Dry Matter, Protein and Fibre Digestibility by West African Dwarf Sheep Fed Varying Levels of *Vernonia amygdalina* Meal in Cassava Starch Residue-Based Diets

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Introduction

It is imperative to find alternative source(s) of feed for livestock in lieu of the limited availability of conventional concentrates and the competition for this resource by man. One plant with great potential for the livestock is bitter leaf (*Vernonia amygdalina)*. It is wide spread with about 200 species, is edible, drought tolerant, nutritious and has been found to have medicinal qualities (John 1994). *V. amygdalina* has an astringent taste which affects its intake. Bitter leaf meal contains 20-34% crude protein (CP) and can be used as protein supplement (Aregheore *et al*. 1998). With the recent introduction of trees and shrubs into cropping and grazing systems to provide high protein fodder to supplement post harvest crop residues, it is conceivable that *V. amygdalina* could play a valuable role in ruminant feeding system.

This study was conducted to assess the dry matter, protein and fibre digestibility by WAD sheep fed diets containing various levels of *Vernonia amygdalina* leaf meal.

Materials and Methods

The experiment was conducted at Federal University of Technology, Akure (FUTA) (Latitude 7^0 18" and Longitude 5^o10"E), Ondo state, Nigeria. Cassava starch residue was collected from a starch processing industry, gathered in a jute bag to ferment for 3-4 days before sun-drying for about 5 days on a concrete slab. Bitter leaves were also air dried after collection. The cassava starch residue and the bitter leaves were packed in jute bags, stacked in a store on a raised wooden platform until required for feeding. The cassava starch residue and bitter leaves were then sun-dried for one additional day to ensure perfect drying before milling and being used to make compound-feed. Palm kernel cake, brewer's dried grain, salt and commercially produced premix were purchased from a commercial feed mill. Five diets were formulated such that 0% (A), 25% (B), 50% (C), 75% (D) and 100% (E) of brewer's dried grain was replaced with *V. amygdalina* (w/w) respectively (Table 1). Fifteen WAD sheep with an average live weight of 15.5 kg ± 2.5 kg, ranging in age from 10-12 months, were treated against endo- and ecto-parasites and randomly assigned to a treatment. The experiment lasted for 63 days during which diets and water were given *ad libitum* to animals at 8.00am in the morning. Daily feed intake and weekly liveweights were recorded. Samples of feed, faeces and urine were analyzed for dietary nutrients (AOAC 1995) and all data tained were subjected to analysis of variance using SAS 2008 version 9.2

Results and Discussion

Table 1 presents intake, digestibility coefficients and weight gain of the experimental animals. Inclusion of bitter leaf meal influenced nutrient intake (P<0.05).The low intake of DM, crude protein (CP), crude fibre (CF), ADF, NDF, and ADL on Diet E might be traced to the astringent taste and perhaps anti-nutritional compounds present in the bitter leaf. Intake on diet C was highest indicating it is more palatable and acceptable than other diets. The apparent digestibility of the fibre fractions, CP and DM were influenced significantly (P<0.05) with inclusion of bitter leaf meal and the digestion coefficient values of DM and CP varied from 557.6 (Diet E) to 788.4 (Diet C) g/kg and between 766.6 (Diet E) and 951.0 (Diet C) g/kg respectively. The favourable digestibility of DM and CP might be due to laxative, medicinal potentials and protein quality of bitter leaf meal supplementation in the diets. However, the digestibility of CP recorded for animals fed Diet E is low compared with the values of other diets. The ADF digestibility coefficient values observed varied, Diet C had the highest of 799 g/kg and Diet A had lowest value of 539 g/kg. Likewise Diet C had the highest NDF and ADL digestibility co-efficient values of 819 and 852 g/kg respectively. No statistical differences (P>0.05) were observed in the growth rate of the animals fed the different diets. The general growth rate of the animals on all treatments might be due to the adequate protein in the feed, which was comparable with the protein requirement and dry matter (DM) intake required for small ruminant growth according to Devendra (1980). Also the higher level of weight gain in Diet B might be due to more effective utilization of the feed and some physiological factors. The efficiency of feed utilization is best in Diet D (9.28) and poorest in Diet B (6.38) which might be attributed to the combined effects of level of bitter leaf meal inclusion in the diets and DM intake by the experimental animals which is higher than the range (0.10 – 0.25) reported by El-Hag *et al* (1986).

Conclusion

Results of this study indicate that *Vernonia amygdalina* leaf

Table 1. Diet composition, intake, digestibility and liveweight gain when fed to West African Dwarf sheep.

	Diet A	Diet B	Diet C	Diet D	Diet E
	Diet composition (g/kg DM basis)[1]				
Cassava starch Residue	340.0	342.4	345.2	342.4	342.4
Brewer's Dried Grain	400.0	300.0	200.0	100.0	0
Bitter Leaf	0	10.0	200.0	300.0	400.0
Palm Kernel Cake	250.0	247.6	247.6	247.2	247.6
Intake (g/day) [2]					
Dry matter	421.6±77.56b	421.0±77.17b	455.6±38.76a	372.7±7.00c	266.4±7.99d
Crude protein	60.3±11.09a	69.8±2.31b	67.9±5.77b	57.0±4.06c	41.3±1.23d
Crude Fibre	78.7±14.48a	70.6±12.93a	70.9±6.03a	64.0±1.20b	45.3±1.36c
NDF	253.0±46.54c	328.4±60.19b	369.0±13.40a	316.8±5.95b	234.4±7.03d
ADF	210.4±7.80c	273.7±50.15b	296.2±25.19a	260.9±4.90b	207.8±6.23c
ADL	131.1±24.11c	154.3±30.10b	185.4±15.77a	160.2±3.00b	119.2±3.57d
Digestibility (g/kg) [2]					
Dry matter	639.9±1.67b	738.4±2.52ab	788.4±1.41a	666.7±3.08b	557.6±1.02c
Crude Protein	888.6±1.26b	949.2±4.00a	951.0±1.90a	845.2±3.43c	766.6±1.37d
Crude Fibre	774.4±3.55b	819.2±3.90a	813.9±5.72a	830.6±3.93a	794.5±1.28b
ADF	538.9±1.36c	750.2±2.43a	798.8±1.20a	714.0±2.49a	644.5±0.73b
NDF	627.6±1.46b	789.5±1.97b	818.5±1.88a	742.3±1.92a	696.5±0.90b
ADL	536.9±0.99b	626.5±1.87a	652.4±0.99a	581.7±1.76b	518.7±3.57b
Liveweight gain					
Total liveweight gain(kg)	3.7±0.22b	4.2±0.18a	3.6±0.27b	2.5±0.67c	1.9±0.60d
Daily liveweight gain(g/day)	58.7±1.26b	66.0±1.54a	57.8±0.99b	40.2±0.88c	30.8±0.67d
EFU (g gain/g DM intake)	7.18	6.38	7.88	9.27	8.65

[1] In addition all diets contain bone meal, premix and salt at the rate of 5.2, 2.4 and 2.4 g/kg DM respectively; [2] means within the same row with different superscripts are significantly different (P<0.05)

meal has good nutrient potential for protein and fibre fractions. Replacing bitter leaf meal for brewer's dried grain at 25% and 50% was palatable, acceptable and tolerable to the WAD sheep could support growth performance without adverse effect on the health on the animals with high degree of fibre digestion.

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