NITROGEN UTILIZATION OF WEST AFRICAN DWARF GROWING RAMS FED *PANICUM MAXIMUM* SUPPLEMENTED WITH DIFFERENTLY PROCESSED *Cajanus cajan* LEAVES

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Abstract
An experiment was carried out to investigate the nitrogen utilization of West African dwarf growing rams fed differently processed *Cajanus cajan* leaves and *Panicum maximum* basal diet for 56 days feeding trial which was carried out at Teaching and Research Farm of Oyo State College of Agriculture and Technology Igbo-ora, Nigeria. A total of sixteen (16) growing WAD rams between 6 - 9 months with an average body weight of 7.00 -12.00kg were randomly allocated to 4 treatments with 4 animals per treatment while 2 animals served as replicate. The experimental diet was fed at 3% body weight of individual animals while fresh, wilted, and dried forms of *Cajanus cajan* leaves supplemented at varied inclusion levels (0%, 30% fresh, 30% wilted and 30% dried) with *Panicum maximum*. There were significant ($P<0.05$) differences in all parameters determined across the dietary treatments. Animals maintained on T_2 diet had the highest intake (4.42g/d), while the lowest value (2.64g/d) for nitrogen intake was recorded in T_1 diet. Rams fed T_1 diet had the lowest nitrogen balance (0.43g/d) and the highest value (2.18g/d) was recorded in T_2 diet. Rams fed T_4 diet has the highest faecal nitrogen value (2.14g/d). However, animals maintained on T_4 diet had the highest value (1.07g/d) of urinary nitrogen. The nitrogen utilization fluctuated significantly ($P<0.05$) across the dietary treatments. It can be concluded that supplementation of fresh *Cajanus cajan forages* at 30% inclusion with *Panicum maximum* at 70% for growing rams can enhance nitrogen utilization without any deleterious effects on the animals.

Keywords: *Tropical grass, Processed Cajanus cajan forages, WAD rams, Nitrogen utilization.*

Introduction

Forages such as grasses and legumes are the main source of feed for ruminants to meet their nutritional requirements, either for maintenance or production. However, in the tropics, inadequate nutrition is a great challenge contributing to production losses in ruminants (Ibhaze, 2016) due to unavailability of forages throughout the year. This unpleasant situation has necessitated the search for alternative feed resources rich in energy and protein that are readily available and relatively cheap. Several indigenous and exotic browse species have been investigated and evaluated for inclusion in ruminant feeding systems in Nigeria (Fajemisin, 2015).

Tropical browse plants such as Pigeon pea (*Cajanus cajan*) is multipurpose nitrogen fixing crop that provides the seed as human food and poultry feed, the leaves and young stems as animal fodder for the subsistence farmers (Lorgyer, 2009). *Panicum maximum* also called guinea grass and tangayika grass (FAO, 2003) is a highly productive, palatable, persistent and acceptable grass by ruminants. It can be fed to livestock solely or with concentrates or legumes. To preserve for future use and to reduce the effects of some inherent anti-nutritive factors present in the leaves of some browse species either drying or wilting is employed at the On-farm level of production. This study was therefore designed to investigate the nitrogen

utilization by West African dwarf growing rams fed *Panicum maximum* supplemented with differently processed *Cajanus cajan* leaves.

Materials and Methods

Experimental Site and animals

The experiment was carried out at the Sheep and Goat Unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora. Sixteen (16) growing West African Dwarf rams weighing between 7.00 - 12.00kg and of 6 – 9 months of age were used. The animals were acclimatized for two weeks and treated against ectoparasites and endoparasites prior to the commencement of the experiment.

Harvesting and Processing of Experimental Diets

The forages were harvested from pasture demonstration plot of the college farm. *Cajanus cajan* leaves and *Panicum maximum* were cut at a height of 30cm above the ground level at 50% flowering stage to allow for good re-growth. *Cajanus cajan* leaves including twigs and petioles were harvested and sun dried for four to five days by spreading on concrete floor and turning thoroughly to facilitate uniform drying for save storage while the wilting were carried out for 14hours between 3.00pm - 8.00am under the shade a day preceding the feeding day. *Panicum maximum* were harvested daily (Zero grazing) and chopped manually into 3-5 cm length before feeding.

