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GROWTH PERFORMANCE AND NUTRIENTS DIGESTIBILITY OF JAPANESE QUAIL CHICKS *(Coturnix coturnix japonica)* FED DIETS CONTAINING RAW AND PROCESSED PIGEON PEA SEED MEAL BASED DIETS.

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ABSTRACT

A total of seven hundred and twenty (one – week old) Japanese quail chicks were randomly allocated to eight dietary treatments, three replicates per treatment and 30 birds per replicate to investigate the growth performance and nutrients' digestibility of the quails fed diets containing raw and processed pigeon pea seed meal (PPSM). Eight diets were formulated which contained 25% crude protein and 30% raw and processed pigeon pea seed meal (PPSM). These were processed by soaking (for 24, 48 and 72 hours), fermentation, boiling for 60 minutes and roasting for 30 minutes and were designated as dietary treatments:T1 (Control), T2 (raw PPSM), T3 (Soaked PPSM for 24 hours), T4 (Soaked PPSM for 48 hours), T5 (Soaked PPSM for 72 hours), T6 (Fermented PPSM), T7 (Boiled PPSM) and T8 (Roasted PPSM). The experiment lasted 28 days. The results showed that processed PPSM significantly (P<0.05) influenced the performance parameters measured across all the treatments. Birds on the T1 diet had the highest values for final body weight (138.33 g/bird) and daily weight gain (4.16g/bird) compared to other treatments. Daily feed intake was significantly (P<0.05) higher for birds fed PPSM based diets. Feed to gain ratio, feed cost per kg gain (₦) and age at first egg (days) were significantly (P<0.05) better for birds on T1 and T6 diets compared to birds on other diets. First egg weight was significantly (P<0.05) lower for birds fed T5 diet compared to the values obtained in birds fed other diets. No mortality was recorded among birds fed PPSM based diets. Birds on the T1 diet had significantly (P<0.05) higher digestibility values in terms of dry matter (DM), crude protein (CP), crude fibre (CF) ash and nitrogen free extract (NFE) when compared to other treatments. It was therefore concluded that raw PPSM and those soaked for digestibility was significantly (P<0.05) lower in birds fed diets T3, T4 and T6. However, ether extract digestibility was significantly (P<0.05) higher in birds fed T1, T2 and T5 diets 24 hours, fermented, and those roasted improved performance and digestibility of nutrients.

Keywords: Growth performance, Japanese quails, pigeon pea seeds, digestibility, nutrients

INTRODUCTION

The major problem of acute shortage and high cost of feed ingredients confronting the poultry industry in Nigeria has been attributed to stiff competition for feedstuffs between human, industry and livestock particularly for the fast growing and prolific monogastric species. (Esonu *et al*., 1999; Iyayi and Davies, 2005). In addition, the sky rocketed prices of conventional protein and energy sources (such as groundnut cake, soya-bean, maize, sorghum and others) has led to increase in the cost of animal protein and by consequence has created a wide gap between the

demand and supply of animal protein in Nigeria and many under developed countries of the world. Hence, the search for non – conventional sources of energy and protein with great potential to improve and sustain livestock production. Pigeon pea (*Cajanus cajan*) is one of the underutilized legumes with crude protein values of 20.6 – 27.7 % and is desirable due to its high nutrient profile (Apata and Ologhobo, 1993). Despite its nutritional potential in terms of protein content, the presence of antinutritional factors such as trypsin inhibitors, tannins, haemaglutinins, cyanogenic glycosides, saponins and phytates limits its use (Amaefule and Nwagbara, 2004). However, remarkable improvement in the nutritive quality of legume seeds have been achieved through various processing methods such as cooking, roasting, soaking and germination, fermentation, dehulling and chemical treatment which exerts beneficial effects by destroying the inherent antinutritional factors (Omeje, 1999 and Kaankuka *et al*., 2000; Matthew *et al.,* 2010). According to Akinmutimi and Okwu (2004), most processing methods employed in improving the feeding values of non conventional or alternative feedstuffs reduce the concentration of these anti nutritional factors to tolerable levels in feedstuffs. The rearing of Japanese quails (*Coturnix coturnix japonica*) as an animal protein source (Edache *et al*., 2005) has caught the attention of scientists and researchers. Quails being a fast growing poultry species are very economical to maintain as they require less floor space (Haruna *et al.*, 1997). They are small sized, early maturing, hardy and prolific laying between 200 – 350 eggs in their first year of production (Oluyemi and Roberts, 2000). The aim of this study was to evaluate the effect of processed pigeon seed meal (PPSM) on growth performance and nutrients digestibility of Japanese quail chicks.

MATERIALS AND METHODS

Experimental Site

This study was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, Ahmadu Bello University, Samaru, Zaria, Kaduna State. It is located within the Northern Guinea Savanna zone of Nigeria, Latitude 11^0 12^1N and Longitude 7^0 23^1E, at an altitude of 610m above sea level. The climate is relatively dry, with a mean annual rainfall of 700-1400mm, occurring between the Months of April and September. The dry season begins around the middle of October, with cold weather that ends in February. This is followed by relatively hot – dry weather from March to April, before the onset of rain. The mean maximum temperature ranges between 14^0C to 24^0C during the cold season while the mean maximum daily temperature is from 19^0C to 36^0C during the hot season. The relative humidity varies between 19 - 35% during the hot season, and 63 to 80% in the wet season as reported by Ovimaps (2012).

