Effect of maturity stage and processing on chemical composition, *in vitro* gas production and preference of *Panicum maximum* and *Pennisetum purpureum*

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Abstract

The trials arranged in 2 x 2 x 2 factorial completely randomized design to evaluated the selection preference of Guinea grass (Panicum maximum) and Elephant grass (Pennisetum purpureum) of four and eight weeks regrowth served either fresh green chop or pelleted using 12 intact Muturu calves in a 15 min cafeteria. The diets were served to animals either individual or in group. The CP content of the grasses ranged from 105 to 133 g/kg DM with pelleted panicum at 8 weeks old having the highest CP. Pelleted grasses of 4 week old had the lowest (P<0.05) NDF in the trial. Panicum pelleted at 4 weeks old recorded the highest (P < 0.05) sequential in vitro gas volume of 5.25 ml/200g while the volume of gas produced by pelleted grasses was higher (P < 0.01) than the fresh grasses. Pennisetum pelleted at 8 weeks old had the highest (P<0.05) ME of 6.18 MJ/kg DM. Age at harvest influenced preference as forages harvested at 4 weeks old had higher intake. Group feeding also influenced forage preference. Correlation analysis showed that DM, SCFA, and ash contents have poor (P> 0.01) capacity to preference of forages. Forage preference considered in terms of intake rate indicated that growing calves preferred fresh P. maximum 4 week old to the other samples used in this study. It is concluded that in order to optimize DM intake farmers should consider the type of grasses and their age at harvest particularly for Muturu. Pelleting improves acceptability of forages when rejected by animal as fresh forage form due to advanced age.

Keyword: pelleting; muturu calves; panicum; pennisetum; age at harvest

Introduction

Ruminants' production in the tropics and sub-tropics regions of the world largely depends on natural pastures and crop residues. Seasonal shortages and low nutritional value of these feed resources constitute the most widespread technical constraints to livestock production in small holder crop-livestock systems (Abate et al., 1992). Shortage during the dry season in turn affects the livestock industry in terms of weight gain, reproduction, growth rate, productivity. Ajayi (2008) reported that if grass of any age is effectively managed, it can strategically be exploited to ameliorate forage scarcity in the off season. However, acceptability of such grasses influences its intake and invariably its utilization. The amount of grass forages given and eaten depend on several factors based on plant-animal relationships that would also determine whether farmers' objectives would be realized. 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. Little has been done on cattle preferences of tropical grass species under zero grazing situations. Similarly, there is paucity of information on factors determining animal choice of tropical grass forages equally harvested for stall-fed. Therefore, since ruminants according to Babayemi and Bamikole (2006) are the best assessors of the nutritive value of any feed, as they always consume more of the forages that are high in protein than the high lignin containing grasses, Muturu cattle breed which is a variety of West African Shorthorn, adapted and naturally selected to be tolerant to trypanosomosis, ticks and tick-borne diseases (Adeniji 1983) was used thee determine forage preference of two tropical grasses harvested at two different ages and served either fresh or pelleted . Such information can also aid in identifying key species, explain shifts in diet quality and animal performance and assist in developing grazing programs.

Materials and Methods

The experiment was carried out at the research paddock and laboratory of the Department of Pasture and Range Management, College of Animal Science and Livestock Production, University of Agriculture Abeokuta, located on latitude 7°13' 49.46"N, longitude 3°26' 11.98"E of Ogun State, Nigeria (Google Earth, 2006). Guinea grass (*Panicum maximum*) and Elephant grass (*Pennisetum purpureum*) of four and eight weeks regrowth collected were staged to provide forage regrowth either 4 or 8 weeks at the time needed either for pelleting or for fresh green chop. The forages for pelleting was harvested with a flail cut harvested and were chopped into 5-6 cm using a reel cutter. They were immediately dehydrated at 120^0 C (panicum) and 150^{0}C (pennisetum). The temperature difference was to achieve approximately similar moisture since pennisetum has larger stems than panicum. After dehydration the dried forage was milled with a hammer mill fitted with 3 mm sieve and pelleted using a 6mm mesh size to produce pelleted hay of average length of 4 cm. Water was used as the binding agent.