Experimental layout, Design and feeding method

The animals were allocated by weight into four treatments of four rams per treatment and two animals as a replicate in a completely randomized design (CRD). The experimental diets composition are: T_1 (100% *Panicum maximum* solely), T_2 (70% *Panicum maximum* and 30% fresh *Cajanus cajan* leaves), T_3 (70% *Panicum maximum* and 30% wilted *Cajanus cajan* leaves) and T_4 (70% *Panicum maximum* and 30% dried *Cajanus cajan* leaves). The chemical composition of fresh, wilted, and dried *Cajanus cajan* leaves and *Panicum maximum* are shown in Table 1. Each group of animals was assigned to an experimental diet, and were fed *ad libitum* while fresh water was made available.

Data Collection and Analysis

Urine and faeces were collected separately from each animal daily throughout the last seven days of the experiment in a metabolic cages. The faeces sample collected were oven dried at 80^0C until constant weight was reached. The urinary output were collected in sample bottles with plastic cover containing 20% dilute tetraoxosulphate (IV) acid and then stored at -20^0C for subsequent analysis. The faecal samples were chemically analyzed using A.O.A.C procedure (AOAC, 1995). Parameters determined on nitrogen utilization include nitrogen intake (NI), faecal nitrogen (FN), urinary nitrogen (UN) and nitrogen balance (NB). All nitrogen utilization data obtained were subjected to one-way analysis of variance (SAS, 1999). Differences among the means were separated using Duncan's multiple range test (Duncan, 1955).

Table 1: Chemical composition of fresh, wilted, and dried *Cajanus cajan* leaves and *Panicum maximum*

Parameters	Fresh *Cajanus cajan* leaves	Wilted *Cajanus cajan* leaves	Dried *Cajanus cajan* leaves	*Panicum maximum*
DM	44.50	86.60	91.48	32.80
CP	22.31	21.20	19.00	5.30
CF	25.26	26.86	27.12	22.20
EE	4.79	4.64	4.50	2.90
ASH	9.12	9.32	9.45	3.30

NDF	33.20	33.52	33.83	51.00
ADF	29.50	29.47	29.40	31.00
Lignin	10.12	11.01	12.40	13.47
NFE	15.98	24.58	8.52	66.00
M.E (Kcal/Kg)	3427.07	3804.98	3206.84	4223.06

DM=Dry matter, CP=Crude protein, CF=Crude fiber, EE=Ether extract, NDF= Neutral detergent fiber, ADF=Acid detergent fiber, NFE=Nitrogen free extract and ME= Metabolizable energy

Results and Discussion

The nitrogen utilization summary of growing West African Dwarf rams fed *Panicum maximum* supplemented with differently processed *Cajanus cajan* leaves are shown in Table 2. The nitrogen intake (4.42g/d) of rams fed T_1 diet was higher (P>0.05) than nitrogen intakes of rams fed T_3 and T_4 diets. Animals fed T_4 diet had the highest value (2.14g/d) of faecal nitrogen output than other treatment groups. The percentage of nitrogen utilization recorded in this study ranged between 16.29 to 49.32%, which fell within the range of 17 to 79% reported by Okoruwa and Adewumi (2010) for West African Dwarf Sheep. The observed values might be attributed to feed intake, protein quality and digestibility of the diet while observed nitrogen retention values corroborated the reported values by Fajemisin *et al.* (2012b). However, the nitrogen utilization values observed in this study was favourably compared to the values reported by Jokthan *et al.* (2009) for Yankasa sheep fed rice straw supplemented with Pigeon pea forage. Higher nitrogen intake of T_2 rams could be due to the fact that the diet contained more crude protein (CP) than the other dietary treatments. The observed increase in faecal nitrogen output noted in T_4 diet could be attributed to inhibitory effects of residual toxic and astringent factor condensed tannins (CTs) associated with *Cajanus cajan* forage. Okoruwa *et al.* (2013) made similar observation with West African Dwarf Sheep fed pineapple waste. Hence, the more the nitrogen consumed and digested the more the nitrogen retained and vice versa (Okeniyi *et al*., 2010). Based on this, it is logical to infer that the superior nitrogen absorbed and retained by T_2 rams might be due to the higher nitrogen intake (4.42g/d). Higher nitrogen retention by the animals fed T_2 diet indicate superior nitrogen utilization efficiency of 30% fresh *Cajanus cajan* leaves and 70% *Panicum maximum*

Table 2: Nitrogen Utilization of West African Dwarf Growing Rams fed *Panicum maximum* supplemented with differently processed *Cajanus Cajan* Leaves

