buffaloes. Production and management of corn cob silage was well established (Elferink *et a*l., 2000; Mohd-Setapar *et al*., 2012). Corncob is a high-quality feed that contains a high concentration of energy.

This study was carried out to evaluate the physio-chemical characteristics and nutritive value of corncob-poultry dropping silage

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2.0 MATERIAL AND METHOD

Experimental Site

The study was conducted at the small ruminant unit of the Ladoke Akintola University of Technology, (LAUTECH), Ogbomosho. The area is situated in derived savannah zone of Nigeria and lies on Longitude4°15 East of Greenwich meridians and Latitude 5°15 north of the equator. The altitude is between 300m-600m above sea level while the mean temperature and annual mean rainfall are 27°C and 1247mm respectively

Collection of Test Ingredient

Poultry dropping was collected from the poultry unit of LAUTECH Teaching and Research Farm, Ogbomoso, Oyo State. The poultry dropping was sundried to reduce the moisture content and it was sieved to remove unwanted particles. Fresh pineapple pulp was gotten from a nearby processing industry and corncob was purchased from Odo Oba market about 9.6km to the Teaching and Research Farm, LAUTECH, Ogbomoso, Oyo State.

Silage Preparation

The poultry droppings, corncob and pineapple pulp were mixed homogeneously in a varying proportion below with constant level of inclusion of pineapple pulp;
Treatment 1: Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%)
Treatment 2: Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%)
Treatment 3: Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%)
Treatment 4: Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%)

Each mixture were packed in the plastic drums of about 60Litres (lined with 20mm thick nylon sheets) and compressed with heavy stones and sand bags to eliminate air and immediately, the plastic cover was placed and sealed; and all materials were allowed to ferment for 21days.

Determination of Silage Quality

After 21 days, the fermentation was terminated and the silage was opened for quality assessment. The appearance, smell, texture, and pH of the silage are judged by experience with silage-making using a 0 - 5 scale as follows according to Ososanya and Olorunnisomo (2015):

Table 1: Determination of Silage Quality

	0	1	2	3	4	5
Observation	Very bad	Bad	Going bad	Moderate	Good	Excellent
Colour	Very dark	Dark	Dark brown	Deep brown	Brown	Light brown
Smell	Offensive	Poor	Almost pleasant	Fairly pleasant	Pleasant	Very pleasant
Texture	Slimy	Very soft	Soft	Moderately firm	Firm	Very firm
pH	>6.5	6.1 – 6.5	5.6 – 6.0	4.6 – 5.5	4.0 – 4,5	< 4.0

On opening the silage, a thermometer was inserted to determine the temperature. Sub-samples from different points and depth were taken and mixed together to determine the dry matter and oven dried at 65˚C until a constant weight is achieved. The samples were stored in an air-tight container until it was ready for chemical analysis. The pH of the sub-samples was determined using the pH meter and distilled water to regulate the pH meter. Colour assessment was determined using visual observation with the aid of color charts. The odour or smell of the silage was assessed as to whether it is nice or pleasant or fruity.

Experimental Animals and Management

Sixteen (16) West African Dwarf (WAD) ram yearlings weighing 17 ± 0.5kg were used for the study. The rams were purchased from the neighboring villages of the Teaching and Research Farm, LAUTECH. They were acclimatized for four weeks and placed on prophylactic treatments. The animals were housed in a group pen within the ruminant house which has been constructed to achieve good ventilation. The floor was covered with wood shavings to a depth of 5cm. The rams were allowed to feed from 8:00 to 16:00 h daily and fresh water served ad libitum.

Preference Study
Ten (10) out of the ram were used in the cafeteria feed preference study. Four different ensiled feed samples offered were:

Treatment 1: (Corncob 40% + Poultry Dropping 40%+ Pineapple Pulp 20%)
Treatment 2: (Corncob 50% + Poultry Dropping 30% + Pineapple Pulp 20%)
Treatment 3: (Corncob 60% + Poultry Dropping 20% + Pineapple Pulp 20%)
Treatment 4: (Corncob 70% + Poultry Dropping 10% + Pineapple Pulp 20%).

