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Effect of Replacing Wheat Offal with *Asystasia gangetica* Leaf Meal (ALM) on Growth Performance and Haematological Parameters of Weaner Rabbits

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ABSTRACT

A fifty six (56) day feeding trial was carried out to determine the effect of replacing wheat offal with A*systasia gangetica* leaf meal (ALM) on the growth performance and haematological parameters of weaner rabbits. Four (4) diets were formulated such that the control diet (T_1) contained 0%ALM while T_2, T_3 and T_4 contained 33%, 66% and 100% replacement levels of wheat offal respectively. Twenty-four (24) unsexed and mixed-breed weaner rabbits were randomly assigned to four dietary treatments. Feed and water were offered *ad-libitum* throughout the period of the experiment. The result of the experiment showed that there were significant differences ($P<0.05$) in daily weight gain and feed cost/kg gain of rabbits. The experimental diets had no significant effect ($P>0.05$) on feed intake and feed conversion ratio of the experimental rabbits. There was a decrease in the cost of feed as replacement levels of ALM increased in the diets. Haematological parameters measured were not significantly ($P>0.05$) different except for WBC. Based on the finding of this study, it was concluded that replacing 66% of wheat offal in the diet of weaner rabbits with ALM will reduce the cost of rabbit production without adverse effects on the growth performance and haematological indices of the rabbits.

INTRODUCTION

Rabbits have been recognized to have a very important role to play in the supply of animal protein to Nigerians especially in the rural and peri-urban areas. They are efficient converters of feed to meat and can utilize up to 30% crude fibre as against 10% by most poultry species (Egbo *et al.,* 2001). To make rabbit rearing more viable as a small-scale business, Alawa *et al*. (1990) have advocated the development of alternative feeding materials that will be relatively cheap when compared with commercial feeds or conventional feedstuffs. Even though locally grown feed material have been identified (Bamikole *et al*., 2000a; Bamikole *et al*., 2000b), formulation of a concentrate diet requires expensive feed ingredients, notably oil cakes which are the major sources of protein and energy in the diets. Identification of forage that has high nutritive value that can replace or reduce the need for concentrate feeding will keep the cost of rabbit production low and sustain growing interest.

Asystasia gangetica (L) T. Anderson, sub-specie *micrantha* (Nees) Family (*Acanthaceae*) is an attractive, fast-growing, spreading, herbaceous ground cover that grows from 300-600mm in height. It has green, oval-shaped leaves with rounded base occurring in opposite pairs. The flower is white-cream coloured with purple markings and the fruit is a club shaped capsule, splitting from up to base (Saunders, 1958). It is widely distributed from tropical Asia to Africa including Nigeria (Elliot, 2004; GRIN, 2007). In the traditional medicine of East Africa, *A. gangetica* is used as an anthelminthic (Kokwaro, 1976) while in Nigeria, the leaves are popularly used in the management of asthma. The utilization of several leaf meals as feed ingredient to reduce production cost in livestock diet is not new but the inclusion levels at various ages and physiological conditions varies (Nworgu *et al*., 2003; Kakengi *et al*., 2007).

Fibre is one of the main constituents of commercial diets for intensively reared rabbits, which typically include around one third of forages and fibrous by-products. The role of fibre in rabbit nutrition is not limited to nutrient supply. Fibre also plays a major role in the regulation of rate of passage of digesta, the control of gut flora and the maintenance of intestinal mucosa integrity.

Rabbits have being raised successfully with a concentrate diet consisting of all nutrients in a balanced manner. Such concentrate diets invariably have the Wheat offal as a potential fibre as well as protein supplement. Wheat offal may often become scarce or costly ingredient. In this direction, an experiment was conducted with an objective of studying the effect of replacing wheat offal with *A. gangetica* leaf meal on the growth performance and haematological parameters of weaner rabbits.

MATERIALS AND METHODS

Study Site

The study was conducted at the Agricultural Extension and Management Teaching and Research farm, Federal College of Forestry, Ibadan.

Collection and Processing of test ingredient

The leaves of *Asystasia gangetica* used for this trial were harvested randomly from bushes around the college premises. Although abundant in the bush, only the green fresh leafy stands at their bloom stage were harvested. The entire collection period lasted eight (8) days. The leaves were sun-dried for four (4) days until they become crispy while retaining the green colouration. The dried leaves were then milled using a hammer mill with a sieve size of 36mm to produce leaf meal.

Proximate analysis

Proximate composition of the ALM was determined using the method of AOAC (1990). The result is shown in Table 1.