Cafeteria study

A total of 12 pure bred Muturu calves of ages ranging from 9-12 months old were used. The cattle pens were thoroughly washed and disinfected. The animals were dewormed (using Albendazole) and dipped to destroy both internal and external parasites before the experiment. All the animals were housed in a roofed shed in well ventilated individual pens (1.5 x 3 m) for the duration of the experiment. Each pen had water and a feed trough. An initial adaptation period of 7 days was used to accustom the animals to the pen conditions as the animals were fed with *Andropogon gayanus* grass and concentrate.

Preference for forages fed individually

One kg of each sample of green chopped forage were measured and served each animal daily. Feed was delivered into cafeteria style feeders placed in a feed pen that consisted of four containers (10.6 in. deep x 16.5 in. wide x 18.5 in long) with the containers placed at each end of the pen being empty to nullify any border bias. Calves were fed at same time with containers positioned randomly in the manger at each feed delivery. At the end of 15 min, the feeding bowls were withdrawn and the left-over in the plastic feeding bowls weighed and recorded to determine the intake per 15 min. This trial was recorded for 7 days. Each day the position and order of placement of the forages before the animals was rotated throughout of the trial to avoid conditioning and learning effects. After collection of the left overs, the animals were allow to graze.

Preference for forages offered jointly

In a second feeding experiment, all the animals were released in same holding yard. The animals were trained for 4 days to eat from four food boxes at equidistance in the yard using a small amount of *Andropogon gayanus* in each food box. After training (i.e., all animals learned to eat from all boxes), a 7 day trial was conducted.

Table 1: Chemical and mineral composition (g/kg DM) of both green chopped and pelleted *P. maximum* and *P. purpureum* harvested at two stages of growth.

Interaction	DM	CP	CF	EE	ASH	K	P	Mg	Ca
P. maximum									
4 Pelleted	947^{a}	105^{b}	160^{c}	24^{a}	171^{a}	33.4	4.09^{a}	1.67	14.7^{b}
8 Pelleted	936^{a}	147^{a}	150^{c}	20^{ab}	110^{bc}	31.6	3.25^{bc}	1.50	23.0^{a}
4 green chopped	722^{b}	129^{ab}	330^{b}	24^{a}	125^{b}	30.0	2.69^{c}	1.58	16.5^{b}
8 green chopped	722^{b}	115^{ab}	400^{a}	12^{c}	95^{bc}	26.5	2.79	1.33	13.3^{c}
P. purpureum									
4 Pelleted	951^{a}	129^{ab}	150^{c}	16^{bc}	90^{bc}	27.6	1.82^{b}	1.38	13.4^{c}
8 Pelleted	932^{a}	115^{ab}	160^{c}	18^{abc}	80^{c}	26.5	3.94^{a}	1.33	17.7^{b}
4 green chopped	702^{c}	133^{ab}	380^{ab}	21^{ab}	125^{b}	26.5	3.93^{ab}	1.33	17.5^{b}
8 green chopped	707^{c}	115^{ab}	370^{ab}	12^{c}	110^{bc}	26.8	2.56^{ab}	1.29	17.2^{b}
SEM	1.88	0.41	2.36	0.37	0.65	1.64	3.29	0.08	1.21
Interaction									
S	*	**	**	**	NS	*	**	NS	**
A	NS	NS	NS	*	**	*	*	**	**
P	**	NS	*	NS	NS	NS	**	NS	NS
S x A	NS	NS	NS	**	**	NS	*	**	**
S x P	**	NS	**	NS	**	NS	NS	NS	**
A x P	**	NS	**	**	NS	NS	NS	NS	**

[abc]: means in the same column with different superscripts are significantly different ($P < 0.05$), ** $P < 0.01$., * $P < 0.05$., NS: Not Significant;

DM: Dry matter; CP: Crude protein; CF: Crude fibre; EE: Ether extract; K: Potassium; P: Phosphorus; Mg: Magnesium; Ca: Calcium; S: Species;

A: Age at harvest; P: Processing

Table 2: Fibre fraction (g/kg DM) of both green chopped and pelleted *P. maximum* and *P. purpureum* harvested at two stages of growth.