1kg of each diet in replicate were introduced on cafeteria basis to the animals in eight different feeding troughs, thus each animal has free access to each of the diet in the trough. The positioning of the feeds was changed daily to prevent bias by the animals taking a particular part of the pen as the position for a particular type of feeds. The amount consumed was monitored for four hours per day and quantity consumed was recorded. After then the animals were released to go for grazing. Feed preference was determined from the Coefficient of Preference (CoP) value calculated from the ratio between the intakes of each individual feed sample divided by the average intake of the feed samples (Bamikole *et al.*, 2004), while percentage of preference was calculated as the ratio of individual intake to total intake multiplied by 100. Silage was considered acceptable when CoP is greater than one while ranking was based on percentage of preference. On the basis, a feed was taken to be relatively preferred if the CoP value is greater than unity:

Chemical Analysis
Dried samples of the experimental silage and feaces were analyzed for Crude protein, Dry matter, Ether extract, Ash, calcium and phosphorus contents as described (AOAC, 2005), while the Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF), and Acid Detergent Lignin (ADL) were determined according to the method of Van Soest *et al.* (1991).

Statiscal Analysis
Data generated from this experiment were subjected to analysis of variance (ANOVA) for a completely randomized design using the procedure of SAS (2002). Significant differences between the means were separated using the Duncan's multiple range test at 5% probability level.

3.0 RESULT AND DISCUSSION

Result
The physical characteristics of the ensiled corncob-poultry droppings silage are presented on Table 1. The colour of corncob with poultry droppings and pineapple pulp in varying proportion were similar in their properties ranging from light brown to dark brown in color, fairly pleasant to very pleasant smell, firm to very firm texture.

Table 2: Physical Characteristics of Corncob-Poultry Dropping Silage

Treatment	Color	Smell	Texture
T1	Dark brown	Fairly pleasant	Firm
T2	Brown	Pleasant	Firm
T3	Light brown	Pleasant	Firm
T4	Light brown	Very pleasant	Very firm

[abc] means in the same column with different superscripts were significantly different ($p<0.05$)
Treatment 1: Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%);
Treatment 2: Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%);
Treatment 3: Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%);
Treatment 4: Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%)

pH and Ammonia (NH_3 %) of corncob ensiled with poultry waste and pineapple pulp.

Table 3 shows the pH and Ammonia of corncob ensiled with poultry waste and pineapple pulp. pH values ranged from4.77 in T4 to 5.54 in T2. The NH_3 values ranged from 6.10 to 7.25 with no significant difference in the silages. T3 (6.10) is the lowest of NH_3 while T4 (7.25) had the highest

Table 3: pH and Ammonia (NH_3 %) on corncob – poultry dropping silage

Parameters	pH	NH_3 (%)
T1	5.50	7.00
T2	5.54	7.25
T3	5.34	6.95
T4	4.77	6.10
SEM	0.06	0.28

^{abc} means in the same column with different superscripts were significantly different (p<0.05)
Treatment 1: Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%);
Treatment 2: Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%);
Treatment 3: Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%);
Treatment 4: Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%)

Presented in Table 4 is the chemical composition (% DM) of corncob ensiled with varying levels of poultry droppings. Dry matter content of the silage ranged from 33.09 to 44.37 %, with treatment 2 having the lowest DM (33.09 %) content. Crude protein of T4 (4.02) was significantly lower (P<0.05) than T2 (6.95) and T1 (8.40). T3 and T4 were however similar (P>0.05). Crude fiber ranged from 25.68 to 31.08 (%). Ether extract ranged from 1.08 to 3.70 (%), Ash content varied between 6.95% in T4 and 19.70 (%) in treatment 1.There were significant differences (p<0.05) in NDF, ADF, ADL and cellulose contents among the treatments. NDF of T4 (69.84%) was significantly higher (P>0.05) than T3 (63.68%), T2 (61.28%) and T4 (59.71%).The value obtained for ADF was highest in T2 (41.73%) when compared to T3 (39.85%), T (38.08%) and T1 (37.05%) respectively.

Table 4: Chemical composition of corncob ensiled with poultry dropping and pineapple.

