ASSESSMENT OF LOOFAH GOURD SEEDS *LUFFA CYLINDRICA* (ROEM) ON PERFORMANCE AND SOME HAEMATOLOGICAL INDICES OF RABBIT WEANERS

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ABSTRACT

Loofah gourd seeds (LGS) *Luffa cylindrica* (M.J. Roem) were made into a meal and used to replace partially soybean meal (SBM) on weight basis at 0, 5, 10, and 15% inclusion in weaned rabbits diet, in a 56-day feeding trial. Twenty-four rabbits (initial live weight 555±55 g), New Zealand x Chinchilla cross bred, were divided into four groups of three replicates containing two rabbits each, in a completely randomized experiment. Growth performance, nutrient digestibility and some haematological parameters were measured. Daily water intake was significantly (P<0.05) the highest for rabbits fed diets with 5% LGS (183±12 ml) and the lowest for those on 15% LGS (149±11.6 ml). Daily weight gain were 15.0, 19.2, 18.5 and 10.3 g/d respectively with increasing level of LGS. Values observed with 5% and 10% LGS were significantly higher than with 15% level which was lower than observed with control diet (P<0.05). Feed conversion ratio (3.12 and 3.26) and protein efficiency ratio (0.53 and 0.52) were similar for 5% and 10% LGS inclusion and better (P<0.05) when compared to the control diet (3.93 and 0.63, respectively) and 15% LGS inclusion by the test diet (5.56 and 0.89 respectively). Dry matter and nitrogen digestibility values for rabbits fed 15% LGS (57.5% and 56.0%) were significantly lower (P<0.05) when compared to other levels of inclusion in the test diets: 70.7, 73.2 and 71.0% for DM digestibility and 66.6, 65.2 and 66.8% for nitrogen digestibility for the for 0, 5 and 10% LGS, respectively. The crude fibre digestibility was similar for the control diet (64.8) and the 5% LGS (65.5) or 10% LGS (64.0) diet and significantly lower for 15% LGS diet (62.4%). Packed cell volume was highest in rabbits on 5% LGS (43.0) and similar to 10% LGS (38.3), but lower (P<0.05) in 15% LGS (32.3) replacement of SBM. Haemoglobin for rabbits on 5% LGS (12.6 g/dl) was also highest and similar to 10% LGS diet (12.3 g/dl). The red blood cell count (5.81±0.34 x 10^6/mm^3) and white blood cell count (8.44±0.77 x 10^6/mm^3) were higher (P<0.05) in rabbits fed 5% LGS but lowest for those on 15% LGS (10.41±0.99 x 10^6/mm^3 and 4.80±0.11 x10^6/mm^3 respectively). Rabbits fed 15% LGS had the highest (P<0.05) blood urea (7.97±0.22 mg/dl) followed by those of on 10% LGS and 5% LGS which were similar (6.09±0.12 mg/dl and 6.05±0.21 x mg/dl) but lowest for those on 5% LGS (5.91±0.42 mg/dl). This indicates wastage and poor utilization of the dietary protein at 15% LGS replacement level. In conclusion loofah gourd seeds may be used up to 10% in growing rabbit diets.

Key words: Rabbit, Growth performance, Loofah gourd seeds, Haematology.

INTRODUCTION

Feed resource has been the main problem faced in the production of livestock products to meet the animal protein requirements of human and other industrial needs. The conventional cereal and vegetable protein sources being used in animal feeds are under pressure of competition through their use in human diets especially in Nigeria and most developing nations of the world. The ban on the use of animal by-products in feeding of poultry by the European Union which now increase the demand for these protein sources hence become very expensive (Farrell, 2005). This has brought challenges in the area of nutrition research into plants of lesser importance to man that may serve as a veritable source of vegetable protein because of the ever increasing cost of the high quality conventional

sources (Amaefule and Obioha, 1998; Agbede, 2000). Animal protein intake is below the recommended level in most developing nations some of which were found to consume 21 kg of meat and 40 kg of milk per capita per year whereas those in the developing nations consumed 76 kg of meat and 192 kg of milk in the 1990's (Delgado *et. al*., 1999). One of the identified means of making animal protein available for the teeming populace in the developing nations is to encourage rabbit production. This is because of the short generation interval and its suitability for production without necessarily having very large area of land.

Loofah gourds belong to the family *Cucurbitaceae.* It is a crawling plant that grows in the wild and on abandoned building structures and fence walls in towns and villages in Nigeria. It is cultivated in other tropical African countries such as Egypt, South-east Asia (Japan, Indian and Philippines) and tropical South America (Brazil), the Caribbean, Europe and the USA. In some of these countries the sponge are used as biological filters and the extracted oils as preparations for cosmetics. The plants with yellow flowers bear fruits that are cucumber shaped but larger in size and contain fibrous sponge in which the hard black seeds are enmeshed. These seeds are known to be rich in protein and oil (Farinu, 1986). The present investigation was therefore conducted to ascertain the utilization of the Loofah gourd seeds as a vegetable protein source to replace the expensive soybean meal in weaned rabbit diets and to primarily study the effect on their growth performance.