Treatment	ADF	NDF	ADL	HEM	CELL
P. maximum					
4 Pelleted	130e	420^{c}	105	211^{c}	198^{d}
8 Pelleted	260^{d}	527^{ab}	120	272^{a}	238c
4 green chopped	310^{c}	530^{ab}	100	227^{b}	303^{b}
8 green chopped	410^{a}	560^{b}	91.0	227^{b}	433^{a}
P.purpureum					
4 Pelleted	130^{e}	400^{c}	105	131^{b}	340^{abc}
8 Pelleted	270^{d}	550^{b}	101	239^{b}	351^{ab}
4 green chopped	380^{b}	590^{a}	75.1	236^{b}	419^{a}
8 green chopped	380^{b}	590^{a}	115	216^{c}	419^{a}
SEM	2.13	1.89	1.03	1.06	4.68
Interactions					
S	NS	NS	NS	**	NS
A	**	**	NS	NS	**
P	**	**	NS	NS	**
S x A	NS	NS	NS	**	**
S x P	NS	NS	NS	NS	NS
A x P	NS	**	NS	NS	NS

[abc:] means in the same column with different superscripts are significantly different ($P < 0.05$), ** $P < 0.01$., * $P < 0.05$., NS: Not Significant

ADF: Acid detergent fibre; NDF: Neutral detergent fibre; ADL: Acid detergent lignin; HEM: Hemicellulose; CELL: Cellulose

S: Species; A: Age at harvest; P: Processing

The four forages of known weights were placed in heaps in an enclosed yard into which animals were released. At the end of 15 min, the amount of grass remaining was weighed and recorded. The order of the presentation of the feed was altered in the following days of the trial to avoid any form of biasness. The two trials were repeated for pelleted forage samples after two weeks.

Feed preferred were assessed from the total dry matter intake throughout the experiments. A forage type was said to be preferred by animals to the others when its intake is more than others.

Laboratory Analysis

At the end of each collection, samples of green chopped forages and the pelleted were dried at 60 ^{0}C for 3 days, they were then milled in a Thomas-Wiley mill (2 mm sieve) and composited for subsequent analysis. The DM content, ash, Ether extract (EE) crude fibre (CF) and CP (N x 6.25) was determined by the method of AOAC (1990). Neutral detergent fiber (NDF), ADF and acid detergent lignin (ADL) determinations were done according to Robertson and Van Soest (1981). *In vitro* gas production was completed according to the procedure described by Menke and Steingass (1988).

Estimation of data

Metabolizable energy was calculated as ME = 2.20 + 0.136GV + 0.057cp + 0.0029 CF (Menke and Steingass, 1988). Organic matter digestibility (OMD) calculated as

OMD = 14.88 + 0.889GV + 0.45CP + 0.651 XA (Menke and Steingass, 1988).

Short chain fatty acids (SCFA) as 0.0239GV – 0.0601 (Getachew *et al*., 1999);

Where GV is the total volume of gas produced at 72 hours, CP is the crude protein, CF is the crude fibre, XA is the ash DMI=1.66 + 0.49a +0.0297b – 4c.

Statistical analysis

The trials were arranged in 2 x 2 x 2 factorial completely randomized design. The statistical analysis was completed using all data generated from the experiment in analysis of variance (ANOVA) using General Linear Model (GLM) procedures of SAS 2001 and separation of treatment means was done using Duncan Multiple Range Test.