Parameters (%)	T1	T2	T3	T4	SEM
Dry Matter	42.79	33.09	41.81	44.37	3.34
Crude Protein	8.40^{a}	6.95^{a}	4.13^{b}	4.02^{b}	0.60
Crude Fibre	25.68^{c}	28.47^{b}	28.65^{b}	31.08^{a}	0.57
Ether Extract	3.70^{a}	3.30^{ab}	1.80^{c}	2.65^{b}	0.20
ASH	19.70^{a}	15.00^{b}	9.15^{c}	6.95^{c}	1.34
NDF	59.71^{c}	61.28^{bc}	63.68^{b}	69.84^{a}	0.74
ADF	37.05^{c}	41.73^{a}	39.85^{ab}	38.08^{cb}	0.75
ADL	16.58^{c}	22.57^{a}	18.83^{b}	16.94^{c}	0.54
Hemicellulose	22.66	19.56	23.83	31.77	0.85
Cellulose	20.48	19.16	21.03	21.14	0.75
Calcium	0.35^{a}	0.20^{b}	0.18^{b}	0.07^{c}	0.02
Phosphorus	0.59^{a}	0.32^{ab}	0.21^{b}	0.19^{b}	0.09

^{abc} means in the same column with different superscripts were significantly different (p<0.05)
Treatment 1: Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%);
Treatment 2: Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%);
Treatment 3: Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%);
Treatment 4: Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%)
NDF; Neutral Detergent Fiber.
ADF; Acid Detergent Fiber.
ADL; Acid Detergent Lignin

The dry matter acceptability and preference of West African Dwarf (WAD) Ram fed ensiled corncob poultry droppings are presented in Table 5. There were significant differences (P<0.05) across the treatments for dry matter intake. The dry matter intake (g/day) was highest in T2 (514.86), followed by T1 (505.93), T3 (378.86) while T4 (360.21) had the least. The Cop and Pp of the diets varied significantly (P<0.05) across the treatments. The CoP values ranged between (0.81-1.17) while the overall percentage preference values also ranged between (20.33-29.32%) respectively. Silages were relatively acceptable when CoP was equal or greater than 1 and assumed to be unacceptable when CoP is less than 1. In this study, CoP of T2 and T1 were greater than 1 while T3 and T4 had CoP less than 1. The ranking was based on percentage of preference and the order was T2 > T1 > T3> T4. The result obtained for acceptability trial showed that animal in T2 (1.17 and 29.32%) had the highest acceptability.

Table 5: Preference of West African Dwarf Ram Fed Ensiled Corncob Poultry Dropping

Parameters	T1	T2	T3	T4	Sem
Dry matter Intake (G/Day)	505.93^{a}	514.86^{a}	378.86^{b}	360.21^{b}	20.10
Coefficient Of Preference (Cop)	1.15^{a}	1.17^{a}	0.86^{b}	0.81^{b}	0.04
Percentage Preference (Pp)	28.81a	29.32^{a}	21.55^{b}	20.33^{b}	1.00
Preference Ranking	2nd	1st	3rd	4th	-

abc means in the same column with different superscripts were significantly different (p<0.05)
Treatment 1: Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%);
Treatment 2: Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%);
Treatment 3: Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%);
Treatment 4: Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%)

The digestibility of nutrient of the experimental diets is shown in Table 5. Significant (p<0.05) difference were obtained for the digestibility percentages of all the proximate nutrients. The highest DM, CP and EE digestibility coefficients (73.97%, 78.39% and 68.94% respectively) were observed in Treatment 1 while the least value (68.14, 25.56 and 20.88 % respectively) was observed in Treatment 1. Crude fiber digestibility coefficient was highest in Treatment 4 (42.35%) while the least value was observed in Treatment 1 (24.49%) with no significant difference. Ash digestibility coefficient was observed highest in Treatment 2 (41.98%) while the least value was observed in Treatment 4 (28.03%).

Table 3: Nutrient Digestibility of Ensiled of Corn-Cob Poultry Droppings Silage.

