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PERFORMANCE AND NUTRIENT UTILIZATION OF PULLET GROWER CHICKENS FED DIETS CONTAINING *PROSOPIS AFRICANA* SEED COAT MEAL TREATED WITH POLYZYME

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ABSTRACT: *The study evaluated the effect of prosopis africana seed coat meal (PASCM) on the performance and nutrient utilization of three hundred (300) Nera brown pullet grower birds that were fed for 12 weeks. The birds were randomly allotted to 5 experimental diets with 3 replications of 20 birds each. The diets were formulated with the inclusion of PASCM at 0, 15, 20, 25 and 30% levels, respectively and the data collected were subjected to analysis of Variance in a completely randomized design. Results obtained indicated that the experimental diets significantly ($P < 0.05$) affected the average feed intake, while body weight gain, final weight of birds, FCR and PER were not affected ($P > 0.05$). Mortality was not observed. The Nutrient digestibility of CP and NFE did not showed significant ($P > 0.05$) effect, but CF and EE were affected by the dietary treatments. It is therefore suggested that 20% PASCM inclusion level could be adopted for optimum growth performance and nutrient digestibility in pullet growers' diets.*

KEYWORDS: Pullet Grower chickens, Performance, Nutrient Digestibility, PASCM.

INTRODUCTION

Inadequate supplies of feedstuffs at economic prices continue to limit the production of animal protein in Nigeria. This is because the cost of animal feed accounts for 60% and 70% of the cost of production in poultry enterprises in Nigeria. Nutritionists and other professionals therefore, strive to reduce this cost to maximize profit (Aletor, 2005; *Odeh et al.,* 2012).

The high cost of feed ingredients has scared some farmers from poultry business (Musa and Olarinde, 2008). The conventional feed like maize continues to be expensive. Maize constitutes the main component of energy diet in poultry production in Nigeria, suggesting that any increase in the price of maize may increase the price of animal products. Therefore, there is the need to find an alternative feed resource which can replace maize (Eruvbetine *et al*., 2003; Kwari, 2008) in the diets of pullet chicks. The use of agricultural by-products and kitchen wastes like maize bran, rice bran and *Prosopis africana* seed coat meal (PASCM) etc. as feed resources can be achieved in poultry diet after careful study. This will help to reduce the competition for maize and increase animal protein at a relatively lower cost and improve net profit (Dafwang and Shwarmen, 1996; Oluyemi and Roberts, 2000; Diorra *et al.,* 2002; Yusuf *et al.,* 2008).

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The availability of PASCM and its free acquisition brings it into focus as a replacement for maize in poultry nutrition. PASCM is high in crude fibre and low in energy compared to maize diet but it can be used to replace maize as energy source (Sanni, 2015; Abang *et al.*, 2016) in layer chickens diets with some exogenous enzymes (e.g polyzme®) fortification (Chesson 1993; Bedford and Morgan, 1996; Classen 1996). This study was sought to provide alternative feedstuffs to address the global feed crisis with the use of PASCM without affecting the performance and nutrient digestibility in pullet growers.

MATERIALS AND METHODS

Experimental Site

This study was conducted at the poultry unit of Ohagwu farm,Ochodu Ukpa Igede, Oju Local Government Area of Benue State, Nigeria. Oju Local Government Area lies between latitude $6^{0}51^{1}$ north and Longitude $8^{0}25^{1}$ east in the Southern Guinea Zone of Nigeria, with a climate that has two distinct seasons. The wet season covers mid-March to mid-November, while dry season starts in late November to early March in which high temperature is experienced between February and April. Oju Local Government Area has an annual rainfall ranging from 1200 mm to1500 mm. The temperatures are generally very high during the day, particularly in March and April with a mean daily temperature of $26^{O}C$, and daily minimum temperature of $16^{0}C$ to $21^{O}C$ and maximum daily temperature of $31^{O}C$ to $37^{0}C$ in dry and wet seasons. The relative humidity ranges from 42% to 75% depending on the time of the day and season of the year (Oju physical setting Online Nigeria.Com, 2003).

Test ingredient

Prosopis africana seed coat meal (PASCM) was sourced from women in Oju Local Government Area that produced food condiment (Okpehe or Dawadawa) from *prosopis africana* seeds.

Experimental Birds and Management

A total of 300 Nera brown pullet growers were used for the study. The birds were randomly allocated to 5 dietary treatments replicated thrice with 20 birds per replicate. They were intensively managed throughout the experimental period. Feed and water were given *ad libitum*. Record of initial weight, final weight, body weight gain and feed intake were taken while feed conversion ratio, protein intake and protein efficiency ratio were estimated.

Dietary treatment

The PASCM was sundried for 10 days and milled. It was then incorporated into 5 diets at 0, 15, 20, 25 and 30% levels as replacement for maize (Table 1).

