



CHEMICAL COMPOSITION, PREFERENCE STUDIES AND SHORT TIME INTAKE OF VARYING MIXTURES OF *GMELINA ARBOREA* AND *FICUS POLITA* LEAVES FED TO GROWING BUNAJI BULLS.

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ABSTRACT

In the North western part of Nigeria, there are two distinct seasons viz rainy and dry. Forage availability is seasonal. Rainy period is known with forage abundance while scarcity is experienced during the dry season. Therefore, in order to broaden the feed base for ruminants in Nigeria, Preference study was carried out on graded Gmelina arborea and Ficus polita foliage combination. Relative Preference Intake(RPI) and Short Time Intake(STI) trial was conducted for six (6) days with five (5 days) adjustment period using six (6) growing Bunaji bulls in a cafeteria feeding system. The bulls were fed 2 kg of Gmelina and Ficus leave combination for three (3) hours daily in a cafeteria system. Results shows that lowest crude protein of 13.81% was observed in Combination 4 of 20:80 Gmelina arborea and Ficus polita foliage while the highest CP of 18.63% in Combination 1 of 80:20 Gmelina arborea and Ficus polita foliage and Combination 2 of 40:60 Gmelina arborea and Ficus polita foliage. The content of ADF and NDF ranged from 10.60 to 23.82% and 18.90 to 31.77%. Combination 1 had the highest value of RPI and STI of 0.93 and 1.87(Kg DM/3hrs while Combination 4 had the lowest values of 0.49 and 0.98(Kg DM/3hrs). It was concluded that growing Bunaji bulls preferred 80:20 Gmelina arborea and Ficus polita foliage combination; thus maybe vital composition for supplemental feeding of growing Bunaji bulls.

Keywords: *Relative Preference Intake, Short Time Intake, Cafeteria feeding, Bunaji bulls, Gmelina arborea and Ficus polita.*

INTRODUCTION

The feeding of livestock accounts for over 60% of total production cost (Schoeminon, 2003). High demand and cost of conventional animal feed ingredients in the tropics have resulted in the need for sustainable alternatives which can be obtained mainly through natural feed resources indigenous to the

Northern region of the country (Abubakar and Muhamed 1992; Osagie 1998; Tian *et al.* 2007). Browse plant importance in ruminant animals feeding especially during the dry season cannot be over emphasized. Browse plants have been proved by different researchers to possess great potential as source of high quality nutrient for ruminants (Babayemi *et al.*, 2003; Okagbare *et al.*, 2004). In the quest to circumvent the constraints of lack of forage materials for livestock during the dry season, a vast numbers of browse plants have been examined and suitable ones identified for livestock during the critical period of food shortage (Omokanye, 2001). Leng (1992) reported a high crude protein of up to 34% when different fodders foliage were fed to livestock. The objective of this study was to assess the nutritive value, preference and short-term intake of *Gmelina arborea* and *Ficus polita* foliage mixture offered growing Bunaji bulls during the dry season in Northern Nigeria.

MATERIALS AND METHODS

Experimental Site

The study was carried out at the Experimental Unit of Beef Research Programme, National Animal Production Research Institute (NAPRI) Shika, Zaria Kaduna state. Shika falls within latitudes 11°8' 19.56"N and longitude 7° 45' 51.22"E with an altitude of 640m above sea level (Google earth, 2017), Shika is located within Northern Guinea Savannah Ecological zone of Nigeria with an average annual rainfall of 1,100mm which starts from late April/early May and ends mid-October, while the mean relative humidity during harmattan and wet season are 21%-72%, respectively (IAR, 2017).

Experimental animals and diet

Six experimental animals (Bunaji bulls) between the ages of 12-15 months and with an average body weight of 143kg were selected from Beef Research Programme of the National Animal Production Research Institute (NAPRI) Shika. *Ficus polita*, and *Gmelina arborea* leaves were sourced from NAPRI Shika, Kaduna State.