Results

The chemical composition of either chopped or pelleted Panicum and Pennisetum harvested at 4 or 8 weeks regrowth is presented in table 1. There was a significant ($P<0.05$) three-way interaction among grass species, age at harvest and processing methods on the DM, CP, CF, EE, Ash, P and Ca content of the grasses. The CP content of the grasses ranged from 105 to 133 g/kg DM with pelleted panicum at 8 weeks old having the highest CP. The interaction effect of species and age at harvest, species and processing was not significant ($P<0.01$) on the CP content of the grasses, however the main effect of species showed that Panicum had higher ($P<0.01$) CP than Pennisetum in this trial. DM values were higher ($P<0.01$) in panicum when green chopped at both 4 and 8 weeks than in Pennisetum of similar ages, while the DM remain similar when the forages were pelleted at both ages. The CF contents of the grasses were influenced by the interaction of species, processing and age at harvest of the forages. Among the treatments, green chopped Panicum at 8 weeks old had greater ($P<0.05$) CF content compared to others. The main effect of processing and species significantly ($P<0.01$) reduced the values of CF in both species.

The neutral detergent fibre (NDF) values, which constitute the cell wall of the grasses

Table 3. *in vitro* gas production characteristic, sequential gas volume and post incubation parameters of the forage diets.

Forage diets	b (ml/200mgDM)	c (ml/hr)	Absg (ml)	Lagtime (hr)	ME (MJ/kg DM)	OMD (%)	SCFA (µmol/g)	Sequential Volume of gas (ml)			
								6	12	24	36
P.maximum											
4weeks Pelleted	32.43	0.03	1.41	0.16	5.22^{b}	46.41^{a}	0.36^{ab}	5.25^{a}	10.50^{a}	17.50^{ab}	22.25^{abc}
8weeks Pelleted	40.02	0.27	1.23	1.39	5.60^{a}	45.10^{a}	0.38^{a}	3.75^{abc}	9.20^{b}	18.50^{ab}	25.25^{ab}
4weeks green chopped	30.77	0.91	0.82	4.07	3.85^{bc}	34.19^{bc}	0.08^{bc}	0.00^{c}	2.50^{c}	6.00^{bc}	9.50^{bc}
8weeks green chopped	18.57	1.22	0.56	5.35	3.72^{bc}	31.16^{c}	0.07^{c}	0.50^{bc}	2.00^{c}	5.50^{c}	10.25^{bc}
P.purpureum											
4 weeks Pelleted	44.98	0.03	1.12	1.77	6.18^{a}	47.47^{a}	0.50^{a}	3.50^{abc}	11.00^{a}	23.50^{a}	30.00^{a}
8 weeks Pelleted	43.23	0.44	0.85	0.66	4.61^{abc}	36.41^{abc}	0.24^{abc}	3.50^{abc}	7.00^{b}	20.00^{a}	16.00^{abc}
4weeks green chopped	37.12	0.02	0.45	1.74	5.79^{a}	46.78^{a}	0.42^{a}	4.00^{ab}	7.30^{b}	12.50^{b}	28.00^{a}
8 weeks green chopped	28.32	1.29	0.33	2.05	3.51^{c}	30.80^{c}	0.04^{c}	2.00^{abc}	2.00^{c}	4.00^{c}	7.00^{c}
SEM	19.51	0.24	0.89	0.60	0.25	1.77	0.04	0.49	0.91	1.82	2.32
Interactions											
S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A	NS	NS	NS	NS	NS	**	NS	**	**	**	NS
P	NS	NS	NS	NS	**	NS	NS	NS	**	**	NS
S x A	NS	NS	NS	NS	**	**	**	NS	NS	NS	NS
S x P	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A x P	NS	NS	NS	NS	**	**	**	NS	**	**	NS

^{bc}: means in the same column with different superscripts are significantly different ($P < 0.05$), ** $P < 0.01$., * $P < 0.05$., NS: Not Significant

: maximum rate of gas production; c: fractional rate of gas production; Absg: absolute initial gas production during first hour

OMD: organic matter digestibility; ME: Metabolizable energy; SCFA: short chain fatty acid were influenced by the interaction of grass species, processing and age at harvest. The NDF values ranged between 400 and 590 g/kg DM. Pelleted grasses of 4 week old had the lowest ($P<0.05$) NDF in the trial. The main effect of species and processing as well as their interaction influenced the NDF content of the grasses. The NDF content of both species pelleted at 4 weeks old were lower than those pelleted at 8 weeks old.

