COEFFICIENT OF PREFERENCE OF *Panicum maximum* AND CASSAVA LEAVES ENSILED WITH DIFFERENT ADDITIVES BY WEST AFRICAN DWARF GOATS

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Abstract
This study was carried out to investigate silage quality, chemical composition and coefficient of preference (CoP) of *Panicum maximum* and cassava leaves ensiled using four different additives such as cracked maize, pineapple, cassava peel, and sugarcane chaff at different ratio. Six treatments were formulated viz; A (50% *Panicum maximum*+30% cassava leaves +20% cracked maize), B (50% *Panicum maximum*+30% cassava leaves +20% pineapple peel), C (50% *Panicum maximum*+30% cassava leaves +20% cassava peel), D (50% *Panicum maximum* +30% cassava leaves +20% sugar cane), E (100% *Panicum maximum* and F (100% cassava leaves). Fermentation was done for 28 days. Silage quality and chemical composition was determined. All the silages were fed to 13 WAD goats in a cafeteria method to determine the coefficient of preference (CoP). Data obtained were analyzed using ANOVA. Silages had pleasant and sweet odour, acceptable olive green colour, dry and moist texture, cool temperature at opening and pH range of 4.22 to 4.76. The crude protein (CP) ranged from 9.86% to 23.13%), Ash ranged from 8.81% to 11.40%), Ether extract (EE) ranged from 2.53% to 3.71%, Neutral detergent fiber (NDF) ranged between 57.43 and 69.19%, Acid detergent fibre (ADF) ranged between 38.13 and 53.15% while Acid detergent lignin (ADL) ranged between 13.46 and 19.56%. Tanin ranged between 0.017 and 0.37%, Saponin ranged from 0.217 and 0.289%. Feed intakes ranged from 0.55kg to 1.9kg. The highest COP was observed in treatment A (1.76) while the lowest was in treatment C (0.55).It was therefore concluded that treatment A was the most preferred among the diets.

Introduction
Ruminant livestock feeding system typically depends mainly on the use of native grasses, legumes and some foliage. During the dry season, the quantity and quality of these natural forages undergo drastic reduction (Babayemi, 2006) grasses wilt and most of the trees and shrubs lose their leaves. The consequent scarcity of forage thus compels the animals to consume higher quantity of less palatable species, which result in reduction of about 50% of the live weight gained during the wet season and consequently increases mortality. There is substantial restriction on the productivity of domestic goats despite ability to survive decrease in natural forage in dry seasons.

Over the years, innumerable ways of combating the problem of dry season feeding in ruminant production have been suggested. The exclusive use of roughages and concentrates has been identified as the major helping tool in this situation. Considering the current environmental degradation coupled with the recent increase in human population and their corresponding demand for animal protein, these solutions are becoming inadequate and can no longer guaranty an all year round production of animal protein. Ultimately, the critical economic situation of marginal farmers in developing countries often makes it impossible for them to afford concentrates for commercial feeding. Hence, this necessitates the use of local natural

resources as sustainable alternatives (Baraza *et al*., 2008), Little research effort have been stimulated to explore the potential benefit of Guinea grass and Cassava leaves as silage for feeding ruminant in dry season. Several research results have also shown that fodders conserved in form of hay and silage also play significant role in the maintenance of ruminant productivity during this critical period. However in making silage, additive is needed to reduce oxygen and increase acidity rapidly, so that lactic acid bacteria grow to stabilize and preserve the foliage, also to reduce the pH more rapidly so as to preserve protein and carbohydrates and inhibit the growth of micro-organisms that might deteriorate the silage (Weinberg and Ashbell, 2000). The cost and availability of commercial silage additives especially molasses are often limiting factor. Crop residues or agro-industrial by-products can also serve as alternative additives. It is also important as crop residues contain polyphenoids and tannins that are known to inhibit microbial fermentation during ensiling. Four different additives for ensiling that are easily available in town were selected which have a nutritional value for ruminants animals. It includes Pineapple peel, Cassava peel, Sugarcane, and Maize.

