



Brewers dried grain and maize offal mixed in equal proportions 1:1. The effect on performance of West African Dwarf weaner bucks fed *Gmelina arborea* leaves.

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Abstract

Twenty (20) West African Dwarf bucks with average weight of 8.04 kg were randomly allocated to four treatments with five animals per treatment in a complete CRD. Treatment one (T₁) was given *Gmelina arborea* leaves *ad libitum*. Animals on treatment two (T₂), three (T₃) and four (T₄) were fed 100, 200, and 300 g/head/day of a mixture of Brewers dried grain and maize offal and *Gmelina arborea* leaves *ad libitum*. The results obtained showed that supplementation significantly increased ($p < 0.05$) feed intake, weight gain, and efficiency of feed utilization. Feed intake increases with increased level of supplement. Based on the results of the study it was concluded that supplementation of *Gmelina arborea* leaves with mixture of brewers dried grain and maize offal at the level of 200 g/head/day (T₂) gave the best performance.

Key words: WAD, *Gmelina arborea* leaves, brewers dried grain, maize offal, performance

Introduction

Nutrition has been identified as a major factor limiting ruminant animal production in Nigeria. In the northern part where over 80% of ruminants are found is faced with severe feed scarcity during the dry season and the available forages are of low quality, resulting in weight loss and high mortality in goats.

The lack of improvement in crop production and the competition between humans and animals for available grains and tubers make nutritional requirement at reasonable cost, difficult to achieve since a viable livestock industry is dependent on agro-products. The problem of seasonal fluctuation in both quality and quantity of animal feed in the tropics call for exploration of some variety of multipurpose tree and shrubs abundant all year round in the region in order to determine their suitability for livestock feeding due to non-availability of pasture lands and shrubs for feeding goats in most areas of world (Ayuk *et.al.*, 2007). In Nigeria, there is heavy weight loss and high mortality in goat due to lack of forage during

the dry season. Multipurpose trees and shrubs are important feed resources for bridging the seasonal deficit in feed quantity and quality (Okagbare *et.al.*, 2005). In Nigeria scarcity and high cost of feed stuffs have led animal nutritionist and researchers to look for unconventional and cheap sources of feeding materials (Adensi, 2000, Esonu *et al.*, 2011).

Gmelina arborea is a perennial leguminous tree which is notable for its fast growth, large green leaves and high dry matter yield (Admosun, 1988). *Gmelina arborea* leaves are considered good for ruminant because of its crude protein content of 11.9%. The proximate composition showed that *Gmelina arborea* have 73.71, 5.39, 13.60, 17.15, 23.00, 65.14, 32.30 and 34.48% of DM, ASH, EE, CF, CP, NDE, ADF and AFE, respectively (Amata and Lebari). Amata and lebari (2012) indicated that *Gmelina arborea* leaf meal contains average tannins, saponins, alkaloids, oxalate and trypsin inhibitors of 0.124, 0.313, 0.695, 0.112 and 0.021 mg/100 g of oven dried leaf sample. In a study carried out by Offor (2014), it was

revealed that mature leaves of *Gmelina arborea* contained higher levels of Saponins compared to the value by Amata and Labari (2012). The high composition of saponins and glycosides in matured *Gmelina arborea* leaves gives it the bitter taste. Okagbare *et al.* 2004 indicated that goats fed *Gmelina arborea* leaves alone lost weight which was attributed to inadequate energy intake by the goats to meet their requirement for maintenance.

Brewers dried grain (BDG) is the residue of cereal grain which resulted from the manufacture of beer. It is a rich source of essential fatty acid and vitamins especially the B-complex vitamins (Gohl, 1981). Brewers dried grain obtained at the Benue Brewery Limited, makurdi according to Dubaja (1976) is a by-product of beer fermentation which is recovered from the fermentation vats by centrifugation and cooling. Once all sugars have been removed from the grain, the residue is high in protein and fibre that is suitable for animal feeding particularly ruminants. The protein of the brewers dried grain have been shown to be resistance to ruminal degradation (Satter and Whitlow, 1977, Merchen *et al.* 1979). BDG composition and nutritional value depends on the grain used, (barley, maize and rice), the industrial processing method (temperature, fermentation) and the method of preservation. On a dry matter basis BDG contain 20.0-26.0% dry matter, 18.75% crude protein, 5.0% fat, 15.5% fibre, 0.6% calcium, 1.0% phosphorus, 4.0% starch, 2.0% sugar, 7.0% oil, 70.0% total digestible nutrient, 11.7MJ/kg net energy (Aduku, 1993).

Maize offal also known as Dusa, a by-product of maize grain obtained after dehulling. The maize is rich in crude protein (cp) and energy (McDonald *et al.* 1999) and abundantly available in all the geopolitical zones in Nigeria. Maize offal has high energy and crude protein content and is used for replacement of

other energy sources in the diet of poultry, swine and rabbit (Vantsawa *et al.*, 2007). The proximate composition of maize offal showed 87.76% dry matter, 11.00% crude protein, 9.45% crude fibre, 4.8% ether extract, 4.23% ash and 78.66% NFE (Vantsawa *et al.*, 2007).