Interaction of grass species, processing and age at harvest affected the ADF content of the grasses as well as their single effect. Pelleted panicum of 8 week old had greater ($P<0.05$) ADF content compared others. The interaction of species and age at harvest on the ADF of the grasses were similar ($P>0.01$). The ADF content of both species pelleted at 4 weeks old were lower than those pelleted at 8 weeks old while pelleting also lower ($P<0.01$) the ADF content of each species.

The EE contents of the grasses were influenced by the interaction of species, processing and age at harvest of the forages. The effect of age and processing was similar ($P>0.05$) within each species of grasses while the 8 weeks old green chopped forages recorded the lowest EE content. Interaction of grass species, processing and age at harvest influenced the ash content of the grasses. The ash content ranged from 90 and 171 g/kg DM with 4 weeks old pelleted Panicum having the highest ash content. Species interact with age harvest and also with processing influenced ($P<0.01$) the ash content of both grasses while age at harvest with processing did not.

The phosphorus (P) content of panicum and Pennisetum were dependent on the interaction between species and age at harvest, and the main effect of each of the factors. Interaction effect between species and processing resulted in higher ($P<0.01$) Ca content in pelleted panicum compared with Pennisetum but lower ($P<0.05$) Ca content in green chopped panicum compare to Pennisetum. The Magnesium (Mg) content of panicum and Pennisetum were dependent on the interaction between species and age at harvest, and the main effect of age at harvest.

The potential gas production lagtime, the volume of gas that evolved with time b, and the fractional rate of gas production c of the two grasses were not influenced by the interaction of grasses species, processing methods and age at harvest, and the main effect of each factor (Table 3). Pelleted Pennisetum at 8 weeks old had the highest ($P<0.05$) ME of 6.18 MJ/kg DM while the least was recorded when Pennisetum was harvested fresh at 8 weeks old. The interaction of species and age at harvest, and age with processing influenced the ME, OMD and SCFA content of both grasses. The OMD and SCFA content of the grasses were similar ($P>0.01$) when either pelleted at 4 and 8 weeks or green chopped at 4 and 8 weeks old. While age at harvest did not affect SCFA of the grasses, OMD was higher ($P<0.01$) 4 week old grasses compare to 8 weeks old either pelleted of green chopped. No significant observation was recorded in the gas volume until the 6th hour of incubation when panicum pelleted at 4 weeks old recorded the highest ($P < 0.05$) sequential gas volume of 5.25 ml/200g. At 24 hours, the volume of gas produced by pelleted grasses was higher ($P < 0.01$) than the fresh grasses. Panicum green chopped at 4 weeks and Pennisetum at 8 weeks recorded lower gas volume till after 36 hours of incubation.

Strong positive correlations between the dry matter intake of 4 weeks old pelleted panicum and 24h gas production and OMD ($P < 0.05$) however there was a negative

Table 4: Correlation coefficients of relationship between chemical composition, *in vitro* kinetics and diet offered

Intake	CP	DM	ash	NDF	24 hrs gas volume	ME	OMD	SCFA
P. maximum								
4 weeks Pelleted	-0.0077^{NS}	-0.7223^{NS}	-0.1711^{NS}	-0.8865**	0.055**	0.972^{NS}	0.865**	-0.345^{NS}
8 weeks Pelleted	-0.1039^{NS}	-0.1143^{NS}	-0.2286^{NS}	-0.0186^{NS}	0.971**	0.675^{NS}	0.832^{NS}	-0.466^{NS}
4 weeks green chopped	-0.5699^{NS}	-0.5688^{NS}	-0.5541^{NS}	-0.5102^{NS}	0.045**	0.624^{NS}	0.655**	-0.234^{NS}
8 weeks green chopped	0.8041**	0.8207**	0.0100^{NS}	0.2252^{NS}	-0.039^{NS}	0.746^{NS}	0.693**	-0.211^{NS}
P.purpureum								
4 weeks Pelleted	0.1773^{NS}	0.9729**	-0.4796^{NS}	-0.4176^{NS}	0.582^{NS}	0.586**	0.887**	-0.234^{NS}
8 weeks Pelleted	0.2288^{NS}	-0.0683^{NS}	-0.3455^{NS}	-0.3807^{NS}	0.045^{NS}	0.456^{NS}	-0.810^{NS}	-0.286^{NS}
4 weeks green chopped	0.1744^{NS}	-0.1562^{NS}	-0.3929^{NS}	0.3721^{NS}	-0.342^{NS}	0.593^{NS}	-0.624^{NS}	-0.393^{NS}
8 weeks green chopped	-0.4972^{NS}	0.3007^{NS}	0.1602^{NS}	0.3617^{NS}	-0.437^{NS}	0.642^{NS}	-0.593^{NS}	-0.432^{NS}