Experimental design

A preference trial was conducted on varying mixtures (80:20, 60:40, 40:60 and 20:80) of air-dried *Gmelina arborea* and *Ficus polita* (GAFP) leaves using 6 Bunaji Bulls for a period of six days with five days adjustment period. Two kilograms of the combined forages were offered to the experimental animals in cafeteria method of feeding, the combined forages were placed side by side in a

demarcated metal feeding trough and the animals were allowed free access to the forage at the same time for a period of three hours each day. The positioning of the combined forages was rotated daily to prevent habit reflex. Intake and left over of the different combination levels of GAFP leaves were recorded and was used to determine short term feed intake. Evapotranspiration loss in the leave combination was taken into consideration. The behavior and selectivity of the animals to each of the combination level was observed and the Relative Preference Index (RPI) was calculated using Van Dyne and Headly (1995) formula as

$$RPI = \frac{\text{Amount of feed intake}}{\text{Amount of feed offered}}$$

Based on the dietary preference index calculated, the *Gmelina* and *Ficus* leaves combinations were classified into the following five preference classes

High preference (hp) 0.77-1.00

Moderate preference (mp) 0.56-0.76

Fair preference (fp) 0.45-0.55

Poor preference (pp) 0.26-0.44

No preference (np) <0.26

Chemical analyses

Proximate analyses were conducted on *Gmelina arborea*, *Ficus polita*, different combined levels of *Gmelina* and *Ficus* to determine the dry matter (DM), crude fibre (CF), ether extract (EE), Ash and crude protein (CP) (using Kjeldahl method) as described by the AOAC (2000) methods. NFE (Nitrogen free Extract) was determined by calculation. ADF (Acid Detergent Fibre) and NDF (Neutral Detergent Fibre) was analysed using Van Soest et al. (1991) methods. Metabolizable energy (ME) was determined by equation of Alderman and Cottrill, 1985. $ME (MJ/Kg DM) = 11.78 + 0.0064 CP + (0.000665EE)^2 - CF (0.00414EE) - 0.0118A$. Where ME = Metabolizable energy, DM = Dry matter, CP = Crude protein, EE = Ether Extract, CF = Crude fiber and A = Ash. The analyses were carried out at the central laboratory, National Animal Production Research Institute, Shika Zaria.

RESULTS AND DISCUSSION

Chemical composition of graded *Gmelina arborea* and *Ficus polita* leave combination, *Gmelina arborea* and *Ficus polita* foliage.

The results of chemical composition of varied combination of *Gmelina* and *Ficus* leave is presented in Table 1. The dry matter (DM) contents ranged from 91.71 to 92.73%. The DM content range reported in this study was similar to the values obtained by some researchers Abu, (2014); Anigbogu (2003) and Ironkwe and Bamgbose (2012), but it was lower than values reported by Lamidi *et al.* (2005) and Okafor *et al.* (2017). Differences in DM content with other authors could be attributed to different browse combination, age difference, harvest season and processing (drying) method. The crude protein (CP) ranged from 13.81% to 18.63%. The crude protein content in this study was similar with the values of 16.00-18.81% and 17.84% reported by Lamidi *et al.* (2005) and by Okafor *et al.* (2017) for *Gmelina arborea* and *Moringa oleifera* mixture. However, the value was higher than the values reported by Abu (2014). The CP content in this study was higher than 10.88 % CP content, reported to be the adequate requirement for production for ruminant (NRC, 1976). ADF and NDF ranged from 10.6% - 23.82% and 18.9%-31.77% The chemical composition of the browse mixture showed that the diets contained proficient DM and CP that could help normal rumen functions (Ahamefule *et al.*,2002).

The DM of *Gmelina* and ficus foliage were 92.19% and 92.51%, respectively. The crude protein contents were 18.06% and 15.50% for *G. arborea* and *F. polita* foliage, respectively. *Gmelina arborea* ADF, NDF and Hemicellulose values were 21.13%, 30.10% and 8.97% respectively. For *Ficus polita* foliage, the ADF, NDF and Hemicellulose values were 18.58%, 33.14% and 14.56% respectively. The crude protein fell within 11 – 14% recommended by NRC to be modest for ruminant production.

Table 1: Chemical composition of graded *Gmelina arborea* and *Ficus polita*(GAFP) leave combination, *Gmelina arborea* and *Ficus polita* foliage.

