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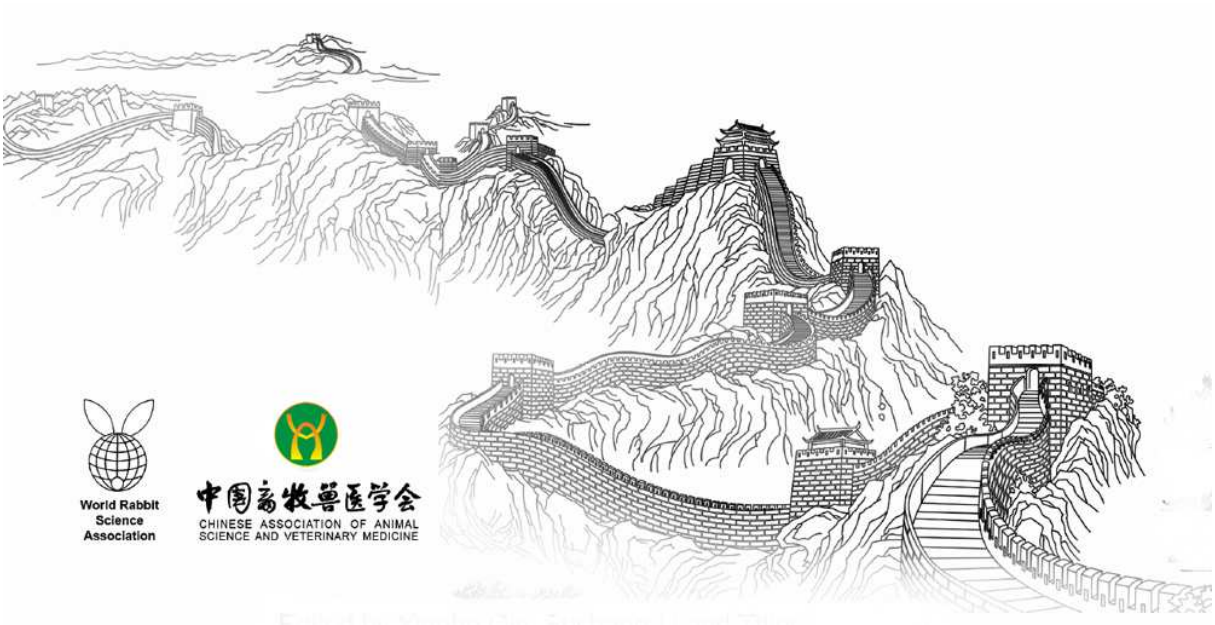

UTILIZATION OF DIFFERENT PLANT LEAF MEALS BY GROWING RABBITS

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ABSTRACT

Four different browse plant leaf meals namely, *Gliricidia sepium, Leucanea leucocephala*, *Tridax procumbens* and *Aspilia africana*) were included as dietary fibre sources to replace wheat offal in pelleted rabbit diets that served as the control. The rabbits were crosses of Dutch and New Zealand breeds, fed *ad-libitum* on the pelleted treatment diets and data for growth performance, nutrient digestibility and haematology were studied. Thirty weaner rabbits that were 7 weeks old with initial live weight mean of 759.8 g were divided into 5 groups and fed each of the pelleted treatment diets for 56 days. Higher ($p<0.05$) and similar average daily feed intake (ADFI) was recorded for rabbits fed the control and *Gliricidia sepium* diets (57.0 g; 56.6g resp.) while those fed diets containing *Aspilia africana* (47.6 g) and *Tridax procumbens* (48.7 g) were similar and lowest ($p<0.05$) than values showed by the other experimental animals. The final live weight (FLW), daily weight gain (DWG), feed conversion ratio (FCR) and protein efficiency ratio (PER) were better ($p<0.05$) in rabbits fed diets containing *Aspilia africana* (1.91 kg; 20.4 g/d and 2.34; 2.59 resp.) even though similar to values from *Tridax procumbens* and the control diets. The nutrient digestibility namely, dry matter (DM), crude protein (CP), neutral detergent fibre (NDF) and acid detergent fibre (ADF) were all similar in rabbits fed diet containing *Aspilia africana* and those on the control (81.4%, 68.3%, 56.1%, 53.6% resp.). These values were higher ($p<0.05$) than those recorded by rabbits on the other treatment diets. The pack cell volume (PCV), haemoglobin concentration (Hbc), red blood cell count (RBC), white blood cell count (WBC) and blood glucose level were not affected ($p>0.05$) by the dietary fibre sources. *Aspilia africana* and *Tridax procumbens* appeared to be a better fibre source for the growing rabbit than *Gliricidia sepium* and *Leucanae leucocephala.*

