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Performance Characteristics of Growing Rabbits Fed Diets Containing Graded Levels of Processed Kolanut (*Cola nitida*) Pod Husks

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Abstract

Performance characteristics of growing rabbits fed graded levels of processed (ash treated and rumen liquor fermented) kolanut (*Cola nitida*) pod husks (PKPH) were investigated. One hundred and twenty (120) rabbits were randomly allotted to four (4) dietary treatments at 0, 10, 20, and 30% inclusion levels and designated as diets 1, 2, 3, and 4 respectively. Each treatment group was replicated ten (10) times with three (3) rabbits representing a replicate and was fed *ad-libitum* for 56 days. Highest final live weight (1777.90g/r), total weight gain (1254.40 g/r) and daily weight gain (22.40 g/r) 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 feed conversion ratio of rabbits fed diet 4 was significantly ($p < 0.05$) lower than those fed the rest test diets.

Keywords: Kola nut pod husk, performance characteristics, rabbits, rumen liquor, ash

Introduction

The dwindling world's animal feed raw materials and increasing population growth, 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 have been thrown away without a second thought (Abioye *et al.*, 2006). Thus, in order to maximize food production and human protein requirement in Nigeria, all available reasonable options, especially production of livestock that are yet to play a major role in animal production must be considered for efficient utilization. Rabbit production and consumption has been reported as a veritable way of alleviating animal protein deficiency in Nigeria (Ajala and Balogun, 2004). The major limitation to the production of rabbit, and other livestock species 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 may alleviate competition between man 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). Some of such crop residues or by – products is kolanut pod husk (Abioye *et al.*, 2006). However, the presence of anti-nutritional factors such as caffeine, theobromine and tannins restricts the use of Kolanut pod husk (KPH) as animal feeds. Several methods have been employed to improve the nutritive value of KPH for livestock production. 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 which aids in degrading anti nutritional factors (Oboh and Akindahunsi, 2003 and Oboh, 2006).

Therefore, the objective of this study were to determine the effect of dietary inclusion of ash treated and rumen liquor fermented kolanut pod husks on performance of growing rabbits.

Materials and methods

The experiment was carried out at the Rabbitary; Teaching and Research Farms of the Federal College of Agriculture (FECA), Akure, Nigeria. The kolanut pod husks were processed as previously described by Adeyeye *et al.*, (2016). Kolanut pod husks were chopped into pieces with sharp stainless steel knife, sun dried for 7-14 days. Dried corn stalks collected were also gathered, burnt to ashes and used to prepare Corn Stalk Ash Solution (CSAS) by suspension in deionized water for 48 hours at room temperature and filtered. One gram of KPH was suspended in 10mls of CSAS for seven days anaerobically and thereafter sundried and named Ash Treated Kolanut Pod Husk (ATKPH) (Adamafio *et al.*, 2004). Droppings of commercial layers' wastes were collected from FECA poultry unit sundried and milled. The ATKPH was mixed with dried layers waste (100 g/kg) and molasses (50ml/kg). Freshly collected rumen liquor from slaughtered White Fulani cattle was added into the

KPH previously mixed properly with layers' wastes and molasses, covered and thereafter fermented anaerobically for 7 days, sundried for one week and named processed kolanut pod husks (PKPH).

The PKPH was analysed for chemical composition. Thereafter, four (4) diets (Table 1) were formulated in which processed kolanut pod husks were included at 0, 10, 20 and 30% and designated as diets 1, 2, 3 and 4 respectively. The rabbits' diets were pelletized (4mm diameter and 8mm long). One hundred and twenty (120) healthy, five-week old growing rabbits were randomly allotted to the four (4) dietary treatments after balancing for weight in a completely randomly design. Each treatment group was replicated ten (10) times with three (3) rabbits representing a replicate. The rabbits were fed their respective diets *ad-libitum* throughout the period of eight (8) weeks.

Table 1: Composition (%) of the experimental diets

Ingredients	0 %PKPH Diet 1	10% PKPH Diet 2	20% PKPH Diet 3	30% PKPH Diet 4
Maize	16.00	15.80	15.50	14.50
PKPH	0.00	10.00	20.00	30.00
Wheat offals	2.50	1.50	1.50	1.50
Soybean meal	8.65	7.65	7.65	7.65
BDG	25.9	26.10	19.40	13.40
Rice Bran	26.9	18.90	15.90	12.90
*Others ingredients	20.05	20.05	20.05	20.05
Total	100.00	100.00	100.00	100.00
Calculated analysis (%)				
Crude protein	17.19	17.20	17.18	17.17
Crude fibre	16.03	16.06	16.04	16.02
Metabolizable energy(kcal/kg)	2540.80	2540.69	2533.19	2541.03