MATERIALS AND METHODS

Collection of test ingredient and preparation of experiment diets

Loofah gourd fruits were collected from the wild and abandoned buildings during the dry season also called "harmattan" season which is between November and March in Nigeria. During this period the fruits of loofah get dried up for harvesting. The cucumber shaped fruits has fibre meshed which holds the seeds. The gourds were broken open and the fibre sliced into half and shaken to release the enmeshed black seeds. The seeds were later sun dried, freed of impurities and milled as harvested in locally fabricated plate mill. Other feed ingredients were purchased from the open livestock feed market and mixed according to the formulation of the experimental diets (Table1). The loofah gourd seeds (LGS) were used to replace soybean meal at 5, 10, and 15% dietary level on weight basis with a control diet in which there was no LGS. The ingredients were adjusted in the diets especially at 15% replacement of LGS for SBM to obtain the crude protein need of rabbit. Crude protein levels varied from 15.00–15.89%, and crude fibre from 5.6-5.8 only (Table 1)

Experimental design and procedure

Twenty–four crossbred (New Zealand x Chinchilla) unsexed weaned rabbits of average initial body weight of 445±12 g were divided into four groups in a completely randomized experiment. Each group had six rabbits and was replicated thrice with each replicate having two rabbits each. They were housed individually in single tier hutches situated in the rabbitry of the University of Ado-Ekiti Teaching and Research Farm. The rabbits were dewormed using piperazine in water. Duococin was also given orally in water against coccidiosis. Both were used as prophylactic treatments. They were allowed 14 days to adjust to the experimental feed during which they were fed in the morning and afternoon to eliminate the effect of pre-experimental diets and also to get acclimatized to the environment before the commencement of the experiment. At the commencement of the trial the rabbit had a body weight of 555±55 g. They were hereafter fed the experimental feed at 07:00 h and 14:00 h. *Aspilia africana* a locally available forage air dried for 24 h was given as supplement to make for the fibre need at 500 g per rabbit at 17:00 h daily while water was given *ad libitum* throughout the 56 days of study. During the last ten days of the experiment, a digestibility trial was carried out. One rabbit from each of the replicate group was used for the trial to make three rabbit per treatment. The rabbits were transferred to a metabolism cage adapted from a layer cage and one rabbit constituted a replicate for the digestibility trial. They were allowed to get used to the cages for a period of 3 days during which they were fed the experimental diets. They were fasted for a period of 24 hours to ensure

elimination of the gut content and then fed for a period of four days. Faecal samples were collected for each day till the 5th day including the fasted day to ensure total collection of the faeces. Polythene sheets were spread under the cages to collect rabbit faeces. The daily collection were dried in a Gallenkamp table oven at 60°C. At the last day of the experiment, blood samples were collected from the marginal vein of the ear of the rabbits into bottles containing ethylene diamine tetra acetate as anticoagulant. Another set of blood samples were collected free of anticoagulant for the analysis of urea.

Table 1: Composition of the experimental diets

	% inclusion of Loofah gourd seeds			
	0	5	10	15
Ingredients:				
Soybean meal	15.00	10.00	5.00	5.00
Loofah Gourd Seeds	-	5.00	10.00	15.00
Maize	40.00	40.00	38.50	38.00
Palm kernel meal	15.00	15.00	15.00	15.00
Wheat offal	13.50	13.50	15.00	13.00
Rice bran	8.50	8.50	8.50	6.00
Salt	0.50	0.50	0.50	0.50
Oyster shell	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00
*Premix	2.50	2.50	2.50	2.50
Chemical composition:				
Crude Protein (%)	15.89	15.51	15.08	15.60
Crude Fibre (%)	5.80	5.80	5.80	5.60
Tannin (%)	0.001	0.014	0.030	0.044
Oxalate (mg/g)	0.005	0.135	0.192	0.321
Phytate (mg/g)	0.003	0.014	0.025	0.047

*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

Table 2: Proximate composition and some anti-nutritional factors of Loffah Gourd Seeds (means±SD)

Nutrients (% DM)		Anti-nutritional factors (DM basis)	
Dry matter	95.65±0.02	Tannin (%)	0.36±0.01
Crude protein	25.59±0.02	Phytic Phosphorous (mg/g)	0.09±0.02
Crude fat	25.64±0.02	Phytic acid (mg/g)	0.33±0.08
Crude fiber	6.50±0.02	Oxalate (mg/g)	2.93±0.01
Carbohydrate	30.62±0.12		
Ash	7.32±0.11		
Nitrogen Free Extract (NFE)	25.64±0.01		

Chemical Analyses

The crude protein and crude fibre contents were analyzed for the experimental diets (Table 1) while LGS was analyzed for crude protein, crude fibre, ash, carbohydrate and ether extract only (Table 2) as described by A.O.A.C (1995). Tannin was determined as described by Makkar and Goodchild (1996), phytate by the method of Young and Greaves (1940) and oxalate according to Huang and Tanudjaja (1992). 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 (Hb) determined using the Wintrobe microhaematocrit, Neuber haematocyatometer and cyanohaemaglobin procedures respectively as described by Cole (1986). Urea was determined by the diacetylmonoxine method of Varley *et al.(*1980).

