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Silage Quality and Preference of Elephant grass (Pennisetum *purpureum*) with Varying Levels of Poultry dropping and Cassava Peel by West African Dwarf Goats

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ABSTRACT

In this study, elephant grass ((Pennisetum purpureum) was ensiled with varying levels of poultry dropping and cassava peel (CSP). Silage characteristics and chemical composition of the silage mixtures were determined in the laboratory while preferences of West African Dwarf (WAD) goats for the mixtures were assessed using eighteen (18) WAD goats. The treatments were: T1: P. purpureum (60%), poultry dropping (40%), dry cassava peel (0%); T2: P. purpureum (60%), poultry dropping (30%), dry cassava peel (10%); T3: P. pupureum (60%), poultry dropping (20%), dry cassava peel (20%); T4: P. purpureum (60%), poultry dropping (10%), dry cassava peel (30%); T5: P. purpureum (60%), poultry dropping (0%), dry cassava peel (40%) and T6: P. purpureum (100%). All the mixtures formed good silage, except the silage with the highest proportion of poultry dropping (T1) and acidity (pH) ranged from 6.75 to 3.80 (T1 and T5 respectively) while colour varied from pale to light green with dark brown and white speckles as proportion of cassava peel in the silage mixture increased. All silages had firm texture with pleasant and slightly alcoholic smell. Dry matter (DM) content of silage increased as proportion of cassava peel in the mixture increased while crude protein (CP) and (NDF) reduced. DM, CP and CF varied from 27.00 to 54.00%, 8.46 to 10.72% and 28.52 to 60.52 %, respectively. The preference by goats was 11.22, 20.44, 20.71, 21.78, 22.56 and 32.28% for T5, T4, T6, T3, T2 and T1 respectively. These results revealed that the silage properties, chemical composition and acceptability of elephant grass silage by WAD goat were enhanced by the addition of cassava peel and poultry dropping to elephant grass
Keywords : Elephant grass, Silage, Chemical composition, Acceptability, WAD Goat

I. INTRODUCTION

The most critical constraint for profitable livestock production in developing countries is the uneven and insufficient supply of quality forage. The availability of green forage is mostly seasonal, only in rainy season, when plant growth is high. The seasonal scarcity can considerably be reduced by conserving the surplus forage during high fodder availability period. Ensiling is the process of preserving a forage crop and its nutrients to feed later on. According to Kung *et al.* (2000), the primary purpose of making silage is to maximize the preservation of original nutrients in the forage crop for feeding at a later date. The fermentation quality of silages has a major effect on feed intake, nutrient utilization and milk production in ruminants (Huhtanen *et al.*, 2002, 2003). Silage-making has great potential to solve seasonal shortage of feed for ruminants by preserving excess forage produced during the wet season for use at the dry period. However, nutritive value of silage prepared from tropical grasses and agricultural wastes is often limited by their low protein content (Gallaher and Pitman, 2001). Yunus *et al.* (2000) stated that the quality of silage made from tropical herbages are generally of low fermentation quality as silage do not contain large amount of lactic acid but considerable acetic acid.

Elephant grass ((*Pennisetum purpureum*) is a high yielding tropical grass with great potentials for making silage. It is a very versatile species that can be grown under a wide range of conditions and systems: dry or wet conditions, smallholder or larger scale agriculture. It is found in most parts of the humid tropics where it is usually rejected by ruminants while grazing but readily accepted when chopped and stall-fed. It is a valuable forage and very popular throughout the tropics, notably in cut-and-carry systems (Mannetje, 1992; FAO, 2015). Low levels of fermentable carbohydrates in elephant grass may, however, limit its use as a silage material, hence there is need to mix with highly fermentable carbohydrates to enhance its silage value. Elephant grass silage has a low fermentation quality leading to reduced intake and digestibility. Preservatives can be used to improve silage quality. Quality of this grass can improve with addition of a readily fermentable carbohydrate like cassava peel which is cheap and available in large quantities in Nigeria. The high starch content in cassava peel (Onua and Okeke, 1999) will also improve energy concentration in the tropical grass silage.