Parameters	T1	T2	T3	T4	SEM
Dry matter	73.97^{a}	70.41^{ab}	70.00^{ab}	68.14^{b}	1.49
Crude protein	78.39^{a}	65.11^{a}	34.67^{b}	25.56^{b}	6.48
Crude fiber	24.49	28.27	31.60	42.35	5.32
Ash	41.84	41.98	30.92	28.03	5.53
Ether extract	68.94^{a}	48.02^{a}	45.89^{ab}	20.88^{b}	7.74

abc means in the same column with different superscripts were significantly different (p<0.05)
Treatment 1: Corncob (40%), Poultry Dropping (40%), Pineapple Pulp (20%);
Treatment 2: Corncob (50%), Poultry Dropping (30%), Pineapple Pulp (20%);
Treatment 3: Corncob (60%), Poultry Dropping (20%), Pineapple Pulp (20%);
Treatment 4: Corncob (70%), Poultry Dropping (10%), Pineapple Pulp (20%)

4.0 DISCUSSION

Silage color is one of the physical parameters used in assessing the quality of silage. The colour of the silage ranged from dark brown to light brown which is close to the original colour of the silage. The result is in conformity with the previous reports (Jianxin, and Jun, 2002; Oduguwa et al. 2007) which claimed that good silage preserves the original colour of the standing plant.
The colour of the silage also changed from dark brown to light brown as the level of the poultry droppings in the mixture decreased.

The smell of the silage is also a good indicator of the quality of silage. Pleasant smell will stimulate and facilitate feed intake and better performance of livestock. Kung and Shaver (2002) reported that pleasant smell is accepted for good or well-made silage. Silages with lesser percentage of poultry dropping (T3 and T4) had pleasant smell while silage from Treatment 2 had a fairly pleasant smell. Silage containing 40% poultry dropping (T1) had a poor and pungent smell resulting from production of ammonia. Ammonia production seemed to increase with higher level of poultry dropping in the mixture, leading to off- odor and dark brown colouration in the silage. All the silages were firm in texture due to the high fiber content in the corncob which improves the general structure of the silage.

The pH values revealed the measure of the acidity of the silage. If the pH is too high, it indicates poor preservation and if the pH is too low, it can reduce intake. .The observed pH values (4.77-5.54) were lower than the range of 4.5 to 5.5 considered by (Meneses, *et al*., 2007) which was acceptable for good silage. The pH increased as level of poultry dropping in the mixture increased. This is due to ammonia production from poultry dropping which counteracted the effects of lactic acid and other organic acids in the silage. However, pH may be influenced by the moisture content and the buffering capacity of the original materials. The ammonia-nitrogen values of the silage ranged from 6.10 to 7.25 % and this is in accordance to Mc Donald *et al*. (2002), who stated that good silage should have less than 11% ammonia-N content.

The chemical composition of the diet revealed that, crude protein, ether extract and ash concentration decreased as the proportion of Corn Cob increased in the silage mixture whereas the fiber fraction increased. The Dry matter (DM) content of the silages in this study is lower than 84.65% reported for poultry litter treated corncobs silage (Fajemisin *et al.*, 2013). The CP content of the silages increased as the level of poultry dropping increased while the fiber fractions decreased. The increase in CP content of the silages was a direct effect of poultry dropping which is a source of non-protein nitrogen in ruminant's diets (Nguyen *et al*., 2009). It is also expected that increased N-supply from poultry dropping would also lead to increased microbial protein synthesis during the ensiling process. The crude protein values obtained from the silages (except for T1, 8.40%) were below the critical value of 7.7% or 70g/Kg recommended for small ruminants (NRC, 2007).This was also is lower than 11.67% to 16.04% reported by Ajayi *et al.* (2016) and 12.0 to 23.4% observed for wet brewer's grain ensiled with maize cob (Ososanya and Olorunnisomo, 2015). The difference between this study and relative studies could be linked to ensiling materials and length of storage.

The increase in fiber fractions in the silage with addition of poultry droppings may have resulted from the solubilization of the hemicellulose in corncob (Abebea, *et al*., 2004). The decreased Fiber fractions of silage diets as corn cob decreases with increasing poultry waste in this study might be due to the breakdown of the cell wall components in corncob due to hydrolysis of uric acid from poultry dropping to ammonia (Ngele *et al.*, 2006) during ensiling.