Key words: Growing rabbit, dietary fibre, browse plants, growth performance

INTRODUCTION

Dietary fibre forms a significant component of rabbit feed to provide energy, protein and other nutrients. This is included in the diets or often fed as supplement such as farm or kitchen wastes and some browse plants (Abu *et al.*, 2008). Efficient utilization of dietary fibre by the rabbit depends on the available fermentable carbohydrates which had been reported to correlate with the size of the fermentation chamber and the transit time of the fibre particles (Lebas, 2004).

Dietary fibre sources in the commercial rabbit pelleted feeds are usually agro- industrial by products that had undergone some level of processing with reduced particle size such as bran which competes with monogastric feeding. Wild rabbit selectively picks the forage to meet their energy and fibre needs. The growing need to reduce the competition on the processed by-product fibre sources that continue to have corresponding increase in price with the main cereal and the lack of information on the beneficial browse plant fibre for rabbit motivated this study.

The objective of this investigation is to determine the growth and haematological response of growing rabbits when some plant fibre sources are used to replace the conventional agro by product in their diets.

MATERIALS AND METHODS

Experimental Site and Preparation of Test Forages

The experiment was carried out in the rabbitry Unit of the Teaching & Research Farm of Ekiti State University, Ado-Ekiti, Nigeria located on latitude 7^{o} 40^{1}N and longitude 5^{o} 15^{1} E. The fresh tender leaves of four different forages namely *Gliricidia sepium*, *Leucaenea leucocephala*, *Tridax procumbens* and *Aspilia africana* were harvested separately on the University Farm, freed of dirt and air dried to crispy touch during the harmatan season. The leaves were then separately milled using a commercial milling machine (Artec Model 20), stored in well labelled transparent polythene bags. The leaf meals were used separately to replace wheat offal (25%) in a control diet that provided about 28.5% the total crude protein in the treatment diets (Table 1).

Table 1. Composition of experimental diets (%)

Ingredients	**Control (WO)**	***Gliricidia Sepium***	***Leucaena leucocephala***	***Tridax procumbens***	***Aspilia africana***
Maize	20.00	20.00	20.00	20.00	20.00
Rice bran	19.00	19.00	19.00	19.00	15.00
Groundnut Cake	10.00	10.00	10.00	10.00	9.00
Palm kernel	20.00	20.00	20.00	20.00	20.00
Wheat offal	25.00	1.29	1.44	1.16	-
Fish Meal	1.00	1.00	1.00	1.00	1.00
Gliricidia Sepium	-	23.71	-	-	-
Leucaena leucocephala	-	-	23.56	-	-
Tridax procumbens	-	-	-	23.84	-
Aspilia Africana	-	-	-	-	30.57
Bone meal	3.00	3.00	3.00	3.00	2.43
Oyster shell	1.00	1.00	1.00	1.00	1.00
*Premix	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Determined Analyses (%)					
Dry matter	88.1	90.0	89.6	88.2	89.1
Crude Protein	17.0	17.1	17.2	17.1	17.0
Crude fibre	11.8	11.8	11.9	11.5	11.7
NDF (calc.)	41.8	46.5	47.6	45.2	45.9
ADF (calc.)	23.2	26.2	29.2	30.5	32.9
Fat	4.2	4.5	4.3	4.0	4.0
Ash	2.1	2.0	2.3	3.0	3.3
ME (MJ/kg)	8.99	9.53	9.52		

*The premix supplied the following kg-1 of diet: Vitamins A 800 I.U.; D3 (1,4731.C.U); Riboflavin 4.20mg; Pantothenic acid 5.0mg; Nicotinic acid 20.0mg; Folic acid 0.5mg; Choline 300mg; Vitamin K, 2.0mg; Vitamin B12, 0.01mg; Vitamin E, 2.5I.U; Manganese, 56.0mg; Iodine, 1.0mg; Iron 20.0mg; Copper 10.0mg; Zinc 50.0mg and Cobalt 1.25mg