Cassava (*Manihot esculenta*) is known as a highly productive tropical crop that is traditionally cultivated to produce roots for human consumption or for starch production. Cassava peel is a waste from processing cassava root which is used extensively as a feedstuff in Nigeria (Ahamefule *et al.*, 2006) and contains high levels of fermentable carbohydrate. It is available throughout the year and constitutes an important supplement to ruminant animals when dried or a nuisance to the environment when left to rot in open spaces during the wet season. Although it has a low protein content, its high starch content makes it a cheap and valuable source of energy (Onua and Okeke, 1999). The presence of hydrocyanic acid in cassava peels (Bradbury *et al.,* 1999) poses a serious risk to livestock. However, when it is ensiled, concentration of this compound is reduced to safe limits for livestock feeding (Asaolu, 1988; Okeke *et al.,* 1985). Ensiling elephant grass with cassava peels has been shown to improve its acceptability and feeding value to ruminants (Olorunnisomo, 2011; Olorunnisomo *et al.,* 2012).

Poultry droppings and cassava peel can be ensiled to meet the animals need for a well-balanced nutrient during dry season while high starch cassava peel (Onua and Okeke, 1999) provides the mixture with fermentable carbohydrate and energy, poultry dropping will help to improve the protein content. This study, therefore, presents nutritive value and preference of WAD goats for elephant grass ensiled with varying levels of cassava peel and poultry droppings.

II. MATERIALS AND METHOD

EXPERIMENTAL SITE

The research was carried out at the small ruminant unit of Teaching and Research farm of Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo state, Nigeria. Elephant grass was harvested from the arable session of the Teaching and Research farm, Ladoke Akintola University of Technology Ogbomoso. Poultry droppings was gotten from the poultry unit of the Teaching and Research farm of Ladoke Akintola University of Technology and cassava peel was gotten from a reputable garri processing industry in Ogbomoso.

ENSILING PROCESS

Fresh *Pennisetum purpureum* harvested were wilted overnight in order to reduce the moisture content after which they were chopped in to pieces of about 2-3cm using forage cutter. The chopped material with the poultry dropping (PD) and the dry cassava peel (DCP) were mixed thoroughly to avoid being bias as follows:

T1: *P. purpureum* (60%), poultry dropping (40%), dry cassava peel (0%);
T2: *P. purpureum* (60%), poultry dropping (30%), dry cassava peel (10%);
T3: *P.pupureum* (60%), poultry dropping (20%), dry cassava peel (20%);
T4: *P. purpureum* (60%), Poultry dropping (10%), dry cassava peel (30%);
T5: *P. purpureum* (60%), poultry dropping(0%), dry cassava peel (40%) and
T6: *P. purpureum* (100%).

After 28 days, fermentation was terminated and the silage samples were opened for quality assessment. The assessed quality characteristics were colour, aroma, texture, pH and temperature according to (Olorunnisomo and Ososanya , 2015). Immediately the silage was opened, a laboratory thermometer was inserted to determine the temperature. The pH of the silage was determined using a pH meter. Colour assessment was ascertained using visual observation with the aid of colour charts. The aroma of the silage was relatively assessed as to whether nice, pleasant, fruity or pungent. Sub-samples from different points and depths were taken and mixed together for dry matter determination by oven drying at 65°C until a constant weight was achieved. The samples were later milled and stored in an air-tight container until ready for chemical analysis

Table 1 : Silage Physical Characteristics Measures Scale

	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	most 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

Source: Olorunnisomo and Ososanya, 2015

EXPERIMENTAL ANIMALS MANAGEMENTAND PREFERENCE STUDY

Twelve (12) matured West African dwarf goats, weighing average of 7.5kg were used for the preference trial. The animals were housed together in a free stall with dwarf walls and concrete floors covered with wood shavings. They were treated against internal and external parasites using ivermectin and housed in one group inside a pen. Each 1kg serving was presented in two separates feeding troughs, thus making a total of (12) feeding trough at a time. The positions of the feeding troughs were randomly changed on a daily basis to avoid any of the animals associating particular experimental silage to a particular position. Fresh water was also offered daily on a free choice basis. Intake of silage was measured four (4) hours after they were offered by deducting remnants from the amount served, and animals were subsequently allowed to graze for the rest of the day.

Coefficient of preference (CoP) was used as an index of acceptability while percentage preference (PP) was used as a preference index. The coefficient of preference (COP) was calculated as the ratio of individual silage intake to the average intake of all silages. When values are equal to 1 or greater, the forage is considered to be acceptable to the animals but when values are less than 1, the forage is considered to be unacceptable (Babayemi, 2007). The preference using relative preference index (RPI) was calculated by dividing the total intake of each silage mixture by the total intake of the most consumed silage mixture. The results obtained were then multiplied by 100 (Larbi *et al.*, 1993). The RPI was used in ranking the silage mixtures. Preference (%) was calculated as the ratio of individual intake to total intake multiplied by 100.

