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Carcass traits and relative organ weights of growing rabbits fed graded levels of processed kola nut (*Cola nitida)* pod husks

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Abstract

Carcass traits and relative organ weights of growing rabbits fed graded levels of processed (ash treated and rumen liquor fermented) kola nut (Cola nitida) pod husks (PKPH) were investigated. One hundred and twenty (120) weaner rabbits of mixed breeds (New-Zealand white × Chinchilla) of equal sexes and average body weight 525.46g were randomly allotted to four (4) dietary treatments at 0 (0.00 % PKPH), 10 (10 % PKPH), 20 (20 % PKPH), and 30 % (30 % PKPH) inclusion levels and designated as diets 1, 2, 3, and 4, respectively. Each treatment group was replicated ten (10) times with three (3) rabbits per replicate and was fed ad-libitum for 56 days. The highest slaughter weight (1813.80 g/r), dressing weight (1068.70 g/r) and dressing percentage (58.54 %) recorded in rabbits fed diet 3 (20% PKPH) were similar to those fed the control diet (0 % PKPH) and diet 2 (10% PKPH) but was significantly (P<0.05) higher than those fed diet 4 (30 % PKPH). The lungs, liver, kidney, heart, and spleen of the rabbits fed dietary treatments were not significantly influenced. It was concluded that processed kolanut pod husk had no deleterious effect on carcass and relative organs weight of weaner rabbits.

Keywords: Kolanut pod husk, Carcass traits, rabbits, rumen liquor, ash

Introduction

The declining world's raw materials as the population grow rapidly, coupled with the real threat of global food shortages has contributed to a growing awareness of the need for conservation and the re-use of things which once would naturally throw away without a second thought (Abioye *et al.*, 2006). Thus, in order to meet maximize food production to meet human protein requirement in Nigeria, all available reasonable options especially the production of livestock that is yet to play a major role in animal production must be considered for efficient utilization amongst which is the rabbit. The major limitation to the production of rabbit in Nigeria is high cost of finished feed (Adeyemi *et al*., 2008) as it has been reported that feed accounts for 60-70 % of the total intensive production cost (Nworgu *et al.*, 1999). Efforts have been directed towards finding alternative sources of feed ingredients for livestock using materials that cannot be directly consumed by man as this is envisaged to alleviate competition between human and animal and reduce feed costs particularly for livestock species that are quite adapted for utilization of fibrous crop residues and by-products (Atuahene *et al.*, 1985). Such

crop residues or by-products are kola nut pod husk (Abioye *et al.*, 2006). The presence of anti-nutritional factors such as caffeine, theobromine, and tannins restricts the use of kola nut pod husk (KPH) as animal feeds. Several methods have been employed to improve the nutritive value of KPH for livestock production and this include fermentation which led to increase in crude protein of fermented KPH as reported by Lateef *et al.* (2008) and also enhanced micronutrient bio-availability and aids in degrading anti-nutritional factors (Oboh, 2006). Internal organs of animals exhibit abnormal growth in response to toxins in feeds (Ayodele *et al*., 2016). Therefore, this study was aimed at assessing the carcass traits and relative internal organ weights of growing rabbits fed graded levels of processed kola nut pod husks.

Materials and methods

Location of study

The field trials were carried out at the Teaching and Research Farm of the Department of Animal Health and Production, The Federal College of Agriculture, Akure (FECA). The area is located between 7^0 15' 0" North and 5^0 12' 0" East. The climatic condition of Akure follows the pattern of Southwest, Nigeria where the climate is influenced mainly by the rain-bearing southwest monsoon winds from the ocean and the dry northwest winds from the Sahara desert.

Collection and preparation of kolanut pod husks and corn stalk ashes

Pods of Kolanut were collected from kolanut plantations in Ijare (Ifedore Local Government Area) Ondo State and identified by the Crop, Soil and Pest Management Department, FECA. The pods were cut into two parts to remove the pulpy seeds, thoroughly washed with water to remove residual mucilage of the pods and thereafter chopped to pieces with the help of a sharp stainless steel knife. Thereafter, the pieces of the kolanut pods were sun dried for 7-14 days, milled (0.6 mm) and designated kolanut pod husk meal (KPHM). The KPHM was kept at moisture level of less than 10% in a jute sack until used.