Table 1: Proximate composition of test ingredient

Composition (%)	*Asystasia gangetica*
Dry matter	89.0
Crude Protein	19.3
Crude Fibre	15.3
Ether Extract	12.7
Ash	1.74
Nitrogen Free Extract	39.12
Metabolizable Energy(kj/kg)	2.8

Experimental animals and management

A total of twenty-four (24) unsexed and mixed breed rabbits (6weeks) were used for the experiment. Four experimental diets were formulated to contain 0, 33, 66 and 100% replacement levels of wheat offal with ALM as shown in Table 2. The rabbits were randomly assigned to 4 dietary treatments in a completely randomized

design (CRD). Each treatment was replicated 3 times with each replicate having 2 (male and female) rabbits. Each replicate was individually housed in a cage measuring 33cm x 36cm x 45cm (width x length x height) and equipped with feeding and watering troughs. Feed and clean water were supplied *ad-libitum* throughout the experiment which lasted for fifty-six (56) days.

Table 2: Composition of Experimental Diets containing ALM

	Replacement Levels of wheat offal with ALM			
	0%	**33%**	**66%**	**100%**
Ingredients (%)	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**
Maize	44.00	44.00	44.00	44.00
Soyabean Meal	16.00	16.00	16.00	16.00
Asystasia gangetica	0.00	11.00	22.00	33.00
Fish Meal	1.00	1.00	1.00	1.00
Wheat offal	33.00	22.00	11.00	0.00
Bone Meal	3.00	3.00	3.00	3.00
Oyster Shell	2.50	2.50	2.50	2.50
*Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated nutrients				
Crude Protein (%)	17.73	17.95	18.17	18.39
Crude Fibre (%)	5.54	6.09	6.64	7.19
Ether Extract (%)	4.10	4.96	5.83	6.69
M.E(kj/kg)	2.5	2.6	2.7	2.8

*Premix Contents: Vit. A-320000IU, Vit. D3-640000IU, Trocopherols-2000IU, Vit. K-800mg, Niacin-600mg, Calcium panthothenate-3000mg, Pyridoxine-6000mg, Cyanocolabamin-4mg, Biotin-8mg, Manganese-30000mg, Zinc-20000mg, Iron-8000mg, Chlorine chloride-60000mg, Copper-2000mg, Iodine-480mg, Cobalt-80mg, Selenium-40mg.

Data collection

Performance characteristics

The rabbits were weighed at the commencement of the experiment. Quantities of feed given to each group were recorded and the left-over were also recorded daily.

Blood collection

At the end of the experiment, three (3) rabbits were randomly selected per treatment, fasted for 24hours and used for haematological studies. 2mls of each blood sample were collected through the ear veins into Ethylene Di-amine Tetra Acetic acid (EDTA) treated Bijou bottles for haematological assay.

Haematological analysis

Blood samples were analyzed within 2hours of collection. The haematological indices determined were Packed Cell Volume (PCV), Red Blood Cell count (RBC), White Blood Cell count (WBC) and Haemoglobin Concentration. PCV was determined by using wintrobes micro haematocrit method (Margi, 1997), haemoglobin concentration was determined by the Cyanomethaemoglobin method according to Kelly (1979). The improved Neubar haemocytometer method described by Jain (1986) was used to estimate the red and white blood cells. Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were computed according to Jain (1986).

Statistical analysis

Data generated from the study were subjected to Analysis of Variance (ANOVA) using SPSS 17.0 (Microsoft, Window, 2003) Computer Software Package. Means were separated with Duncan multiple range test at 5% level of significance.

RESULTS AND DISCUSSION

The effect of the test material on the growth performance of the rabbits is shown on Table 3. Performance characteristic of rabbits fed various dietary treatments showed that there were no significant differences ($P>0.05$) in daily feed intake and feed conversion ratio across the treatments. This may be attributed to the ability of rabbits to handle high amount of fibre in their diets. Gidenne and Bellier (2000), and Gidenne and Perez (2000) had earlier reported that feed ingredients rich in fibre content are particularly well digested by the rabbit. The weight gain of rabbits fed diet with 33% replacement level was the highest. However, rabbits fed