Digestibility trials

At the 19^{th} week of the experiment, 2 pullet growers from each replicate were randomly selected and managed in clean disinfected metabolic cages. They were allowed 3 days of acclimatization and four (4) days of feacal collection. A known weight of feed was given daily. The feaces voided each day per treatment per replicate were weighed fresh and oven dried to a constant weight.

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Statistical analysis
The data obtained were subjected to one way analysis of variance (ANOVA) and in a completely randomized design using the procedure outlined in the Minitab (2014). Where significant difference between treatment means occurred, they were separated using Minitab (2014) software.

RESULTS AND DISCUSSION

Performance of Pullet Grower Chickens
Effect of replacing maize with *Prosopis africana* seed coat meal (PASCM) on the performance of pullet growers in Table 2 showed significant ($P < 0.05$) effect among the treatments groups for average feed intake (AFI) however, average final weight (AFW), average weight gain (AWG), feed conversion ratio (FCR), average daily protein intake (API) and protein efficiency ratio (PER) were not significantly ($P > 0.05$) affected by the dietary treatments. The result of this study is in harmony with the report of Mohammadi *et al.* (2018) who observed a decrease in feed intake and a non-significant ($P > 0.05$) effect on FCR, energy efficiency ratio (EER) and protein efficiency ratio (PER) when *Prosopis juliflora* seed meal was fed at graded levels to broiler chickens. Birds that were fed on 0% PASCM inclusion level had the highest AFI (68.09g/bird/day) but was not significantly difference ($P > 0.05$) from those on diets 15% and 20% PASCM inclusion levels. Feed consumption is a variable phenomenon and is influenced by factors such as strain of the bird, energy content of the diet, anti-nutritional factor inherent in the feed, ambient temperature, density of birds in the pen, hygienic conditions and rearing environment (Oluyemi and Roberts, 2000). PASCM is known to contain some phytotoxins (Uzogara *et al*., 1990; Njoku andObi, 2009; Pasiecnik *et al.*, 2001). Uzogara *et al*. (1990) and Njoku and Obi (2009) had reported the removal of part of the phytochemical substances through processing. It can therefore be inferred that these phytonutrients that are heat labile may have been eliminated during the processing of *Prosopis africana* seeds (PAS) into food condiment, the process by which PASCM is obtained. However, other phytonutrients that are not heat – labile (NSP) may constitute anti – nutritional factors (Uzogara *et al.*, 1990 and Njoku *and Obi*, 2009). The effect of these on monogastric nutrition includes trypsin-inhibitor and reduction in palatability and hence reduced feed intake as observed in the present study. This result is in agreement with the report of Al-Mazooqi *et al*. (2015) who observed decreased in average daily weight gain, feed intake and FCR when *Prosopis juliflora* pods with or without feed enzyme was fed to broiler chickens. The growth performance of pullet growers in 0% (control diet) PASCM inclusion level was not superior to PASCM based diets. This similarity may be due to effect of Polyzyme® on PASCM which has improved the digestibility and utilization of NSP of PASC cell walls caused by the release of nutrients that were incapacitated in PASC cell walls. This result is in line with earlier reports (Campbell and Bedford, 1992; Adegbe *et al.*, 2002; Bawa *et al.*, 2010; Owosibo *et al.*, 2007, Ademola *et al.*, 2013). The FCR and PER were not significantly ($P > 0.05$) affected by the dietary treatments in all the treatment groups, though lower numerical values of FCR were observed in PASCM based diets. The lower feed intake in PASCM based diets may be implicated on the anti- nurientt content of PASCM based diets which depressed feed intake compared with the control group; this may have resulted in higher growth rate in 0% (control diet) PASCM inclusion level. Also birds on 0% PASCM inclusion level recorded higher AFW and AWG compared to birds in PASCM based diets since more feed was consumed and hence more essential nutrients available for growth and development. This result agrees with the report of Paul (2015) who observed depressed weight

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gain, feed intake, FCR and feed utilization when varied levels of PASCM were fed to Japanase quails. There was no mortality recorded in any of the dietary groups during the study period. It may be concluded that this category of birds can tolerate up to 30% replacement of maize with PASCM without causing severe negative effect on growth and survivability of the pullet growers.

