VOLUNTARY DRY MATTER INTAKE OF *PANICUM MAXIMUM* AND FOUR BROWSE SPECIES BY WEST AFRICAN DWARF GOATS

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ABSTRACT
Fifteen WAD goats aged between 7-9 months obtained from smallholder goat farmers were used for the voluntary feed intake study. The goats were placed on four browse species with *Panicum maximum* as the control diet. The treatments were: T1, *Panicum maximum*, T2: *Antocleis tavogelli*, T3: *Aspillia africana*, T4: *Microdesmis puberula* and T5: *Pterocarpus santolinoides*. Maize offal served as the basal diet. The goats were randomly assigned to the treatment diets between 1000h and 1800h daily whilemaize offal was offered at 1300h. Data were collected on voluntary feed dry matter intake, body weight gain and dry matter digestibility. Samples of test diets were dried for dry matter determination, proximate and cell wall composition. The study lasted for 70 days with 14-d adjustment and 56-d data collection periods. Results showed goats placed on *M. puberula* recorded the highest values ($P<0.05$) of forage dry matter intake ($830.2gd^{-1}$) and total dry matter. Intake ($981.7gd^{-1}$) while goats on *A. vogelli* were least in both forage dry matter intake ($253.6gd^{-1}$) and total dry matter intake ($382.9gd^{-1}$) and basal diet intake ($129.5gd^{-1}$). Goats on *A. Africana* consumed more of the basal diet ($188.3gd^{-1}$) digested more (97.1%) and gain more weight. (0.93g). Chemical composition showed browses are richer in crude protein than grasses. Browse plats can be useful supplements to low quality basal diet.

Keywords: WAD goats, forage species, voluntary intake.

INTRODUCTION
Intensification of agricultural production in the context of ruminant production systems means a broadening of the feed resources base to compensate not only for the shrinking of rangeland and natural grassland but also for the low quality and seasonal nature of the major feed source. Inadequate quantity and quality of feed is known to be largely responsible for low livestock productivity in the tropics. Fodder from several indigenous multipurpose trees and shrubs (MPTS) are commonly used by small holder livestock farmers on cut-and-carry basis for confined sheep and goats in South eastern Nigeria (Wahua and Oji, 1987). These browse species have high potentials as important feed resources for ruminants since they are evergreen, thus constituting a ready source of feed during off season feeding (Oji *et al., 2007*). The role of browse plants in maintenance and survival of ruminant animals is of great importance as more than 50% of the total dry matter intake of sheep and goats was obtained from browses (Carew *et al.*, 1980). The quantity of forage dry matter eaten is the most important factor controlling ruminant production from forages (Adegbola, 1985) and forage must be available at all times (Minson, 1990). Given their high relative abundance and potential feeding value, browse would inevitably contribute to goat diets in most feeding systems (Kamupingene and Abate, 2014).

The present study was designed to assess the voluntary dry matter intake of *Panicum maximum*, and four browse species by West African Dwarf (WAD) goats.

MATERIALS AND METHODS
The study was conducted at the small ruminant research unit of the Imo State Polytechnic Umuagwo. Fifteen WAD bucks aged 7-8 months averaging 6.8 kg liveweight were housed in clean individual pens of dimension 1.5 m x 1.5 m in dimension, dewormed and vaccinated against *peste de petit* ruminant (PPR), with clean water made available to them. The goats were assigned to five treatment diets replicated three times for 70 days with a 14-d adjustment and 56-d collection periods.

The treatments were: Treatment 1: *Panicummaximum* (control), Treatment 2: *Antocleis tavogelli*
Treatment 3: *Aspillia africana*, Treatment 4: *Microdesmis puberula*, Treatment 5: *Pterocarpus santolinoides*
The goats were offered the forage species between 1000h and 1800h daily while maize offal which served as the basal diet was offered at 1300h. Faecal materials were collected in the last seven days of data collection period. Data were collected on daily total dry matter intake, forage dry matter intake, basal diet intake, co-efficient of dry matter digestibility. Samples of the forages were dried for dry matter determination at 60^{0}C for 48h and ground in a hammer mill (Christy and Norris Laboratory mill) through a 1mm screen for chemical analyses. Proximate composition was determined by AOAC (2005) methods while fibre content: neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined by the method of Van Soest *et al.*(1991). Data were analyzed as a completely randomized design and split-plot design as well. (SAS, 2002).