66% ALM were also comparable with the control in terms of weight gain. This means replacing wheat offal with 100% of *Asystasia gangetica* leaf meal (ALM) retards the growth of rabbits. Although, no analysis was done on the amount antinutritional factors present in ALM, the poor growth rate observed among rabbits fed 100%ALM replacement level may be attributed to the presence of anti-nutritional factors ranging from phytates, oxalates, saponins and tannins. Oxalates have been reported to form complexes with mineral particularly calcium thereby making them unavailable to the body, cause irritation of the gut and resulting in low feed intake, inhibit protein and energy utilisation in broilers (Agwunobi *et al.,* 2002; Ndimantang *et al*., 2006; Okereke, 2012). Phytates impairs the utilisation of protein and some minerals resulting in poor performance while tannins inhibits digestive enzymes and causes irritation of the gut. Not only does oxalate interfere with calcium absorption in the digestive tract, it also limits nitrogen retention (Hang and Preston, 2009; Hang and Binh, 2013). Saponins may inhibit a number of cellular enzymes (Cheeke, 1971), because saponins are not appreciably absorbed, their effects on enzymes would most likely to be in the digestive tract. Saponins form bonds with protein (Livingstone *et al*., 1977) and therefore could conceivably bind digestive enzymes. However, Makinde *et al*. (2013) reported that poorer weight gain observed among birds could be as a result of the high fibre content of the diets. The decreasing cost of feed observed as replacement levels of ALM increased from 0 to 100% was not unexpected since no cost was incurred during the collection and processing of ALM.

Table 3: Performance of rabbits fed *Asystasia gangetica* based diets

	Replacement Levels of wheat offal with ALM				
Parameters	**0%**	**33%**	**66%**	**100%**	**SEM**
Initial Body Weight(g)	616.88	616.90	616.70	616.78	2.18
Final Body Weight(g)	1216.70^{ab}	1250.00^{a}	1150.00^{b}	1069.26^{c}	36.01
Av. Daily Weight gain(g)	10.70 ^{ab}	11.31 ^{a}	9.50 ^{b}	8.08 ^{c}	0.61
Av. Daily Feed Intake(g)	45.10	44.30	44.30	43.80	0.28
Feed Conversion Ratio	4.21	3.92	4.66	5.42	0.82
Cost of Feed(#/kg)	45.88^{a}	42.25^{ab}	38.62^{b}	34.99^{c}	1.25
Feed Cost/Weight gain(#/kg)	24.46^{a}	21.91^{c}	23.18^{ab}	22.04^{b}	0.39

a.b.c means on the same row having different superscripts were significantly (P<0.05) different. ALM: *Asystasia gangetica* leaf meal. SEM: Standard Error of Mean

Table 4 shows the haematological parameters of the rabbits measured. There were no significant (P>0.05) differences between the mean of PCV, RBC, Hb, MCV, MCH and MCHC despite increasing replacement levels of ALM in the dietary treatments. However, the values obtained for all diets fall within the normal range of haematological standard as established by Mitruka and Rawnsley (1977). The non-significant difference in the values obtained for most of the haematological indices is an indication of the safety and adequacy of the test ingredient (Alu *et al.,* 2009). The values obtained on PCV for all the treatment groups were within the normal range of 24.9-45.2% as reported by Mitruka and Rawnsley (1977). It is also in agreement with the range (22-26%) as reported by Ameen *et al.* (2007). The significant difference observed on WBC implies that the rabbits may not be able to perform their phagocytic functions at the same rate. The range of the result obtained on WBC (22.22-53.33) is in contrast with the reference normal values reported by Mitruka and Rawnsley (1977), and Ameen *et al.* (2007).

Blood cellular and biochemical indices of rabbits provide valuable information on the immune status of animals (Kral and Suchy, 2000) as well as serve as indicators of physiological state of rabbits. Consideration and investigation of the physiological mechanisms involved in nutritional studies may indicate innovative approaches to reduce the adverse effect of non-conventional feedstuffs, such as ALM which contain anti-nutritive factors.

Table 4: Haematological Parameters of Rabbits fed ALM based diets

	Replacement Levels of wheat offal with ALM				
Parameters	**0%**	**33%**	**66%**	**100%**	**SEM**
PCV (%)	32.64	34.33	36.48	35.34	1.89
Haemoglobin (g/dl)	10.21	11.34	12.57	12.46	1.40
RBC (x10^6/mm^3)	2.53	3.17	4.22	3.17	1.13
WBC (x10^3/mm^3)	22.22^{c}	26.67^{c}	46.67^{b}	53.33^{a}	2.20
MCV (μ^3)	76.47	76.60	76.77	76.60	0.20
MCH (μ^2)	2.02	2.02	3.01	2.77	0.51
MCHC (%)	31.53	31.49	31.42	31.27	0.21

abcd means along the same row with different superscripts are significantly (P<0.05) different. SEM: Standard Error of Mean

CONCLUSION

The present study shows that 66% of wheat offal can be replaced with *Asystasia gangetica* leaf meal (ALM) as a fibre source in the diet of weaner rabbits as it does not adversely affect their growth performance and haematological parameters measured. Further research should be carried out to identify the antinutritional factors present in ALM and how they can be reduced to the bearest minimum.

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