** $P < 0.05$., NS: Not Significant

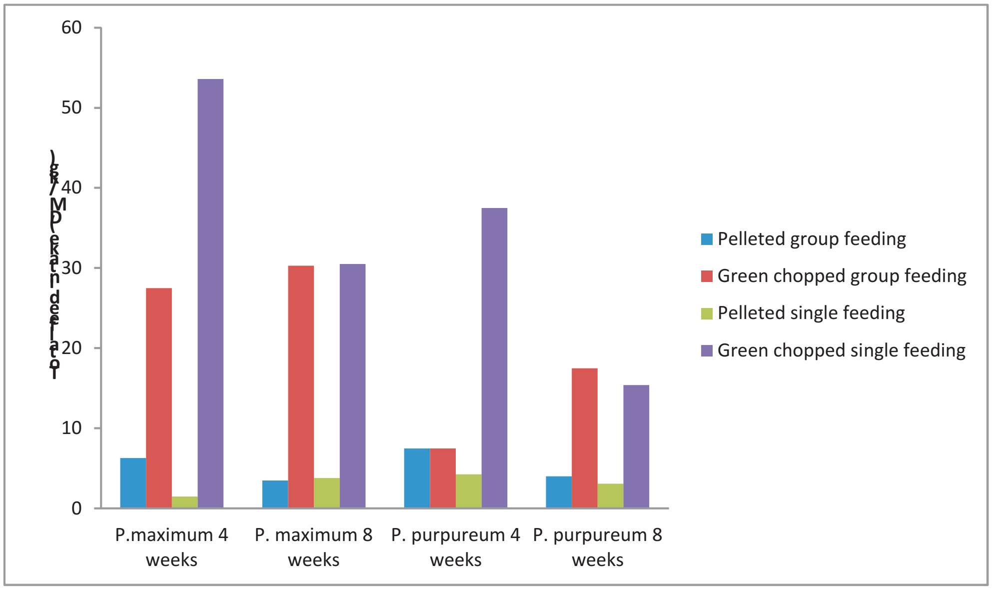

Fig. 1: Feed preference as assessed from the total intake

significant association with the NDF content of the diet. There was also a significant and positive correlation between dry matter of 4 weeks old Pennisetum and the ME and OMD of the diet (Table 4). Preference was observed using intake from the cafeteria method as recorded in figure 1. Green chopped *P. maximum* 4 weeks old was most preferred by the calves. *P. maximum* was more preferred than *P. purpureus* either green chopped or pelleted at both ages. Intake was influenced most by individual feeding method for all categories except green chopped *P purpureum* 8 weeks old where intake increased in group feeding than individual feeding method. Group feeding method increased preference for pelleted samples than when served individually. When served in group calves preferred green chopped to pelleted forages except in 4 week *P purpureum* where pelleted forage had similar intake with green chopped. Age at harvest influenced preference as forages harvested at 4 weeks old had higher intake when served individually than forages harvested at 8 weeks old. However, when served in group, calves preference for fresh forages at 8 weeks old was higher than forages at 4 weeks old.

Discussion

The assessed quality parameters of the grasses were dependent on the interaction of species, processing and age at harvest. The CP content of the grasses ranged from 105 to 133 g/kg DM and these values fall within the range reported for tropical grasses (Topps and Oliver, 1993) and well above 8 % suggested by Norton (1994) for ruminal function. The interactions of species, processing and age at harvest CP content of the grasses were similar irrespective of processing method.