TREATMENT	pH	TEMPERATURE
T1	6.75^{a}	34.25^{a}
T2	5.55^{b}	32.70^{b}
T3	4.70^{c}	32.75^{b}
T4	4.30^{d}	32.90^{b}
T5	3.80^{e}	32.80^{b}
T6	4.50^{cd}	32.20^{b}
SEM	0.08	0.32

Silages were ranked based on percentage of preference (Olorunnisomo, 2011). The silage eaten most (highest DMI) was ranked 1 and the least eaten ranked 5; the other silages were ranked between 2 to 4.

CHEMICAL AND STATISTICAL ANALYSIS

Crude protein, crude fibre, ether extract and ash contents of the silage were carried out in triplicates as described by AOAC (2005) and the amount of CP was calculated (N x 6.25). The fibre components including neutral detergent fibre, acid detergent fibre and acid detergent lignin were determined according to Van Soest *et al.* (1991).)

Data were analyzed using analysis of variance by following the procedure of SAS (SAS, 2002). Significant differences between the means was separated using the Duncan's multiple range test at 5% probability level.

RESULT

The physical characteristics of the ensiled *P. purpureum* with poultry droppings and cassava peel silage are presented in Table 2. The ensiled *P. purpureum* with poultry droppings and cassava peel in varying proportion were similar in their properties ranging from light brown to dark brown in colour fairly pleasant to very pleasant smell, and firm texture. The temperature of all the silage ranges from 32.3-34.8^{0}c.

Table 2 shows the pH of ensiled *P. purpureum* with poultry droppings and cassava peel silage. The pH of the silage ranged from 3.80-6.75. Treatment 1 has the highest pH(6.75) which differed significantly from Treatment 5 with the lowest pH (3.80)

Table 2 : pH AND TEMPERATURE OF *Pennisetum purpureum* ENSILED WITH DRY CASSAVA PEEL AND POULTRY DROPPING

T1: *P. purpureum* (60%), poultry dropping (40%), dry cassava peel (0%);
T2: *P. purpureum* (60%), poultry dropping (30%), dry cassava peel (10%);
T3: *P. purpureum* (60%), poultry dropping (20%), dry cassava peel (20%);
T4: *P. purpureum* (60%), poultry dropping (10%), dry cassava peel (30%);
T5: *P. purpureum* (60%), poultry dropping (0%), dry cassava peel (40%) and
T6: *P. purpureum* (100%).

Table 3 : SILAGE QUALITY COLOUR, TEXTURE AND ODOUR OF *Pennisetum Purpureum* ENSILED WITH DRY CASSAVA PEEL AND POULTRY DROPPING

Treatment	Colour	Texture	Odour
T1	Dark Brown	Firm	Fairly Pleasant
T2	Dark Brown	Firm	Fairly Pleasant
T3	Dark Brown	Firm	Fruity
T4	Pale Green With Dark Brown And White Speckles	Firm	Fruity
T5	Pale Green With Brown And White Speckles	Firm	Fruity
T6	Light Brown	Firm	Pleasant

T1: *P. purpureum* (60%), poultry dropping (40%), dry cassava peel (0%);
T2: *P. purpureum* (60%), poultry dropping (30%), dry cassava peel (10%);
T3: *P. purpureum* (60%), poultry dropping (20%), dry cassava peel (20%);
T4: *P. purpureum* (60%), poultry dropping (10%), dry cassava peel (30%);
T5: *P. purpureum* (60%), poultry dropping (0%), dry cassava peel (40%) and
T6: *P. purpureum* (100%).

Presented in Table 4 is the chemical composition (% DM) of ensiled *Pennisetum purpureum.* The silage was significantly influenced by the varying proportions of poultry droppings and cassava peel. Dry matter content of the silage ranges from 27.00-54.00%, the lowest is T_6 and the highest is T_1. Crude protein was from 8.46 to 10.72% in T5 and T6. Crude fibre ranged between 9.0 and 36.05 %, the lowest was treatment 2 and the highest treatment 6. Ash content was significantly highest (33.10%) in T1 with the highest proportion of poultry waste and lowest (10.45%) in T4. Ether extract ranged from 2.20-2.50. NDF content of the silage was from 28.52 to 60.52%, ADF: 14.0 to 40.80%, ADL: 6.00 to 21.90%.