Preparation of corn stalk ash solution

Dried corn (*Zea mays*) stalks were collected after harvesting from the Teaching and Research Farm of FECA, burnt in the open to ashes at 600^0C. The Corn Stalk Ash Solution (CSAS) was prepared by suspending 39.2 g of ash in 100 ml of deionized water for 48 hours at room temperature and filtered first through cheese cloth then through whatman No. 1 filter paper (Adamafio *et al.,* 2004 and Adeyeye *et al*., (2016). This is comparable to 9.8M of NaOH or 7M of KOH. One gram of KPH was steeped in 7mls of CSAS for seven days anaerobically and thereafter sundried and named Ash Treated Kolanut Pod Husk (ATKPH) (Adamafio *et al*., 2004).

Collection of layers' wastes and rumen liquor

Droppings of commercial layers' wastes (LW) devoid of feathers and broken egg shells were collected from Teaching and Research Farm, FECA, sundried for 14 days to moisture level of less than 6%, milled with hammer mill, bagged and kept in cool dried place until used. The rumen liquor was manually squeezed out of rumen content of freshly slaughtered cattle (White Fulani) through a clean muslin cloth at the Central Abattoir, Akure, Nigeria and used almost immediately.

Bio-degradation of Kolanut Pod Husks

ATKPH was mixed successively with dried layer wastes and molasses at rate of 100 g/kg and 50 ml/kg; respectively in an air tight black plastic container, sprayed with rumen liquor and allowed to ferment for the duration of 168 hours anaerobically as

described by Oloruntola *et al.* (2015) and Adeyeye *et al.* (2016). The fermented ATKPH was thereafter spread lightly on polythene and allowed to sundried for 7 days, analyzed (Table 1) for proximate analysis (AOAC, 1995), theobromine (Bisto *et al.,* 2002), caffeine (Rade *et al.,* 2008), tannin (Shad *et al.,* 2013) and thereafter labeled as processed kolanut pod husk (PKPH).

Animals' arrangement and management

One hundred and twenty (120) healthy, five-week old weaner rabbits of cross-breeds (Chinchilla and New Zealand) and mixed sexes were randomly allotted to the four (4) dietary treatments after balancing for weight in a completely randomized design. Prior to the commencement of the experiment, the rabbits were treated against coccidiosis, mange and bacterial infections by administering prophylactic coccidiostat, ivomectin and tetracycline as antibiotics. The rabbits were made to undergo a week adaptation period in their cages. Each treatment group was replicated ten (10) times with three (3) weaner rabbits per replicate. The rabbits were housed individually in two-tiers, wooden framed and wire meshed cages. The cages were raised 90cm above the floor and housed in well ventilated pen. The rabbits were provided with separate galvanized water trough and feeder. The rabbits were fed their respective diets *ad libitum* throughout the period of eight (8) weeks.

The test ingredients and experimental diets

The best Potash-rumen liquor treated kolanut pod husks obtained with respect to enhanced crude protein, reduced crude fibre and anti-nutritional factors after laboratory analysis was used as component of diets for the growing rabbits. Four (4) diets were formulated in which the best Potash-rumen liquor treated cocoa pod husks at 168 hours of fermentation period was included at 0, 10, 20 and 30% and designated as diets 1, 2, 3 and 4, respectively and the diets were pelletized (4mm diameter and 8mm long). The gross compositions and analyzed composition of the diets are as presented in Table 2.

Evaluation of carcass and relative organ weights

Two (2) rabbits were randomly selected from each treatment group of thirty (30) rabbits at the end of the 8 weeks feeding trial. The rabbits were starved overnight, slaughtered according to the guidelines of the World Rabbit Science Association (WRSA) (Blasco *et al*., 1993) and skinned. Their internal organs namely; lungs, liver, kidney, heart and spleen were removed and weighed. Thereafter, dressed weights were determined and used to calculate the dressing percentage for the rabbits.