Statistical analysis

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

RESULTS AND DISCUSSION

The crude protein content of LGS (Table 2) compared favourably with other vegetable protein sources like cotton seed cake, coconut meal and palm kernel cake with crude protein range of 18-26%. The content of the anti-nutritional factors evaluated in LGS and the experimental diets namely, tannin, phytic acid and oxalate were at tolerable levels for farm animals (Agbede, 2000). Table 3 also shows the growth performance, nutrient digestibility coefficients and haematology indices. The feed intake was not significantly ($P>0.05$) affected by the feeding of LGS**.** However, the daily water intake was highest ($P<0.05$) for rabbits fed 5% LGS dietary inclusion (183±12 ml) and decreased as the inclusion level of LGS increased. Daily body weight gain was significantly highest and similar for rabbit fed 5% LGS (19.2±2.3 g) and those on 10% while 15% LGS had the lowest (10.25±2.0 g). The FCR and PER values were significantly lower ($P<0.05$) and similar for rabbits on 5% and 10% inclusion of LGS followed by those on the control and 15% LGS. This implies that LGS was better utilized by rabbits fed at 5% and 10% dietary inclusion.

Table 3: Performance, nutrient digestibility and haematology of rabbits fed LGS (means±SD)

Parameters	% inclusion of Loofah Gourd Seeds				Signif.
	0	5	10	15	P
Daily experimental feed intake (g)	59.1±6.3	60.1±5.0	60.1±5.2	57.1±5.5	0.06
Daily water intake (ml)	169±10.2^{b}	183±12^{a}	161±9^{bc}	149±12^{c}	0.02
Initial body weight (g)	578±51	543±59	530±55	570±53	0.13
Final body weight (g)	1419±110^{b}	1619±150^{a}	1564±138^{a}	1146±96^{c}	0.023
Daily weight gain (g)	15.0±1.8^{b}	19.2±2.3^{a}	18.5±3.0^{a}	10.3±2.0^{c}	0.001
Feed conversion ratio[1]	3.93±0.8^{b}	3.12±0.6^{c}	3.26±1.0^{c}	5.56±0.9^{a}	0.02
Protein efficiency ratio	0.63±0.02^{b}	0.53±0.02^{b}	0.52±0.01^{b}	0.89±0.03^{a}	0.03
Dry Matter Digestibility (%)	70.7±5.6^{a}	73.2±6.7^{a}	71.0±6.0^{a}	57.5±4.5^{b}	0.002
Nitrogen Digestibility (%)	66.6±7.0^{a}	65.2±6.7^{a}	66.8±5.8^{a}	56.0±9.0^{b}	0.001
Crude Fibre Digestibility (%)	64.8±5.0^{a}	65.5±5.7^{a}	64.0±8.1^{a,b}	62.4±8.0^{b}	0.002
Packed cell volume (%)	37.67±2.5^{b}	43.00±5.1^{a}	38.33±4.1^{a,b}	32.33±3.8^{c}	0.02
Haemoglobin (g/dl)	11.30±0.81^{b}	12.57±1.50^{a}	12.27±0.98^{a}	10.41±0.99^{c}	0.005
Red Blood Cells (10^{6}/mm^{3})	5.37±0.30^{b}	5.81±0.34^{a}	5.09±0.21^{bc}	4.80±0.11^{c}	0.04
White Blood Cells (10^{6}/mm^{3})	7.37±0.90^{b}	8.44±0.77^{a}	7.99±0.48^{a}	7.03±0.41^{b}	0.03
Serum Urea (mg/dl)	6.05±0.21^{b}	5.91±0.42^{c}	6.09±0.12^{b}	7.97±0.22^{a}	0.01

[1]based on experimental feed intake, additional forage excluded
On the same row, means with different superscripts differ significantly ($P<0.05$) from each other

The two vegetable protein sources may have complemented one another for enhanced utilization because SBM is of better protein quality than LGS. The FCR and PER were best at 5% LGS inclusion level following the same trend as the body gain. The digestibility coefficients for dry matter, nitrogen and crude fibre for rabbits fed 5% and 10% LGS compared with those on 15% LGS in the diets indicate that the anti-nutritional factors levels in the former two diets containing the test ingredient did not significantly impair the utilization of these nutrients which agreed with the report of Amaefule *et. al*. (2004). The haematological parameters are all within the range recommended for the rabbit, however, the urea value for rabbits on 15% LGS indicate inadequacy of the average protein quality of this diet. The packed cell volume, haemoglobin, RBC and WBC values were better for rabbits fed 5% LGS than the others. This shows that the amino acids content of the SBM and LGS might have complimented one another thereby making the protein in the 5% LGS inclusion in diet to be adequate. It is worthy of note that the seeds were fed undehulled as it is proved that rabbit needs some level of fibre for the normal maintenance and functions of the digestive tract.

CONCLUSIONS

Rabbits fed loofah gourd seeds as partial replacement of soybean meal up 10% inclusion in their diet showed optimum performance and nutrient digestibility. The haematology also compared well with rabbits on the control diet.

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