RESULTS AND DISCUSSION

The chemical composition of the treatment diets are presented in Table1. Crude protein content of the forage species ranged from 6.85g kg-^{1}DM in *P. maximum* to 219.0g kg-^{1}DM in *P. santolinoides*. Crude protein content of maize offal was found to be 128.0gkg-^{1}DM. Tannin concentration ranged from 1.5g kg $^{-1}$DM in *M. puberula* to 3.3gkg-^{1}DM in *A. africana.* Mean values for NDF ranged from 433.4g kg-^{1}DM in *A. Africana* to 619.9g kg-^{1}DM in *P. santolinoides*. The ADF values ranged from 351.4g kg-^{1}DM in *A. Africana* to 426.5g kg-^{1}DM in *P. santolinoides* whereas ADL values ranged from 90.0g kg^{-1}DM in *P. maximum* to 180.5g kg^{-1}DM in *M. puberula*. Voluntary feed dry matter intake, body weight gain and co-efficient of dry matter digestibility (Table 2) were significantly different. (P<0.05).Goats on *M. puberula* had the highest forage dry matter intake (830.2 gd^{-1})while goats on *A.vogelli* had the least. Goats on *A. Africana* had the highest intake (P<0.05) of the basal diet (188.3gd^{-1}). Similarly, co-efficient of dry matter digestibility of *A. Africana* and *P. santolinoides* was significantly higher (P<0.05) than in other browses including the control, but goats fed *A. Africana* gained more weight (0.93kg). Table 3 shows the mean feed dry matter intake of the goats with weekly feed dry matter intake as the main plot.Data onBDI, FDMI and TDMI of the goats (Table 3) varied from week to week. Intake of the basal diet (189.0gd^{-1}) was highest in week eight and least in week one (98.3gd^{-1}), recording a drop in week five. Forage dry matter intake was highest in week five. Forage dry matter intake was highest in week five. (700.2gd^{-1}). The highest TDMI was recorded in weeks five and eight (837.2gd^{-1} and 871.9 gd^{-1}) respectively showing a weekly interaction. Forage dry matter intake and TDMI were positively correlated (r = 0.99).
The observed CP values were within the range in values of 6.85g kg^{-1}DM and 219.0g kg^{-1}DM reported by Okolie *et al.* (2003). The low CP content of *P. maximum* (6.85g kg^{-1}DM) could be due to an increase in NDF values (Larbi *et al.*, 2005). Besides, browses are richer in CP than grasses (Smith, 1991). The relatively high tannin content of *A. Africana* (3.3g kg^{-1}DM) could be responsible for the low dry matter intake of the browses. Palatability and feed intake reducing effect of high tannin concentration have been identified by Kalio *et al.* (2006).Data on BDI, FDMI and TDMI showed significant treatment by week interaction. This is because appetite of the goats varied from day to day (Minson, 1990). Goats on *M. puberula* had the highest TDMI but a low intake of the basal diet and conversely with goats on *A. africana,* suggesting a substitution effect (Smith *et al.*, 1995).More than 50% of the total dry matter intake of goats in this study was obtained from browses (Carew *et al.*, 1980).

CONCLUSION

The result of this study showed that browses are richer in protein than grasses and may serve as supplements to low quality basal diets. They are quite digestible. Two browse species *M. puberula* and *P. santolinoides* were consumed most by the WAD goats, hence their use in ruminant feeding programme would enhance feed utilization.

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Table 1. Chemical composition of forage species and maize offal (g kg^{-1}DM)

Forage species / Maize offal	Dry matter	Crude protein	Ether extract	Crude fibre	Ash	Nitrogen free extract	Tannin	NDF	ADF	ADL
A.vogelli	923.0	187.0	153.7	-	52.8	82.8	1.9	552.3	411.6	93.2
A. africana	909.6	180.0	151.7	-	136.2	232.8	3.3	433.4	351.4	111.0
M.puberula	931.9	181.2	124.7	-	104.0	194.7	1.5	599.6	401.0	180.5
P.santolinoides	930.3	219.0	131.5	-	67.7	144.8	2.5	619.9	426.9	139.8
P. maximum	385.0	6.8	181.5	-	90.0	457.9	-	600.0	390.0	210.0
Maize offal		128.0	117.2	120.7	54.2	499.1	-	-	-	-

Table 2. Mean voluntary dry matter intake (g kg^{-1}DM) dry matter digestibility (%), body weight gain (kg) of the goats

Parameter/	*P. maximum*	*A.vogelli*	*A. Africana*	*P. santolinoides*	*M. puberula*	X	LSD
Basal diet intake (BDI)	158.48^{bc}	129.5^{d}	188.3^{a}	160.1^{b}	151.4^{c}	189.0	8.07
Forage dry matter intake (FDMI)	490.0^{d}	253.6^{e}	696.7^{c}	776.0^{b}	830.2^{a}	682.9	37.49
Total dry matter intake (TDMI)	648.5^{d}	382.9^{e}	885.1^{c}	936.1^{b}	981.7^{a}	766.8	38.16
Co-efficient of Dry matter digestibility (%)	93.2^{b}	93.6^{b}	97.1^{a}	97.1^{a}	94.7^{b}	95.1	1.79
Body weight gain	0.83^{b}	0.62^{c}	0.93^{a}	0.86^{b}	0.88^{b}	0.85	0.05

a,b,c,d,e: means within same row with different superscripts differ significantly (P<0.05)

Table 3.Mean weekly voluntary feed dry matter intake by the WAD goats (gd-^{1})

Week	BDI	FDMI	TDMI
1	98.3^{f}	362.8^{e}	461.2^{e}
2	122.3^{e}	529.9^{d}	652.3^{d}
3	138.7^{d}	622.0^{c}	760.7^{c}
4	175.2^{bc}	645.3^{bc}	820.6^{b}
5	173.0^{c}	700.2^{a}	873.2^{a}
6	180.0^{abc}	665.4^{abc}	845.5^{ab}
7	183.4^{ab}	665.9^{abc}	849.4^{ab}
8	189.0^{a}	682.9^{ab}	871.9^{a}
LSD	10.21	47.42	48.27

a,b,c,d,e,f: means within same column with different superscripts differ significantly (P<0.05)