Results

The Processed Kolanut Pod Husk contained 21.36g/kg crude protein, 12.38g/kg crude fibre, 1.80g/kg ether extract, 1.07g/kg caffeine and 1.59 g/kg theobromine as stated in Table 1. Carcass evaluation and relative organ weights of weaner rabbits fed diets containing graded levels of Processed Kolanut Pod Husk

Table 1: Chemical composition (g/kg) of processed kolanut pod husk meal

Composition	Quantity
Crude protein	21.36
Crude fibre	12.38
Ether extract	1.80
Ash	17.33
Caffeine	1.07
Tannin	0.98
Theobromine	1.59

Table 2: Gross composition of the experimental diets (g/kg)

	Levels of PKPH inclusion (%)			
	0	10	20	30
INGREDIENTS	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**
Maize	160.00	158.00	155.00	145.00
PKPH	0.00	100.00	200.00	300.00
Wheat offals	25.00	15.00	15.00	15.00
Soya bean meal	86.50	76.50	76.50	76.50
BDG	259.00	261.00	194.00	134.00
Rice Bran	269.00	189.00	159.00	129.00
Soya bean hay	50.00	50.00	50.00	50.00
Maize husk	130.00	130.00	130.00	130.00
Bone meal	10.00	10.00	10.00	10.00
*Premix	2.50	2.50	2.50	2.50
Methionine	1.50	1.50	1.50	1.50
Lysine	1.00	1.00	1.00	1.00
Salt	2.50	2.50	2.50	2.50
Vegetable oil	3.00	3.00	3.00	3.00
Total	**1000.00**	**1000.00**	**1000.00**	**1000.00**
Calculated (g/kg)				
Crude Protein	171.90	172.00	171.80	171.70
Crude fibre	160.30	160.60	160.40	160.20
**ME (kcal/kg)	2540.80	2540.69	2533.19	2541.03
Calcium	5.00	5.10	5.30	5.00
Phosphorus	3.10	3.20	3.00	3.00
Analyzed composition (g/kg/DM)				
Crude protein	162.60	163.00	162.80	162.70
Crude fibre	157.70	168.10	167.90	168.00
Ether extract	31.40	31.20	31.40	31.30

PKPH: Processed Kolanut pod husk, BDG: Brewers'dried grain. * Vit A 1200 IU; Vit K3 0.67mg; Vit B1 0.67mg; Vit B2 2.0mg; Vit B6 0.67mg; Vit B12 0.0004mg; Pantothenic acid 16.7mg; Biotin 0.07mg; Folic acid 1.67mg; choline chloride 400mg; Zn 22.3mg; Mn 10mg; Fe 25mg; Cu 1.67mg; I_2 0.25mg; Se 0.033mg and Mg 133.4mg.
**ME: Metabolizable energy= 37x% CP) + (81.8xFat) + (35.5x% NFE) (Pauzenga, 1985).

(PKPH) meal-based diets are as presented in Table 3. The slaughter weight (SW), dressing weight (DW) and dressing percentage (DP) were significantly ($P<0.01$) influenced by the dietary treatments. The SW and DW of rabbits fed 20% PFKPM-based diets (1813.80g and 1058.70g, respectively) were significantly ($P<0.05$; 0.001) higher than those fed on the control (1747.30g and 984.92g), 10% PFKPM: (1710.90g and 978.08g) and 30% PFKPM: (1624.20g and 937.75g). The relative organs weight of all the parameters measured (lung, liver, kidney, heart and spleen) were not significantly ($P>0.05$) influenced by the dietary treatments. The value of the lungs varied from 0.53% in rabbits fed 0% and 30% PKPH to 0.55% in rabbits fed 20% PKPH while kidney varied from 0.63% in those fed 0%PKPH to 0.67% in rabbits fed 30% PKPH.