The NDF values ranged between 400 and 590 g/kg DM. The values were lower than those reported by Gomez *et al.,* (2011) but comparable to values reported by Minson (1990) as typical of tropical grasses. Mtui 2009 reported no difference in NDF content between panicum, Pennisetum and certain forage grass species and the type of season. The increase in NDF with age of regrowth is related to physiological changes that occur as plant ages, that lead to a decrease in cell cytoplasm highly soluble components (cell contents), accompanied by an increase in cell wall fiber components (Nogueira *et al*., 2000). Pelleting resulted in decreased NDF content within species and age with greater reduction in the NDF content of Pennisetum than panicum. Since reduction in forage particle size greatly influences the effectiveness of fiber (Allen, 1995), this implies that intake of Pennisetum with high NDF content could be improved through pelleting.

Forage preference considered in terms of intake rate indicated that growing calves preferred fresh *P. maximum* 4 week old to the other samples used in this study. For a given plant, ingestibility, like digestibility, is dependent on the vegetation stage and the number of the vegetation cycle (Demarquilly et al., 1981). The decrease in ingestibility with age of forage is the consequence of the increase in its ₦l effect. As the plant ages, its morphological and histological development decreases the amount of cell content, which is soluble, rapidly degraded and has almost no ₦l effect, and increases the amount of cell walls. Consequently, forage retention time in the rumen and thus ₦l effect increases. In addition, tissue ligni₦cation increases the undegradable fraction of the cell walls and decreases the degradation rate of the degradable fraction (Grenet and Demarquilly, 1987).

The CP and NDF concentrations of diets are the most important factors affecting DMI. Muturu calves showed more preference for fresh *P. maximum* than *P. purpureum* in this trial. This could be as a result of the coarse and hairy morphology of *P. purpureum* because the sense of touch plays a role in the response of the animal to the feed. Physical characteristics of the forage such as hair, thorns, coarseness and resistance to fracture are known to affect ease of prehension and thus intake rate (Inoue et al., 1994). Higher leaf to stem ratio in guinea grass may also influenced its preference over Elephant grass.

Pelleted grasses has shown in this study had a greater significance in the volume of gas production which directly translates the digestibility of the feed stuff (Getachew *et al*. (2000) The volume of gas for the green chopped samples increased after 36 hours showing that fresh forages do not digest easily but needs more retention time but pelleted samples due to processing digests easily and with lesser retention time. This result is in consonance with findings of Meyer et al., (1959) where they fed chopped hay and pelleted hay made from alfalfa to sheep. They noted that carbon dioxide production by the rumen content of the pelleted hay fed sheep was greater by one and half by 4 hours after feeding than by the rumen of sheep fed chopped hay.

Digestibility has been reported to be synonymous to *in vitro* gas production. (Fievez *et al.,* 2005) so that the higher the gas production, the higher the digestibility. In relation to the harvesting ages of these forages, it could be inferred that harvesting at 4 weeks resulted digestibility of the feed. If forages are harvested at older ages, there will be decline in digestibility as stated by Kabuga and Darko (1993) with maturity for tropical grasses which has been attributed to an increase in structural cell wall components and decline in leaf to stem ratio. There was a significant negative correlation between NDF or DM content and SCFA which indicate that the major factor affecting the voluntary food intake of ruminants is the cell content and digestibility of forages (Buxton, 1996).

Group feeding tended to show increased in intake as preference for pelleted samples increased than when served individually. Mustafa et al (2009) reported that cafeteria calves show more eating behavior and less idle standing, licking object and drinking behavior which led to increased ruminating and intake in comparison to individually fed calves The instinct for completion invariably decreased idle standing which could probably result to increased intake of fresh forages at 8 weeks old as observed in the present trial than forages at 4 weeks old when served in group.

Conclusion

Forage acceptability by animals on pasture or under zero grazing conditions is a function of forage, inherent chemical traits, forage morphology as was ascertained by the observed intake and also the influenced of group feeding. Therefore, effort should encourage farmers to establish and maintain the forage species which are locally available that are also adapted to social and environmental conditions of respective areas

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