Table 4 : CHEMICAL COMPOSITION OF ELEPHANT GRASS ENSILED WITH POULTRY DROPPING AND DRY CASSAVA PEEL

Treatment	DRY MATTER	CP	Ash	EE	NDF	ADF	ADL	HEMI	CELLULOSESE
T1	54.00^{a}	10.72^{a}	33.10^{a}	2.55^{a}	60.52^{a}	40.80^{a}	21.90^{a}	19.73^{b}	18.90^{a}
T2	48.05^{ab}	10.72^{a}	13.59^{b}	2.30^{bc}	52.85^{b}	31.78^{b}	17.10^{b}	21.08^{a}	14.68^{b}
T3	43.00^{b}	9.00^{c}	12.35^{c}	2.40^{ab}	30.90^{d}	16.00^{d}	7.55^{d}	14.90^{d}	8.45^{c}
T4	46.60^{b}	9.65^{b}	10.45^{e}	2.20^{c}	33.75^{c}	16.95^{c}	9.65^{c}	16.80^{c}	7.30^{d}
T5	47.15^{b}	8.46^{d}	11.45^{d}	2.40^{ab}	28.52^{f}	14.00^{e}	6.00^{e}	14.52^{ed}	8.00^{dc}
T6	27.00^{c}	8.66^{cd}	11.48^{d}	2.20^{c}	29.90^{e}	15.50^{d}	7.40^{d}	14.40^{e}	8.10^{dc}
SEM	0.35	0.13	14.02	0.05	0.18	0.24	0.19	0.14	0.29

a, b, c means within the same column without common superscript differs significantly ($P<0.05$)
SEM- standard error of mean

T1: *P. purpureum* (60%), Poultry Dropping (40%), dry cassava peel (0%);
T2: *P. purpureum* (60%), poultry dropping (30%), dry cassava peel (10%);
T3: *P. purpureum* (60%), Poultry Dropping (20%), dry cassava peel (20%);
T4: *P. purpureum* (60%), Poultry Dropping (10%), dry cassava peel (30%);
T5: *P. purpureum* (60%), poultry dropping(0%), dry cassava peel (40%)and
T6: *P. purpureum* (100%).
C P- crude protein; EE- Ether Extract; CF- crude fibre;NDF- neutral detergent fibre
ADF- Acid detergent fibre; ADL- Acid detergent lignin; HEMMI- hemicellulose

Table 5 shows the preference of West African dwarf goat fed ensiled *Pennisetum purpureum* with poultry droppings and cassava peel. After the experiment, the preference was calculated from 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, CoP of T1 and T2 had CoP less than 1. The CoP varied between 0.20 to 1.35. Percentage of preference ranged from 11.22% to 32.28%. The ranking was based on percentage of preference and the order was T5>T3>T2>T6>T4>T1.

Table 5 : PREFRENTIAL STUDY OF ELEPHANT GRASS ENSILED WITH POULTRY DROPPING AND DRY CASSAVA PEEL FED

TREATMENT	COEFFICIENT OF PREFRENCE	DRY MATTER	% preference	Ranking
T1	0.20^{d}	72.80^{d}	32.28^{d}	6th
T2	0.67^{c}	248.60^{c}	22.56^{a}	5th
T3	1.31^{a}	482.60^{a}	21.78^{a}	2nd
T4	1.23^{b}	453.00^{b}	20.44^{b}	4th
T5	1.35^{a}	500.00^{a}	11.22^{c}	1st
T6	1.24^{b}	459.00^{b}	20.71^{b}	3rd
SEM	0.02	5.66	0.26	

T1: *P. purpureum* (60%), Poultry Dropping (40%), dry cassava peel (0%);
T2: *P. purpureum* (60%), poultry dropping (30%), dry cassava peel (10%);
T3: *P. purpureum* (60%), Poultry Dropping (20%), dry cassava peel (20%);
T4: *P. purpureum* (60%), Poultry Dropping (10%), dry cassava peel (30%);
T5: *P. purpureum* (60%), poultry dropping(0%), dry cassava peel (40%)and

T6: *P. purpureum* (100%).

DISCUSSION

All the mixtures formed good silage except the silage with the highest proportion of poultry droppings.

The elephant grass ensiled with higher content of cassava peel had a lighter green colour than those with little or no cassava peel. All the silages prepared had a pleasant and acceptable smell except the one with highest level of poultry dropping having fairly pleasant smell because of the foul smell of ammonia. This is due to increase in ammonia concentration with increase in the level of poultry dropping in the mixture. However, it appears that the smell improved with increasing level of cassava peel in the mixture. All the silages were firm in texture. The pH of the ensiled mixtures reduced with increasing level of cassava peel inclusion, showing that addition of cassava peel was effective in improving fermentation characteristics of the tropical grass silage.