Table 3: Carcass evaluation and relative organ weights of weaner rabbits fed graded levels of processed Kolanut pod meal (PKPH)

	Levels of PKPH inclusion (%)					
	0	10	20	30		
Parameters	Diet 1	Diet 2	Diet 3	Diet 4	SEM	P value
Slaughter weight (g)	1747.30[a]	1710.90[ab]	1813.80[a]	1624.20[b]	24.63	0.03
Dressing weight (g)	984.92[b]	978.08[b]	1058.70[a]	937.75[c]	13.30	0.00
Dressing percentage	56.40	57.26	58.54	57.79	0.57	0.66
Lung (%)	0.53	0.54	0.55	0.53	0.004	0.45
Liver (%)	3.20	3.24	3.40	3.17	0.05	0.43
Kidney (%)	0.63	0.65	0.64	0.67	0.02	0.85
Heart (%)	0.26	0.26	0.28	0.28	0.01	0.56
Spleen (%)	0.09	0.08	0.10	0.09	0.09	0.33

Means with different superscripts in the same row are significantly different ($p<0.05$).

Discussion

The protein levels in the formulated diets (16.26-16.30%) was higher in value than 15.01-16.00%, 15.84 – 16.85% and 15.34 – 17.50% as adopted by Olajide and Garus-Alaka (2019), Abegunde *et al.* (2014) and Olajide *et al.* (2016) respectively but lower than 17-18% reported for rabbits (deBlas and Wiseman, 2003). There was reduction in the crude protein with increasing inclusion of PKPH in the diets. This could be ascribed to lower crude protein content of PKPH (21.36g/kg) as compared to soybean (44.00%) crude protein level. The crude fibre content of the experimental diets (15.7 – 16.81%) was comparable with 13 – 14% reported by Coudert and Rouchambeau (1986) and 14% reported by Cheeke *et al.* (1987). The Metabolizable energy of the experimental diets increased as the PKPH inclusion level increased (2533.19 – 2541.03 kcal/kg). This is comparable to 2520.08 - 2528.90 kcal/kg (Abegunde *et al.* (2014) and 2522 – 2555.31 kcal/kg (Olajide and Adeniyi, 2015) reported for rabbits but lower than 2617.00 – 2661.00 (Olajide and Garus-Alaka, 2019). The variation in the slaughter weight (SW) of 1624.20-1813.80 g/rabbit and dressed weight (DW) of 937.75-1058.70 g/rabbit in this study could be ascribed to variations in the live weight of the experimental rabbits which increased as the levels of processed kola nut pod meal (PKPH) increased to 20 % and thereafter decreased in 30 % inclusion. This observation is similar to the report of Retore *et al.* (2008) and Olafadehan, (2011). The slaughter weight was however lower than 1640.00-1860.00g earlier reported by Olafadehan, (2011) and 1677.44 - 2218.01g reported by Ogunsipe *et al.* (2014). The dressed percentage range of 56.40-58.54% in this study was however higher than 50.03-58.51%, 52.05-53.36%, 43.24-53.83%, 48.70-49.45%, 43.76-51.45%, 51.10-57.39g and 44.88-55.12% reported by Olafadehan, (2011), Sobayo *et al.* (2008), Akinmutimi and Alufo (2006), Oteku and Igene (2006), Olajide and Adeniyi (2015), Abegunde *et al*. (2014) and Olajide and Garus-Alaka (2019), respectively but lower than 68.00-70.34% and 61.69-66.66% reported by Adeyemi *et al*. (2011) and Togun *et al*. (2006). These variations could be due to differences in breeds, age, nutrition, and animal environment. Examination of organ weights and histo-pathological findings are considered the very important aspect of any routine studies because they reveal many of the age-related, naturally occurring lesions of the animal used (Ogbuewu, 2011). The liver and the kidney are involved in the

elimination of toxins and metabolic wastes from animals' body (Onyeyilli *et al.,* 1998). Enlargement of organs such as liver and pancreas has been linked with the presence of anti-nutritional factors due to their higher detoxification activity (Aderemi, 2003) and as such, liver and kidney from rabbits fed PKPH based-diets are safe for consumption. The relative organ weights of the growing rabbits in this study were not affected by the dietary treatments. This is an indication that the test diets promoted similar organs' development and health as the control diet.

Conclusion

It was therefore concluded that inclusion of processed kolanut pod husk (PKPH) at 30% level in rabbits' diet had no deleterious effect on the carcass and thus promoted identical organ development.

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