Materials and Methods

Silage making

Guinea grass was harvested at 6week old re-growth from an established pasture land, Cassava leaves were also obtained from a post harvested cassava plantation. The two forages were chopped into 2 - 3cm length for ease of compaction and consolidation for silage and wilted for 12 hours in order to reduce the moisture content. 50% *Panicum maximum,* 30% cassava leaves and 20% each of the four different additives were ensiled. Filling and compaction was done simultaneously to eliminate inherent air. The silages were prepared in 10 kg polythene bags which serve as silo, the polythene bags were sealed and compressed with piles of heavy sand bag in 60 L buckets. Fermentation was done for 28 days. Six treatments were formulated viz; A(50% *Panicum maximum*+30% cassava leaves +20% cracked maize), B(50% *Panicum maximum*+30% cassava leaves +20% pineapple peel), C(50% *Panicum maximum*+30% cassava leaves +20% cassava peel), D(50% *Panicum maximum* +30% cassava leaves +20% sugar cane), E(100% *Panicum maximum* and F(100% cassava leaves). After 28 days, the fermentation was terminated and the silage was opened for silage quality. The assessed quality characteristics were colour, aroma, texture, pH and temperature according to Babayemi and Igbekoyi (2008). Immediately the silage was opened, a laboratory thermometer was inserted to determine the temperature; pH meter glass electrode was inserted to determine the pH. 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.

Chemical and statistical analysis

Crude protein, crude fiber, ether extract and ash content of the silages were carried out in triplicates as described by AOAC (1995). The fiber components including neutral detergent fiber, acid detergent fiber and acid detergent lignin were determined according to Van Soest *et al.,* (1991). Quantitative determination of tannins, saponnins and phytates were also carried out in triplicates, using the method of AOAC (1995). Data were analysed using descriptive statistics and ANOVA at $p = 0.05$.

Acceptability Study

The study was conducted at sheep and goats unit of Federal College of Animal Health and Production Technology. Eight healthy West African Dwarf goats were used to determine the coefficient of preference (CoP) of the silages in a cafeteria technique for seven days. 2kg each of the silages were served daily in six different feeding troughs to the animals. 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 all the feed samples (Karbo *et al.,* 1993). On the basis, a feed was taken to be relatively preferred if the CoP value is greater than unity.

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

Results and Discussion

It was observed that the fermentation characteristics of the ensiled forages are normal and accepted, the temperature is cool, the texture is firm and moist, and the aroma is pleasant. The color is brownish green which shows the normal characteristics of good silage. pH ranged from 4.22 to 4.27. The crude protein content of all the silages ranged from 23.13% to 9.86% which can meet the protein requirement of ruminant and some exceed the minimum recommended range of 7.0% to 8.0% for efficient functioning of the rumen micro organism and higher than the range of 11.0% to 13.0% known to be capable of supplying adequate protein for maintenance and moderate growth in goats (NRC, 2000). It was also observed that treatment D has the highest fiber content while treatment F has the lowest which ranged from 33.29% to14.23%, high level of the fibre have been acknowledge to be inversely related to digestibility and nutrient availability (Mc Donald *et al*., 2005) Dietary fibre contribute significantly to be balancing of nutrient requirement in goats it plays a pivotal role in goats production through its influence in the interaction of the intake and digestion of nutrient. Dietary fiber intake influence mastication and rumen fermentation. In growing goat, high level of fibre depresses intake and reduces the growth rate, the ash content of the silages range from 11.29% to 8.87%. The anti nutritional factor of the ensiled forages were saponin, phytate and tannin, were determined in all the diets used. saponin is high in treatment (0.289) and low in E(0.217) . Tannin follow the same trend. The positive effect of tannin is to improve protein supply to the small intestine while the negative effect of high level of tannin reduces growth and causes health disorder. Phytate was high in E (0.245) and low in A (0.144), phytate helps preventing chronic disease in animals but it is considered anti nutrient because it binds minerals in the digestive tract making them unavailable to the body (Sehlemmer *et al*.,2009). Feed intake(kg) was highest in A (1.9kg) followed by C (1.17kg), D (1.07kg), F (0.97kg),B (0.92kg), and lowest in E (0.55kg).It was also observed that intake was directly proportional to coefficient of preference i.e. the higher the intake, the higher the co efficient of preference of (1.73kg), while F and B were similar .Coefficient of Preference (CoP) is a direct measure of acceptability and nutritional capabilities of a feedstuff. In recent times, cafeteria techniques have been used to assess the acceptability of some forage, Babayemi *et al*., 2006, silage with CoP ranging above unity were accepted or preferred.