There is little information on the utilization of brewers dried grain and maize offal mixed in equal proportion and fed at different levels as supplement to *Gmalina arborea* in goats.

This study was therefore designed to evaluate the performance of West African Dwarf weaners goats fed *Gmalina arborea* leaves alone and different levels of mixtures of Brewers dried grain and maize offal (1:1) as supplement.

Materials and Methods

The experiment was conducted in the small ruminant unit of Akperan Orshi College of Agriculture, Yandev – Gboko, Benue State. Yandev is located in Benue State within the Southern Guinea Savannah Agro ecological Zone of Nigeria. It lies between longitude 9° 02'E and latitude 7° 21' North of equator (TAC, 2018). The area is characterized by 6-7 months of rainfall which ranges from 1350 – 1400mm. the ambient temperature ranges from 34°C – 36°C with the highest in March, the lowest mean monthly temperature range of 26°C – 28°C occurs in December and January (TAC, 2002). The relative humidity is highest (69%) in August and September and lowest (39%) in January and February.

The maize offal (MO) used in this study was purchased at Gboko Market, while Brewers Dried Grain (BDG) was purchased from Benue Brewery limited (BBL), Makurdi. The maize offal and Brewers Dried Grain were sun dried and mixed at a ratio of 1:1 (i.e 49.75 % of MO and 49.75 % of BDG with 0.5 % of table salt. The experimental diet is shown in Table 1.

Table 1: Composition of Supplemental Diet

Ingredient	% Composition
Maize offal	49.75
Brewers dried grain	49.75
Common salt	0.50
Total	100

Twenty (20) West African dwarf (WAD) bucks with average body weight of 8.04 kg were sourced from Gboko and its environs. The bucks were vaccinated against Pests des Petits Ruminat (PPR), dewormed and deticked using *ivermectin* preparation before the feeding trial. Routine hygiene and medication to guard against endo and ecto parasites were taken throughout the study period. The animals were randomly allocated to four treatment diets which was replicated five times with each animal serving as a replicate in each treatment.

Experimental Diets

Diet I = 1000 g of *Gmelina arborea* leaves *ad Libitum*

Diet II = 100 g of concentrate mixture of MO/BDG which was offered three hours before serving them with the 1000 g of the *Gmelina arborea* leaves.

Diet III = 200 g of concentrate mixture of MO/BDG which was offered three hours before serving them with 1000 g of the *Gmelina arborea* leaves on.

Diet IV = 300 g of concentrate mixture of MO/BDG which was offered three hours before serving them with 1000 g of the *Gmelina arborea* leaves.

Fresh leaves of *Gmelina arborea* which served as the basal diet were harvested within the Akperan Orshi College of Agriculture Yandev

– Gboko every morning, washed, weighed and fed fresh to the goats. (T₁) was fed only fresh leaves of *Gmelina arborea ad libitum*. T₂, T₃ and T₄ were fed 100 g, 200 g and 300 g of the concentrate mixtures and *Gmelina arborea* leaves was also fed three hours after the concentrate feed was given to them. The animals were given clean water *ad libitum*. Left over were carefully collected and weighed and feed intake by difference (feed offered less the left-over) was determined. The study lasted for 98 days after an adjustment period of 14 days.

Data obtained were subjected to the Analysis of Variance (ANOVA) using Completely Randomized Design (CRD). The means were separated using Duncan's Multiple Range Test (DMRT) according to the procedures outlined by Steel and Torrie (1991).

Results and Discussion

The proximate composition of feed ingredients and experimental diets are shown in Table 2 and the result of the performance of WAD bucks as affected by the Experimental Treatments is presented in Table 3.

The crude protein (CP) content of *Gmelina arborea* 10.14%, crude fibre (CF) 34.84%, ether extract 8.79%, ash 11.25%, NFE 34.98% are not too far from the values reported by Osakwe and Udeogu (2007) who obtained 10.05%, 30.40%, 5.24%, 12.96% and 44.69% for CP, CF, EE, ash and NFE

Table 2: Proximate Composition of Feed Ingredient and Supplement (Dry Matter Basis)

Parameters (%)	<i>Gmelina arborea</i>	Brewers Grain	Dried	Maize Offal	Supplement BDG/MO)	(50:50
Dry Matter	29.59	86.62		89.62	85.95	
Crude protein	10.14	11.57		12.87	12.21	
Crude fibre	34.84	3.88		7.88	5.88	
Ether extract	8.79	2.42		6.85	4.64	
Ash	11.25	3.24		6.08	4.66	
NFE	34.98	78.89		66.32	72.61	

BDG=Brewers Dried Grain

MO=Maize Offal

respectively. The present dry matter DM of 29.59% is slightly higher than the findings of Amata and Lebari (2011) who obtained a dry matter of 25.30%. The variation in proximate composition of *Gmelina arborea* relative to other reports could be as a result of difference in strain, age, environmental and soil condition, method of analysis and the time of harvest (Catchpole, 1962; Oyediji, 2001). The proximate result obtained for maize offal shows CP 12.87%, CF 7.88%, EE, 6.85%, Ash 6.08% and NFE 66.32%, these values differed from the reported values of Vantsawa *et al.* (2007) who reported 11.00%, 44.5%, 4.80%, 4.12% and 78.66% for CP, CF, EE, Ash and NFE.