Experimental Animal, Design and Procedure

Thirty weaner rabbits of Dutch and New Zealand White crosses aged seven (7) weeks, with mean weight 760g were used for the 56 day study. They were balanced for sex and allotted to 5 treatments. Each treatment had 3 replicates and contained 2 rabbits per replicates in a completely randomized trial. The rabbits were allowed to adjust to the environment and experimental diets for 14 days in rabbit wooden hutches raised 40 cm above the floor of the rabbitry, dewormed and coccidiostatic administered as prophylactics. They were fed the pelleted experimental diets *ad libitum* and fresh water generously supplied at 07 hr and 14 hr. Live weight was measured weekly and converted to daily weight gain (DWG) while average daily feed intake (ADFI) was done on daily basis. Feed conversion ratio (FCR) and protein efficiency ratio (PER) were calculated from the DWG and ADFI. Faecal digestibility of dry matter, crude protein, neutral detergent fibre (NDF) and acid detergent fibre (ADF) were determined during the last 10 days of the 56-day feeding trial. Blood samples were collected between 07 – 08 hr using syringe through the marginal ear vein into bottles containing ethylene diamine tetra acetate (EDTA) and immediately taken to the laboratory for haematology indices analyses to ascertain possible profound deviation from the normal values.

Chemical Analyses

Test leaf meals, feed and faeces samples of the rabbits were dried in Gallenkamp table oven at 60^{o} C to constant weight to determine the dry matter. All the samples were analysed separately for proximate composition (AOAC, 2010) while the ADF and NDF were also determined without the use of amylase but residual ash inclusive (Van Soest *et al*, (1991). The forage analyses were done in triplicates and average values used. Blood samples collected were immediately taken to the laboratory and analyzed for the packed cell volume (PCV), red blood cell count (RBC), white blood cell (WBC) and haemoglobin concentration (Hbc) using the Wintrobe microhaematocrit, Neuber haematocyatometer and cyanohaemaglobin procedures respectively as described by Cole (1986).

Statistical Analysis

All the data collected were statistically analysed using SAS (1987) version 6 computer package for one way analysis of variance and means separated by Duncan Multiple Range Test.

RESULTS AND DISCUSSION

Table 2 shows the proximate composition and fibre fraction values of wheat offal, *G. sepium, L. leucocephala, T. procumbens* and *Aspilia africana.* All the values were significantly ($p<0.05$) influenced except the crude protein. The quantity of crude protein in the wheat offal was within the documented value (Amaefule *et al.,* 2009). Protein contents of the all the test forages were all within the range of previous studies documented in literature (Ahamefule, 2006).

Table 2.: Proximate and fibre analysis of test forages used as dietary fibre source (%DM)

Forage Species	DM	CP	Crude Fat	Crude Fibre	ADL Lignin	ADF	NDF	Crude Ash
Wheat offal	83.1^{a}	18.1	9.1^{a}	7.0^{b}	6.9^{b}	53.3^{b}	55.9^{a}	4.8^{c}
Gliricidia Sepium	24.2^{b}	19.8	6.9^{b}	9.2^{a}	8.6^{a}	24.7^{c}	61.2^{a}	9.9^{ab}
Leucaena leucocephala	26.3^{b}	19.9	6.1^{b}	10.8^{a}	9.0^{a}	37.5^{b}	66.2^{a}	7.8^{ab}
Tridax procumbens	25.0^{b}	19.7	5.2^{c}	7.5^{b}	10.2^{a}	42.5^{c}	55.4^{a}	10.9^{b}
Aspilia Africana	23.9^{b}	15.3	6.4^{b}	6.9^{b}	7.2^{b}	48.0^{a}	53.1^{b}	12.6^{a}

Wheat offal had the highest ($p<0.05$) values for DM, and crude fat (83.1% and 9.1% resp.). Crude fibre was higher ($p<0.05$) in *L. leucocephala* (10.8%) and *G. sepium* (9.2%) but the values were similar in the two leaf meals. The lowest ($p<0.05$) CP values were obtained in *Aspilia africana* (6.9%), *T. procumbens* (7.5%) and wheat offal (7.0%). These values were similar for the 3 leaf meals. They all correspond with those documented in literature (Ahamefule, 2006). Highest ($p<0.05$) final live weight (FLW) were recorded by rabbits fed the control diets, (1.91 kg), *T. procumbens* (1.87 kg), and *Aspilia africana* (1.89 kg) and they all showed similar values.