Ash content signifies the mineral level and among the treatment, Treatment 1 had the highest ash content. The ash content increased with increase in the level of the poultry droppings, this was due to higher proportion of ash in poultry dropping. T1 had the highest ash content; this might be due to the high proportion of poultry dropping in it. Ash content was higher than 5.10% to 7.49% reported by Ajayi *et al.* (2016). Ether Extract (EE) ranged significantly from 1.80% to 3.70%. The values from T2, T3 and T4 were lower when compared with 3.58% EE content observed in the study of Ajayi *et al.* (2016). Treatment 1 has the highest Ether Extract (EE) which implies that the varying proportion of the mixture reduced the EE of the treatment. Low EE in other treatments connotes that the silage is low in energy and therefore must be supplemented with high energy source.

The NDF contents of the silage ranged between 59.71% and 69.84% while the acid detergent fibre (ADF) contents ranged between 37.05% and 41.73%. The silage NDF and ADF values represent a great reduction from the corresponding respective values of the original silage material, probably due to the action of cellulolytic microorganism during the ensilage process. The resultant silage ADF and NDF values could be regarded as low to moderate when compared with low quality roughages which ruminants can readily degrade (Okoli *et al.*, 2003). Rodriquez, *et al*., (2002) indicated that ammonia has the ability to dissolve parts of the hemicellulose, releasing phenolic and acetic acids which led to break down of the NDF. These results show that poultry droppings addition and ensiling could improve nutritive value of highly fibrous feeds. The fiber fractions obtained were indicative of the potential of the rations to support rumen microbial fiber requirement. The NDF values were similar to the range reported by Ajayi *et al.*, (2014) for concentrate diet containing varying inclusion levels of corncob and higher than values (39.12-46.03%) reported by Ibhaze *et al.* (2014) for ensiled corncob based diets. The hemicellulose content increased with reduced proportion of the poultry dropping, while the cellulose content reduced as the proportion of the poultry dropping increased.

Calcium (Ca) level falls within the range of (0.07% - 0.35%). The value of Ca gotten in this study is below the theoretical calcium requirement of 0.30% needed for all forms of production in ruminants (Khan *et al* 2006b) except for T1 which had 0.35%. However, phosphorus content were significantly different in all the treatment. The phosphorus level range between (0.19% - 0.59%). Comparing the value gotten from the study with the recommended critical level of phosphorus, the result falls within the range recommended for grazing animals of 0.25% by McDowell (2003) and it is higher than 0.15% recommended by NRC (2007).

Acceptability of the ensiled mixtures by West African Dwarf goats is presented in Table 4. The CoP and Pp of the diets varied significantly (P<0.05) across the diets. For all the silages, the CoP (0.81- 1.17) and the overall percentage preference ranged from 20.33 - 29.32%. When CoP is equal or greater than 1, the diet is considered to be acceptable and when CoP is less than 1, the diet is assumed to be unacceptable to livestock. Treatment 2 had the highest CoP (1.17) followed by Treatment 1 (1.15), followed by Treatment 3 (0.86) and Treatment 1 had the least CoP value (0.81). This implies that Treatment 2 and Treatment 1 were preferred and accepted by the Ram and Treatment 4 and Treatment 3 were rejected. The order of preference was T2 > T1 > T3> T4. The result further showed that acceptability was highest for T2 with values 1.17 and 29.32 % as CoP and Pp respectively. Intake and preference of the animals could be attributed to proportions of poultry droppings and corncob in the mixture. Poultry manure ensiled with whole corn or sorghum forages have been reported to improve fermentation quality, feeding value, palatability and digestibility in cattle, goats and sheep (Kim *et al*., 2000).

Apparent digestibility of WAD goats were significantly (P>0.05) different across the treatments. DM digestibility was highest in goats fed Treatment 1 (73.97%) and lowest in goats fed Treatment 4 (68. 14%). The high digestibility values obtained for T1 and T2 could be due to the higher level of protein and low fiber content in the diet which influenced microbial protein synthesis, facilitated fermentation and consequently improved intake and digestibility. Mc Donald *et al.* (2002) reported that the digestibility of the dry material can be influenced by the composition of the feed material, the comparison between the composition of the feed materials with other feed ingredients, feed treatments, enzyme supplementation in feed, livestock and feeding level The values obtained in this study is higher than 64.05% reported by Fajemisin *et al.*, (2013) for Poultry litter treated corncobs fed to WAD goats and 43.05- 50.04% reported by Ibahaze *et al*., (2014) for DM digestibility of ensiled mixtures of corncobs, cassava peels and brewers' grain by WAD goats.