The dry matter (DM) value obtained in this study compared favourably with the findings of (Adeyele, 2008) who reported 88.95% dry matter for maize offal. The crude protein content of 11.57%, crude fibre 3.88% Ether extract 2.42%, Ash 3.24% and NFE content of 78.89% realized for Brewers dried grain differed from the findings of (Aduku, 1993) who reported 18.75% CP, 15.5% fibre, 6.10% EE, 4.72 Ash and 76.21 NFE. The present dry matter (DM) of 86.62 is higher than the one reported by (Aduku, 1993) who reported DM of 20.0 – 26.0%.

In general the disparities observed in proximate composition of by-product is captured by the

view of Oyediji (2001) who observed that the protein, fibre energy and other nutrients in these by-products differ among themselves according to source and variety and that each producer has a different method of extracting the primary products. The results obtained showed significant differences among the treatments except for the initial weight. The average daily supplement intake, daily *Gmelina arborea* intake and total feed intake increased with increased level of BDG/MO mixture. The high dry matter by the supplemented groups is in agreement with the findings of Adebawale and Taiwo (1996) who reported increase in DM intake when forages are supplemented with concentrates. The low DM intake on T₁ could be ascribed to the low CP content compared with the supplemented groups.

The daily weight gain of 26.12 g, 28.98 g and 27.45 g recorded for T₂, T₃ and T₄ respectively is within the range of 15.4 g – 28.4 g/day for West Africa dwarf goat fed agro by-product (Adebawale and Taiwo, 1996). Abubakar *et al.* (2005) reported 51.12 g – 83.4 g/day for Red Sokoto goat fed varying levels of groundnut haulm and cowpea shell as concentrate mixture. Abdelrahim *et al.* (2012) however reported 0.12 kg – 0.55 kg/day for Ewe lambs fed groundnut testa as supplement. These disparities could be due to differences in breed used as well as the type and processing method of the ingredients

used. The goats on T₁ lost weight (-12.86 g/head/day), this is agreement with earlier studies (Okagbare *et al.*, 2004) who indicated that goats fed *Gmelina arborea* leaves alone

consistently lost weight and attributed to inadequate energy intake by the goats to meet their requirement.

Table 3: The performance of WAD Bucks as affected by the Experimental Diets

Parameters		Treatments				SEM
		T ₁	T ₂	T ₃	T ₄	
Initial	mean	8.34	8.18	8.15	8.29	0.12 ^{ns}
weight (kg)						
Final	mean	7.08 ^c	10.74 ^b	10.99 ^a	10.98 ^a	0.12 [*]
weight (kg)						
Avg daily <i>Gmelina</i>		189.37 ^d	209.42 ^c	214.23 ^b	224.17 ^a	2.12 [*]
intake (g/DM)						
Avg daily conc.	-		85.19 ^c	130.88 ^a	109.72 ^b	0.59 [*]
intake (g/DM)						
Avg. total feed		189.37 ^c	294.61 ^b	345.11 ^a	333.89 ^a	26.34 [*]
intake (g/DM)						
Total weight gain		-1.26 ^d	2.56 ^c	2.84 ^a	2.69 ^b	0.11 [*]
(kg)						
Fed. Conversion		-14.73 ^b	11.27 ^a	11.91 ^a	12.16 ^a	2.12 [*]
ratio						

a, b, c, d means in the same row with different superscript differ significantly (P<0.05)

SEM = standard error of mean

* = significant (P<0.05)

ns = not significant (P>0.05)

T₁ = 0 g of concentrate /day and *Gmelina arborea* leaves

T₂ = 100 g concentrate/day and *Gmelina arborea* leaves

T₃ = 200 g concentrate/day and *Gmelina arborea* leaves

T₄ = 300 g concentrate/day and *Gmelina arborea* leaves

Total weight gain was observed to be highest on T₃ 2.84 kg and least on T₁ (-1.26 kg). The high weight gain could be attributed to the high daily feed intake recorded by bucks on T₃ (200 g) of concentrate mixture, compare to the lowest total feed intake recorded by bucks fed *Gmelina arborea* leave. The trend of the result in this study could be an indication of better acceptability, protein contribution and nutrient utilization of the diet containing concentrate. Which is in agreement with the views of (Ukanwoko *et al.*, 2009) that feed intake has been observed to be governed by dietary crude protein palatability and other factors like gut fill in WAD goats fed cassava peel based diets.

The highest final mean weight of 10.99 kg was recorded in T₃ with the least in T₁ (7.08 kg). This performance may be attributed to the relatively better nutrients density, digestibility and availability to the bucks in the concentrate diet. The diet met the minimum CP requirement required by rumen microbes for optimum activity (Uza *et al.*, 2005). Feed conversion ratio was best in T₂ though it was not significantly different (P>0.05) from other supplemented groups (T₃ and T₄) but the supplemented groups were significantly (P<0.05) different from treatment (T₁).

Conclusion

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