Nutrient Digestibility of Pullet Growers

Nutrient digestibility of the digestible nutrients such as DM, CP and NFE as presented in Table 3 were not significantly ($P > 0.05$) affected by the dietary treatments, however, CF and EE were affected ($P < 0.05$) by the dietary treatments. The digestible crude protein content of 20% and 25% PASCM inclusion levels were higher than that of 15%, 30% and 0% (control diet) PASCM inclusion levels. The non-significant effect of the digestible CP may be due to the effect of exogenous feed enzyme (Polyzyme®) treatment which has positively improved nutrient digestibility and utilization in PASCM based diets. Campbell and Bedford (1992); Adegbe *et al.(* 2002); Bawa *et al.* (2010); Ademola *et al.(*2013) have reported the digestibility of the digestible nutrients such as protein and calcium from NSP of the cell walls of feed materials. Except, for treatment 25% PASCM inclusion level of the digestible CF were similar to that of 0% (control diet) PASCM inclusion level. Though, CF and EE digestible nutrients were affected ($P < 0.05$) by the dietary treatments, the non-significance of AFW, AWG, FCR and PER in Table 2 may be concluded that the digestible nutrients in all the experimental diets met the productive potential of the pullet growers in this study. The nutrient digestibility of the five nutrients investigated in this study exceeded 50% in all treatment groups which indicates good efficiency of the biological value of the experimental diets. The result of the study therefore suggests that 30% replacement of maize with PASCM treated with Polyzyme® has no detrimental effect on the digestibility of the DM and other nutrients investigated, neither the health of the pullet grower chickens was compromised.

CONCLUSION

The non-significant difference in treatment 0, 15 and 20% in the average final weight, average weight gain, average feed intake, feed conversion ratio, protein intake and protein efficiency ratio suggests that up to 20% of PASCM inclusion level in the diets of pullet grower chickens could be adopted for optimum growth performance and nutrient digestibility.

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Table1. Ingredients And Dietary Composition Of Pullet Chick Diets

Experimental diets **Ingredients**	**0%**	**15%**	**20%**	**25%**	**30%**
Maize	53.00	45.05	42.40	39.75	37.10
PASCM	-	7.95	10.60	13.25	15.90
Sobean meal	20.00	20.00	20.00	20.00	20.00
Rice bran	18.45	18.45	18.45	18.45	18.45
Palm oil	1.00	1.00	1.00	1.00	1.00
Blood meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50	1.50
Vit.Min permit	0.25	0.25	0.25	0.25	0.25
Salt (Nacl)	0.25	0.25	0.25	0.25	0.25
Enzymes	-	+	+	+	+
Total	100.00	100.00	100.00	100.00	100.00
Determines nutrients					
Dry matter	93.13	92.71	94.36	92.90	94.31
Crude protein	18.31	17.22	16.47	16.67	16.78
Crude fibre	6.66	8.09	7.49	7.83	7.16
Ether extract	3.34	4.35	3.74	3.48	3.39
Ash	12.64	11.51	11.49	11.52	11.83
Nitrogen-free Extract (NFE)	59.06	59.01	60.30	60.84	60.84
Metabolizable Energy (kcal/kg)	3044.97	3084.78	3053.35	3058.84	3055.61

PASCM = *Prosopis Africana* seed coat meal

❖ Vitamin/mineral premix supplied the following additional nutrients per kg of feed.

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Table 2: Effect of *Prosopis africana* on Performance of Grower Pullet

Performance Indices	Experimental Diets					
	T_1	T_2	T_3	T_4	T_5	SEM
AIW (g)	608.33[a]	558.33[a]	560.00[a]	478.33[b]	463.33[b]	17.02
AFW (g)	1215.00	1105.00	1091.70	1073.30	1146.70	31.83
AWG (g/b)	15.39	13.96	13.78	13.56	14.50	0.41
AFI (g/b)	68.09[a]	68.08[a]	66.58[a]	64.13[b]	64.30[b]	0.48
FCR	4.42	4.80	4.83	4.73	4.60	0.19
ADPI	11.92	11.40	11.22	10.72	10.66	0.01
PER	0.77	0.81	0.81	0.79	0.75	0.11
Mortality (%)	0	0	0	0	0	0

[a,b] Means with different superscript in the same row are significantly different (P<0.05)
SEM = Standard error of mean; AIW = Average initial weight; AFW = Average final weight; AWG = Average weight gain; FCR = Feed conversion ratio; ADPI = Average daily protein intake; PER = Protein efficiency ratio

Table 3: Effect of the Dietary *Prosopis Africana* Seed Coat Meal on Nutrient Digestibility of Pullet Grower Chickens

Nutrients (%DM)	**Experimental Diets**					
	T_1	**T_2**	**T_3**	**T_4**	**T_5**	**SEM**
DM	71.66	71.30	73.44	73.06	72.92	0.74
CP	86.26	85.36	87.41	87.50	86.27	0.37
CF	56.33[ab]	52.55[a]	54.12[b]	61.04[a]	52.27[b]	1.01
EE	82.32[b]	86.94[a]	87.70[a]	87.10[a]	85.28[ab]	0.65
NFE	84.41	84.31	87.03	82.46	85.16	0.94

[a,b] Means with different superscript in the same row are significantly different (P < 0.05)
SEM = Standard error of mean; DM = Dry matter; CP = Crude protein; CF = Crude fibre; EE = Ether extract; NFE = Nitrogen free extract

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