Parameters(%)	Combination					
	levels(G:F)				<i>Gmelina</i>	<i>Ficus</i>
	C1(80:20)	C2(60:40)	C3(40:60)	C4(20:80)		
<i>Dry matter</i>	91.90	92.00	92.73	91.71	92.51	92.19
<i>Crude protein</i>	18.63	18.63	18.06	13.81	18.06	15.50
<i>Crude fibre</i>	11.95	11.46	9.39	8.63	15.10	10.62
<i>Ether extract</i>	16.82	15.17	14.99	13.98	13.94	13.09
<i>Ash</i>	3.01	6.19	10.07	8.91	5.84	12.84
<i>NFE</i>	41.49	40.55	40.22	46.38	39.57	40.14
<i>ADF</i>	23.82	19.23	10.60	20.70	21.13	18.58

NDF	31.77	25.30	23.13	18.90	30.10	33.14
Hemicellulose	7.95	6.07	12.53	1.80	8.97	14.56
Metabolizable energy(MJ/KJDM)	11.03	11.24	11.19	11.26	10.96	11.15

G=Gmelina F=Ficus C1-C4= combination levels NFE=Nitrogen free extract ADF=Acid detergent fibre
NDF=Neutral detergent fibre

Relative Preference index (RPI) and Short term feed intake by Growing Bunaji Bulls fed graded *Gmelina arborea* and *Ficus polita* leave combination.

The result of Relative Preference Index (RPI) and Short term feed intake by Growing Bunaji bulls fed varying combination of *Gmelina arborea* and *Ficus polita* (GAFP) is presented in Table 2. The preference index ranged from 0.49-0.93 with C1 ration of 80:20 GAFP recording the highest and being the most preferred and C4 ration of 20:80 GAFP being the least preferred combination. High preference observed in this work was in tandem with the results of Lamidi *et al.* (2005) who reported a preference index range of 0.36-0.98 for Bunaji bulls. The low preference observed in Combination 4 could be as a result of the strong odour of *Ficus polita* leaves as was reported by Abu (2014), varied nutrient content of different combination levels, particle size as stated by Jarrige *et al.* (1995), prior contact and relishing of *Gmelina arborea* leaves by the bulls. Kalio *et al.* (2006) reported that palatability and preference of green fodders are affected by plant species, form of presentation, stage of maturity, methods of processing and chemical constituents (Level of occurrence of phytochemical or other anti-nutritive factors).

Table 2:Relative Preference index (RPI) of Growing Bunaji Bulls fed graded ratios of *Gmelina arborea* to *Ficus polita* (GAFP) leave.

Combination (G:F)	Preference
C1(80:20)	0.93(hp)
C2(60:40)	0.81(hp)
C3(40:60)	0.72(mp)
C4(20:80)	0.49(fp)

G=Gmelina F=Ficus C1-C4=combination level STI=short time intake hp=high preference mp=moderate preference fp=fair preference

The result of Short term feed intake by Growing Bunaji bulls fed varying combination of *Gmelina arborea* and *Ficus polita* (GAFP) is presented in Table 3. The average daily intake ranged from 1.87 Kg DM/3hrs for C1 ration of 80:20 GAFP to 0.98 Kg DM/3hrs for C4 ration of 20:80 GAFP combination level. Lamidi

et al. (2005) reported a STI of 1.33 and 1.56kg/DM/2hrs when dried *Khaya senegalensis* and *Gmelina arborea* foliage mixed at 1:2 and 1:1 were fed to young Bunaji bulls. The contrasting result observed might be due to the quantity of feed offered to the animals, duration of access to the forage, particle size (Jarrige et al., 1995). Baumont (1996) stated that certain senses (i.e. sight, smell, touch and taste) in the feeding behaviour of ruminants affects intake, therefore the lower Intake of C4 might have been as a result of the smell which puts the animals off.

Table 3:Relative Preference index (RPI) and Short term feed intake by Growing Bunaji Bulls fed graded ratios of *Gmelina arborea* to *Ficus polita* (GAFP) leave.

Combination (G:F)	STI (Kg DM/3hrs)
C1(80:20)	1.87
C2(60:40)	1.63
C3(40:60)	1.43
C4(20:80)	0.98

G=Gmelina F=Ficus C1-C4=combination level STI=short time intake
hp=high preference mp=moderate preference fp=fair preference

CONCLUSION

As the level of *Ficus polita* was increased in the forage combination; acceptability was declining, thus diet containing 80:20 (*Gmelina arborea* : *Ficus polita*) had the highest preference and short time intake by Growing Bunaji bulls while 20:80 (*Gmelina arborea* : *Ficus polita*) was less acceptable. 80:20 (*Gmelina arborea* : *Ficus polita*) can be fed to Bunaji bulls because of its higher crude protein content, high biomass production and its acceptability by the bulls.

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