Kung and Shaver (2002) in their interpretation of silage analysis stated that good quality grass and legume silage pH values in the tropics range between 4.3 and 4.7. The pH of the silages observed ranged from 6.75 to 3.8. The pH of silage from T2 (5.55) to T6 (4.6) were within the acceptable range of 3.5 -5.5 for good silage (Obua, 2005; Menesses *et al.,* 2007). The acidity (pH) decreased from 5.6 to 3.9 as proportion of cassava peel in the silage mixture increased, showing that cassava peel improved fermentation of elephant grass silage. This trend was also observed when cassava peel was ensiled with elephant grass and legume forages (Olorunnisomo, 2011; Olorunnisomo and Fayomi, 2012). However the pH (6.75) which falls within the slightly acidic, in the silage with the highest proportion of poultry dropping showed that it was not a good silage. The pH of the other silages were within acceptable range for good silage in the tropics (Bilal, 2009; Nhan *et al.*, 2009).

Silage usually preserves the original colour of the pasture or any forage ensiled (Mannatje, 1999). Colour of silages varied from dark brown colour, pale green with dark brown and white speckles, light green with brown and white speckles to light brown. It 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 smell/odour of the silages had a pleasant and slightly alcoholic smell typical of fermented cassava. The silages with cassava peels exhibit pleasant alcoholic aroma which is typical of fermented cassava which is relished by ruminants and is an indication of well made silage. Kung and Shaver (2002) reported that pleasant smell is accepted for good or well- made silage. Good silage usually preserves the original colour of any forage and has a pleasant and fruity smell which is characteristic of good quality silage which was well preserved (Oduguwa *et al.,* 2007; Obua, 2005). This confirms earlier reports that cassava peel had a positive influence on silage characteristics of tropical forages (Olorunnisomo and Adesina, 2014). All the silages were firm in texture though with varying degree of moistness.

The colour, smell and texture of silage apparently improved with higher proportions of cassava peel in the mixture. This confirms earlier reports that cassava meal or peel had positive influence on silage characteristics of tropical forages (Oliveira, 2008; Olorunnisomo, 2011). The temperature of fermenting forage varying from 27^0c to 38^0c was presumed to produce excellent silage (Muck, 1996). The temperature range appears to be the operating temperature for normal silage fermentation, good quality silage should be cooled at opening and at feed-out phase having a normal room temperature (McDonald *et al* 1995). Bolsen *et al* (1996) reported that any excessive heat production can result in Millard or browning reaction which can reduce digestibility of protein and fibre components. The useful proteins form complexes with carbohydrate and thereby making them less digestible. Temperature is one of the essential factors affecting silage colour. The lower the temperature the better the silage, the less the colour change.

The dry matter (DM) (%) content of the silages ranged from 24.84% (diet 1) to 31.31% (Diet 5) and increased with the inclusion of cassava peel in the silage mixtures.

This agrees with the findings of Olorunnisomo and Fayomi (2012) and Olorunnisomo and Adesina (2014), when they ensiled different legumes or elephant grass with cassava peels and ensiled moringa leaf with different levels of cassava peels. The increase in DM across diets may be attributed to the relatively high dry matter of cassava peels.

The crude protein (CP) of the silage mixtures decreased with increasing levels of cassava peels and ranged from 8.50% for diet 5 to 19.24 % for diet 1. This could be attributed to the level of CP of cassava peel, however, the CP meets the critical protein requirement of ruminants which is 7.7% or 70g/kg DM (NRC, 1981) and the minimum protein content recommended for ruminant diets is 10 – 12% (ARC, 1980) hence; animals fed elephant grass silage with high proportion of cassava peel (40% of the mixture) may need extra protein supplementation.

Ash content is useful in assessing the quality grading of leaves and also gives an idea of amount of mineral element present in the elephant grass. The ash content of silage with high proportion of poultry dropping was higher compared to those with high cassava peel content. This is largely a reflection of the high mineral content reported for poultry dropping .This indicates that addition of poultry dropping may serve as a good source of minerals in ruminant diets. Poultry litter has high concentrations of nitrogen, phosphorus, potassium, and micro minerals such as copper and zinc (Oviedo-Rondon, 2008; Lima *et al.*, 2016). This indicates that poultry dropping may serve as a good source of minerals in ruminant diets.