Table 1: Fermentation characteristics of the ensiled forages

Samples	A	B	C	D	E	F
Colour	Brownish green	Brownish green	Brownish green	Brownish green	Brownish green	Brownish green
Aroma	Pleasantly alcoholic	Pleasantly alcoholic	Pleasantly alcoholic	Pleasantly alcoholic	Pleasantly alcoholic	Pleasantly alcoholic
Texture	Firm	Firm	Firm	Firm	Firm	Firm
pH	4.26	4.25	4.23	4.22	4.26	4,27

Table 2: Chemical composition of the ensiled forages

SILAGE SAMPLE	%CP	%DM	%ASH	% CF	%EE	%NDF	%ADF	%ADL
A	12.68^{b}	55.15^{a}	9.22^{c}	31.20^{c}	3.18^{ab}	63.91^{c}	49.43^{c}	16.53^{c}
B	11.50^{bc}	26.21^{d}	8.81^{d}	33.29^{a}	2.53^{b}	69.19^{a}	53.15^{a}	19.56^{a}
C	12.70^{b}	30.85^{c}	9.77^{b}	32.29^{ab}	3.12^{ab}	61.49^{d}	47.35^{d}	15.76^{c}
D	11.86^{bc}	25.34^{d}	9.29^{c}	31.33^{bc}	2.85^{ab}	57.43^{e}	38.13^{e}	13.46^{d}
E	9.86^{c}	34.65^{b}	11.40^{a}	29.75^{d}	2.74^{b}	65.34^{b}	51.46^{b}	18.08^{b}
F	23.13^{a}	30.56^{c}	11.29^{a}	14.23^{e}	3.71^{a}	63.55^{c}	50.45^{bc}	16.88^{c}
SEM	0.389	0.168	0.063	0.181	0.158	0.232	0.297	0.209

Table3: Anti Nutritional Factors of the ensiled forages

SILAGE SAMPLE	%Saponin	%Tannin	%Phytate
A	0.237^{ab}	0.020^{b}	0.144^{e}
B	0.239^{ab}	0.017^{b}	$0.162d^{e}$
C	0.257^{ab}	0.026^{ab}	0.190^{c}
D	0.217^{b}	0.017^{b}	0.173^{cd}
E	0.289^{a}	0.037^{a}	0.245^{a}
F	0.270^{ab}	0.027^{ab}	0.222^{b}
SEM	0.010	0.003	0.003

Table 4: Feed Intake and CoP of Ensiled Forages

Silage Sample	**Feed Intake(Kg)**	**Cop**	**Ranking**
A	1.9	1.73	1
B	1.07	0.98	3
C	1.17	1.07	2
D	0.92	0.84	5
E	0.55	0.50	6
F	0.97	0.89	4

Conclusion

The chemical composition of ensiled forages revealed that they have good level of nutrient, the Crude Protein meet the protein requirement of ruminants and capable of supplying adequate protein for maintenance and moderate growth and coefficient of preference shows good acceptability level which is guaranteed in cracked maize silage.

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