Parameters	T_1	T_2	T_3	T_4	SEM
Nitrogen intake (g/d)	2.64^{b}	4.42^{a}	4.24^{a}	3.89^{ab}	0.35
Faecal nitrogen (g/d)	1.96^{ab}	1.92^{ab}	1.85^{b}	2.14^{a}	0.05
Urinary nitrogen (g/d)	0.25^{c}	0.32^{bc}	0.57^{b}	1.07^{a}	0.16
Total N output (g/d)	2.21	2.24	2.42	3.21	0.21
Nitrogen balance (g/d)	0.43^{cd}	2.18^{a}	1.82^{b}	0.68^{c}	0.37
Nitrogen utilization (%)	16.29^{d}	49.32^{a}	42.92^{b}	17.48^{c}	4.12

$^{a\,b\,c\,d}$ *Means on the same row with different superscript are significantly different (P< 0.05*).

Conclusion

The findings from this study revealed that *Panicum maximum* supplemented with differently processed *Cajanus cajan* leaves has a good nutrient profile for feeding small ruminant animals. The results showed that feeding 70% *Panicum maximum* and 30% fresh *Cajanus cajan* leaves to growing rams tends to be palatable, acceptable and can increase their nitrogen utilization. Hence, incorporating fresh *Cajanus cajan* leaves into growing ram diets can solve the problem of inadequate nutrients due to shortage of feed during the dry season faced by smallholder ruminant farmers and enhance their performance characteristics.

Recommendation

Based on the result of this research, it can be recommended that *Cajanus cajan* leaves and *Panicum maximum* could be incorporated into the diet of WAD sheep at 30% fresh form of *Cajanus cajan* leaves and 70% *Panicum maximum* in terms of nitrogen utilization as supplement and basal diets for growing rams to alleviate the nutrient requirement and body weight loses that are usually experienced during the dry period.

References

A.O.A.C. (1995). Official Methods of Analysis. 15th Edition. Association of Official Analytical Chemists. Washington, DC. Pp: 68-69

Duncan, B.D. (1955).Multiple Range Test and Multiple Test Biometrics 1:1- 42.

Fajemisin , A.N., Chineke, A.J. and Alokan, J.A. (2012b). Dietary effect of ensiled corncobs treated with or without water, lye and urea on performance characteristics of West African Dwarf sheep. *Proceeding of 17th Annual Conference of Animal Science Association of Nigeria* held at International conference Centre, Opposite Radio House, Area 8, Abuja, Nigeria. September 9-13th 2012. Pp. 575-578.

Fajemisin, A.N. (2015). Chemical composition and in vitro evaluation of the nutrient contents of *Panicum maximum-Moringa oleifera* diets. *Nigerian Journal of Animal Production* 42(2):197-208.

FAO. (2003). *http:/www.fao.org/ag/agap/frg/AFRIS/DATA/188.hmt.* Assessed on 21st July, 2015.

Ibhaze, G.A. (2016). Reproductive performance of intensively managed primiparous gravid West African Dwarf goats fed pulverized bio-fibre waste-based diets. *Nigerian Journal of Animal Production* 43(2):133-138.

Jokthan, G.E., Lakpini, C.A.M., Adamu, A.M. and Akpa, G.N. (2009). Effect of supplementing rice straw with Pigeon pea forage on performance of Yankasa sheep. *Nigeria Journal of Animal Production vol* 36 (11): pp134-142.

Lorgyer, M.I., Odoh, O.E., Ikondo, N.D and Okoh, J.J. (2009). The replacement value of Pigeon pea (*Cajanus cajan*) for maize on performance of broiler finishers. Publication of Faculty of Agriculture, Nasarawa state University, Keffi, 1: 67-74.

Okeniyi, F.A., Aina, A.B.J., Onwuka, C.F.I. and Sowande, S.O. 2010. Nutrient digestibility of urea maize stover-based diets as dry season feed in WAD goats. Proc. 15th Conf. Anim. Sci. Assoc. of Nigeria, Univ. of Uyo, Nigeria, Pp.663-665.

Okoruwa, M.I., Adewumi, M.K and Njidda, A.A. 2013. Nutrient utilization and growth performance of West African Dwarf goats fed with elephant grass or different proportions of plantain and mango peels. *World J. Agric. Sci.* vol 1(6): pp194-202.

SAS/STAT (1999). SAS User's guide: ver9.0. Statistical Analysis System Institute Inc.Cary, NC.