The average daily weight gain (ADWG) followed the same pattern as the FLW. ADFI values were highest ($p<0.05$) for rabbits fed diets containing wheat offal (control), *G. sepium* and *L. leucocephala* (57.0g; 56.6g resp.) while animals on diets with inclusion of *T. Procumbens* and *Aspilia africana* had the lowest (48.7g; 47.6 g). The fairly high lignin contents of *T. Procumbens* may be responsible for the low ADFI of rabbits fed that diet (Gidenne and Lebas, 2002).

Though ADFI was higher in rabbits fed the control, *G. sepium* and *L. leucocephala* diets; they were not well utilized as observed in animals on *T. Procumbens* and *Aspilia africana*. This may be due to the presence of antinutritional (ANFs) factors flavonoid and or saponin in *G.Sepium*, and mimosine in *L.leucocephala* (Aye and Adegun, 2013).

Table 3: Growth performance and apparent nutrient digestibility of rabbits

	Control (WO)	***Gliricidia Sepium***	***Leuceanea leucocephala***	***Tridax procumbens***	***Aspilia Africana***	**SEM**	**P value**
Initial Live Weight (g)	758.5	759.1	758.4	766.6	753.6		
Final Live weight (kg)	1.91 [a]	1.79 [b]	1.81 [b]	1.87 [a]	1.89 [a]	0.02	0.0008
Daily gain (g/d)	20.3 [a]	18.4 [b]	18.8 [b]	19.7 [a]	20.4 [a]	0.28	0.0036
Daily feed intake (g/d)	57.0 [a]	56.6 [a]	54.4 [b]	48.7 [c]	47.6 [c]	0.50	0.0001
FCR	2.82 [c]	3.07 [d]	2.89 [b]	2.48 [ab]	2.34 [a]	0.05	0.0001
PER	2.15 [c]	1.88 [d]	2.01 [c]	2.36 [b]	2.59 [a]	0.05	0.0001
Faecal digestibility (%)							
DM	84.1[a]	69.8 [c]	70.2 [c]	78.4 [b]	81.4 [a]	3.81	0.004
CP	66.5 [a]	55.2 [c]	58.3 [c]	69.2 [ab]	68.3 [a]	3.27	0.003
NDF	58.1 [a]	51.9 [c]	52.9 [c]	54.2 [ab]	56.1 [a]	3.95	0.0001
ADF	50.3 [a]	46.9 [c]	48.1 [c]	50.4 [b]	53.6 [a]	2.45	0.0004
Haematology criteria							
PCV (%)	33.9	35.0	35.9	34.7	35.4	0.58	0.25
Hbc (g/dl)	12.2	12.3	12.2	12.6	12.7	0.29	0.06
RBC (10^6/mm^3)	5.30	6.61	6.70	6.34	5.92	0.41	0.19
WBC (10^6/mm^3)	7.44	6.56	6.72	6.76	7.13	0.57	0.81
Glucose (mg/dl)	125.7	151.0	125.7	154.0	158.7	18.74	0.59

Rabbits fed *Aspilia africana* diet exhibited the best FCR and PER (2.34; 2.59). Apparent nutrient digestibility values of DM, CP, NDF and ADF were higher ($p<0.05$) in rabbits fed *Aspilia africana* and the control diets with similar values. The corresponding lowest values ($p<0.05$) were recorded by rabbits fed diets containing *G. sepium* (69.8%; 55.2%; 51.9% and 46.9% resp.) The haematology indices measured viz; PCV, Hbc, RBC and WBC were not affected by the treatment (Table 3). The implication of feeding these various fibre sources on the rabbit could not be accurately determined, since the number of rabbits is low. However, there was no mortality and none of the rabbits becames ill throughout the study.

In conclusion, the use of *Tridax procumbens* and *Aspilia africana* leaf meals appeared better sources of fibre than the other plant leaf meal sources used in this study for growing rabbit. These first results of performances must be confirmed with a higher number of rabbits.

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