PKPH: Processed kolanut pod husk, BDG: Brewers' dried grain

*Other ingredients: soybean meal (5%), maize husk (13%), bone meal (1%), premix (0.25%), methionine (0.15), lysine (0.1%), salt (0.25%) and vegetable oil (0.3%)

Results and Discussion

Performance of growing rabbits fed graded levels of processed kolanut pod husks (PKPH) is shown in table 2. Fermentation is a major process of caffeine and theobromine elimination, which according to Adamafio *et al.* (2004) enhances nutrient contents of foods through the biosynthesis of vitamin and protein by improving the protein quality and fibre digestibility. It also enhances micronutrients availability and aids in degrading anti-nutritional factors as observed by Oloruntola *et al.* (2017) and Adeyemi *et al.* (2008) in cassava sievate fermented with bovine rumen liquor fermented cassava sievate and cassava root meal respectively; and Adeyemi *et al.* (2011) for fermented pineapple peel. Chemical analysis showed that processed kolanut pod husk has 15.95% crude protein, 14.28% crude fibre, 2.05% ether extract, 14.46% ash, 1.33 mg/g caffeine and 2.45 mg/g theobromine.

Table 2: Performance of growing rabbits fed graded levels of processed kolanut pod husks (PKPH)

Parameters	Levels of PKPH inclusion (%)				SEM	P value
	0 Diet 1	10 Diet 2	20 Diet 3	30 Diet 4		
Initial liveweight (g/rabbit)	524.18	523.17	523.48	524.48	0.28	0.09
Final liveweight (g/rabbit)	1748.00 ^{ab}	1712.20 ^{ab}	1777.90 ^a	1530.60 ^b	41.65	0.03
Total weight gain (g/rabbit)	1223.80 ^{ab}	1189.00 ^{ab}	1254.40 ^a	1005.80 ^b	41.80	0.03
Daily weight gain (g/r/d)	21.85 ^{ab}	21.23 ^{ab}	22.40 ^a	17.96 ^b	0.75	0.04
Total feed intake (g/r)	3462.31	3232.51	3487.70	3356.32	56.44	0.25
Daily feed intake (g/r/d)	61.83	57.72	62.28	59.93	1.01	0.25
Feed Conversion Ratio	2.84 ^a	2.72 ^a	2.79 ^a	3.39 ^b	0.10	0.05

Means with different superscripts in the same row are significantly different (P<0.05)

g/r/d: grams/rabbit/day

+

The best final live weight (FLW), total weight gain (TWG) and daily weight gain (DWG) recorded for rabbits fed diet 3 (20% PKPH) were similar to those fed the control diet (0% PKPH) and diet 2 (10% PKPH) but significantly higher ($p < 0.05$) higher than those fed diet 4 (30% PKPH). The (DWG) range of 17.96-22.40g/rabbit/day observed in this study were however higher than 9.11-12.68g/rabbit/day for rabbits fed cassava sievate (Ekwe *et al.*, 2011), 12.50-14.00 g/rabbit/day for rabbits fed soaked cassava peels (Oluremi and Nwosu, 2002), 11.62-12.17g/rabbit/day for rabbits fed fermented and unfermented pineapple meal (Adeyemi *et al.*, 2010) and 12.92-13.74 g/rabbit/day for rabbits fed pride of barbados seed meal (Olajide and Adeniyi, 2015).

Consistent improved performance response was observed for rabbits fed diets containing fermented kolanut pod husks up to 20% PKPH inclusion level in terms of FWG, DWG and feed conversion ratio (FCR). This suggested that processed kolanut pod husks enhances or supports the performance characteristics of growing rabbits up to 20% inclusion level, beyond which depressed performance may be recorded.

The depressed ($p < 0.05$) TWG, DWG and FCR recorded in rabbits fed diet 4, compared to other diets may be as a result of increased anti nutrients (such as caffeine and theobromine) concentration at 30% PKPH inclusion level. This result agreed with Cunningham (1970), who recorded retarded growth and decreased feed efficiency in pig as a result of high level caffeine in diets. The feed conversion ratio (FCR) observed in this study i.e. 2.72-3.39 were better than 5.39-6.30 reported by Ogunsiye *et al.* (2011) for rabbits fed graded levels of gliricidia leaf protein concentrates and 4.42 and -5.85 reported by Ekwe *et al.* (2011) for those fed cassava sievate.

Conclusion

In conclusion, the inclusion of PKPH up to 20% level did not affect the performance of weaner rabbits negatively.

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