Crude protein digestibility coefficient was highest in sheep fed diet T1 (78.39%) and lowest in rams fed diet T4 (25.56%). Animals on T1 (78.39%) digested more crude protein similar to those of rams from T2 (65.11%) but higher than those on T3 (34.67%) and T4 (25.56%). Indeed animals fed with diet T4 had low protein digestibility. The CP digestibility obtained in this present study (except those from T1) were lower than 70.46% reported by Fajemisin *et al.*, (2013) for Poultry litter treated corncobs fed to WAD goats but higher than 48.71- 52.41% reported by Ibahaze *et al*., (2014) for DM digestibility of ensiled mixtures of corncobs, cassava peels and brewers' grain by West African Dwarf goats.. The observed lower digestibility of animals fed T3 and T4 agreed with the submission of (Okolo *et al.,* 2012) that protein digestibility decreased with decreasing levels of dietary protein. Variations observed in CP digestibility in this study could be linked to the source of the protein, CP content in the diet (percentage inclusion of poultry droppings in the diets) and solubility in the rumen. The high CP digestibility observed in goats fed treatment 1 is an indication that the silage contained highly soluble and degradable nitrogen. Uric acid is the principle nitrogen (N) component of poultry excreta which degrades more slowly than urea (Abdel-Baset and Abbas, 2010) creating a favourable ammonia pattern for efficient utilization in ruminants.

Previous reports have shown that CP content and nutritive value of low quality crop residues improved when treated with poultry dropping (Oji *et al.,* 2007) and adequate nitrogen enhanced the activities of rumen microbes which eventually improved the CP digestibility in the diets**.**

Crude fibre digestibility was fairly good. Animals on T3 recorded the lowest rumen crude fibre degradation compared to those on T2 and T1. The variation could be associated with the ability of the animal to utilize the nutrients and also the nature of the feed. Eniolorunda, *et. al.,* (2008) reported that highly degradation of cell wall fraction of corn cob enhanced the ability of ruminant animal to process structural carbohydrate in the rumen and obtained desirable nutritional benefit to the animal. The value obtained in this study (24.49-42.35%) was lower than the 65.27% obtained by Fajemisin *et al., (*2015) who WAD sheep Poultry treated corncob. Generally, animals on T4 digested more of the fiber in the diets offered to them than those in T1, T2 and T3.

5.0 CONCLUSION

The study has shown the potential of corncob-poultry droppings silage as a livestock feed resources in the dry season. The results obtained from this study revealed improved nutritive potential of ensiled corncob with poultry droppings. Corncobs low in protein can be fortified with protein sources by ensiling with poultry droppings; Ensiling improved the nutritive value of crop residue. The addition of poultry dropping and pineapple pulp did improve the nutritive quality of the corn cobs after ensiling. The study showed that ensiling corn cob with poultry dropping improved and sustains ruminants during period of feeds insufficiency. Also, provide a better utilization of wasteful corn cob and poultry dropping to feedstuff so as to improve farmers that practice intensive ruminant management. However, for effective ensiling of corn cob and poultry dropping, it is therefore recommended that it should be formulated with adequate available feed addictive to enhance the quality and acceptability of the feedstuff by the ruminants.

RECOMMENDATIONS

Based on the findings, the following recommendations are necessary:

1. Ensiling corncob (40%), poultry dropping (40%), and pineapple pulp (20%) was found to meet the recommended nutrient requirement.

2. It was deduced from this study that T1 (corncob (40%), poultry dropping (40%), and pineapple pulp (20%)) was found to be superior to other experimental diets because of increased level of poultry droppings.
3. Based on the low calcium content, supplemental mineral premix should be provided to meet the recommended mineral requirement.
   For further study, higher level of poultry dropping and lower level of corncob should be ensiled to improve the mineral content of the silage

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