The value of Ether extract in elephant grass is an indicator of higher energy level for the animal (Babayemi and Bankole, 2006) and this is a major form of energy store in plant which has been utilized by the animal for body maintenance and production. The crude fibre content of the sample was within the range of 15-20% recommended for improved intake and production in finishing ruminant (Buxton, 1996). The crude fibre level in the grass silage is generally low compared with conventional ruminant forage. This may have a negative impact on normal rumen function and fat content of the milk when offered as a basal diet to lactating ruminants; hence dairy cows fed elephant grass silage should be grazed or fed additional roughage. This result indicates that cassava peel improved energy concentration in the silage and could enhance feed utilization. This agrees with the observation of Oliveira (2008) who reported improved nutrient utilization in elephant grass ensiled with increasing levels of cassava meal. This probably represents the optimum protein–energy ratio in the silage mixtures, leading to optimum conditions for rumen microbes and improved digestibility (Preston and Leng, 2009). A similar observation was made when sweet potato foliage and root were mixed in different proportions for sheep. Nutritive value was optimized when the foliage and root were mixed in equal proportions (Olorunnisomo, 2008).

There were significant differences ($P<0.05$) in coefficient of preference (COP) and % preference of the goats for the various silage mixtures. Coefficient of preference, dry matter intake and percentage preference vary significantly amidst all the silages. When CoP is equal or above unity, the silage is considered to be acceptable and when CoP is below unity, the silage is assumed to be unacceptable to livestock. Preference indices showed that goats prefer silages with higher proportions of cassava peel as CoP of T3,T4,T5 and T6 were above unity (1.31, 1.23, 1.35 and 1.24 respectively) while T1 and T2 with high proportion of poultry dropping had CoP below unity (0.20-0.67.) indicating that they were poorly accepted by the animals. Based on % preference, the order of preference by goat in this study was; T5 being highest and most preferred followed by T3, T6 and T4 while T1 and T2 were poorly accepted by the animals. This trend indicates that addition of cassava peel to elephant grass greatly enhanced its acceptability by goats, while increase in poultry dropping decreased the acceptability of the goat. Coefficient of preference

(COP) showed the degree of acceptability of these silage by WAD goats.

However, it had been noted in some previous studies (Olorunnisomo and Fayomi, 2012;Ososanya and Olorunnisomo, 2015) that CoP may not be a realistic measure of acceptability of diets by ruminants since it does not take into consideration the previous experience of the animals or the importance of changing dietary preference of animals. Percentage preference (PP) appears to be a more realistic index of acceptability since it does not foreclose the possibility of changing dietary performance among livestock (Ososanya and Olorunnisomo, 2015). Ikhimioya and Imasuen (2007) reported that small ruminants readily accept silage with which they have had previous experience while Provenza and Cincotta (1994) reported that pre-conditioning of small ruminant to a particular silage influence their choice among a variety of diet. There are number of factors that may influence acceptability of silage by small ruminants: plant physical structure and chemical composition are the most important factors that influence preference (Babayemi, 2009 and Van soest, 1994). Preference of herbage is a result of available choices, physical and chemical characteristics of the plant material where measuring of voluntary intake through cafeteria trials is used to infer preferences. (Amole *et al* 2011). With the range of PP values observed in this study (11.22 to 32.28%) as indices, the experimental silage could be said to be preferred in the following order: T5>T3>T6>T4>T2>T1. In other words, the animals would opt for the silage with higher proportion of cassava peels in preference to silage with higher proportion of poultry dropping. This shows that the goats preferred elephant grass silage with 20-40% cassava peel and reject elephant grass silage no cassava peel or less than 20% cassava pee and 20-40% poultry dropping. This trend indicates that addition of cassava peel to the silage greatly enhanced its acceptability by goats.

III.CONCLUSION

The results showed that silage characteristics in terms of colour, aroma, texture, pH and temperature were similar among the silage except for those with higher proportion of poultry dropping were within the acceptable properties of well-made silage. Silages with high poultry dropping and no cassava peel exhibited poor silage characteristics and were rejected by the experimental animals.

The preference ranking based on preference showed that treatment 5 with 40% cassava peel and 0% poultry droppings was most preferred. This trend indicated that addition of higher cassava peel and lower poultry dropping to elephant grass greatly enhanced its acceptability by goats. Cassava peel and poultry dropping is readily available, it is recommended that it forms at least 20% of silage made from elephant grass to improve productivity of goats in Nigeria as feed resource in dry season.

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