Source of Pigeon Pea Seeds

The Pigeon pea seeds used for this study were purchased from Samaru Market in Sabon Gari Local Government Area of Kaduna State, Nigeria.

Processing of Pigeon Pea Seeds

Four processing methods of pigeon pea seeds were employed. Thirty kilogram of raw pigeon pea seeds were milled and bagged. Another batch of 30 kg pigeon pea seeds were soaked in 75 litres of cold clean water for different hours; 24, 48 and 72 hours at room temperature. The water was drained after each soaking duration and the seeds were sun dried for four days on a clean concrete floor. Seeds were then milled and bagged. The next batch of 30 kg pigeon pea seeds were soaked in 75 litres of water for 24 hours at room temperature. The water was allowed to

drain and the seeds bagged and put into an air – tight polythene bag and allowed to ferment for three days. After 72 hours, the seeds were then sun dried on a clean concrete floor for four days. For boiling method of processing, 30 kg pigeon pea seeds were boiled for 60 minutes. The 75 litres of water was allowed to boil at a temperature of 100^0C using fire wood as the source of heat. The seeds were then poured into the boiling water, covered and then allowed to boil again for a specific duration of 60 minutes. The cooked sample was removed after draining the water and dried on a concrete floor for four days. The last batch of 30 kg raw pigeon pea seeds were roasted in a silver pot on a big tripod stand with fire wood supplying a steady flame. The seeds were constantly stirred with a spoon so as to have uniform roast and prevent the seeds from burning. The roasting was done for 30 minutes. The processed pigeon pea seeds were incorporated into the different dietary treatments at 30 % level of inclusion.

Design and Management of Experimental Birds

A total of seven hundred and twenty (720) one – week old Japanese quail chicks purchased from National Veterinary Research Institute (NVRI) Vom, Jos were used for the study. Ninety birds were randomly assigned to each of the dietary treatments which had 30 chicks per replicate in a completely randomized design. The birds were raised in 75cm long × 75cm wide × 60cm high cages. Kerosene stoves were used to provide additional heat while electricity bulb were installed in each pen to provide light and heat during the brooding period. Feed and water were provided *ad libitum.* Drugs were administered as at when necessary and all other routine management practices duly observed. The experiment lasted for four weeks. The birds were weighed at the beginning of the experiment and their average initial weights were taken. The chicks were subsequently weighed every week to determine the weight gained. Feed supplied and the left over were also weighed daily to determine the daily feed intake. Average final weight, daily weight gain, daily feed intake, feed to gain ratio, and percentage mortality (where it occurred) were computed. The cost /per kg of feed and cost of feed /kg gains were computed for each dietary treatment.

Experimental Diets

Eight experimental diets were formulated which contain 25% crude proteins based on the standard requirement (NRC, 1994) as shown in Table 1. Milled pigeon pea seeds processed by different methods as described above were incorporated into the dietary treatments at 30% of diet. Diet 1 formulated with soya bean seed meal as the main vegetable protein source served as the control. Diet 2 was formulated with raw pigeon pea seeds, while diets 3, 4, and 5 were formulated with pigeon pea seeds soaked for 24, 48 and 72 hours respectively. Diet 6 was formulated with pigeon

pea seeds that were soaked and fermented for 3 days. Diet 7 contained pigeon pea seeds boiled for 60 minutes while Diet 8 contained pigeon pea seeds roasted for 30 minutes.

Chemical Analysis

The proximate composition of the test ingredient (raw pigeon pea seeds) and experimental diets as well as the faecal samples were determined using the procedures of the Association of Analytical Chemist (AOAC, 1990).

Statistical Analysis

All data obtained in this study were subjected to analysis of variance using the general linear model procedure of Statistical Analytic System (SAS, 2008). Significant differences among treatment means were separated using Tukey model.

Table 1: Composition of Quail Starter Diets Containing Raw and Differently Processed Pigeon Pea Seed Meal (2-6 weeks)

	Treatments							
Ingredients	**1 Control**	**2 Raw PPSM**	**3 Soaked PPSM (24hrs)**	**4 Soaked PPSM (48hrs)**	**5 Soaked PPSM (72hrs)**	**6 Soaked Fermented PPSM**	**7 Boiled PPSM (60mins)**	**8 Roasted PPSM (30mins)**
Maize	47.97	30.29	30.29	30.29	30.29	30.29	30.29	30.29
SBM	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
PPSM	0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
GNC	37.53	25.21	25.21	25.21	25.21	25.21	25.21	25.21
Bone	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Common Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Vit. Premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total (%)	100	100	100	100	100	100	100	100
Determined Analysis								
M.E (Kcals/Kg)	2933	2976	2971	2965	2881	2927	2975	2955
Crude Protein (%)	25.12	25.88	26.13	26.68	24.87	24.68	25.06	24.50
Crude Fibre (%)	5.73	5.64	5.00	5.45	6.70	6.00	5.94	6.25
Ether Extract (%)	4.54	4.16	3.92	4.00	4.34	3.85	3.77	4.08
Calculated Analysis								
Calcium (%)	1.39	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Phosphorus (%)	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Lysine (%)	1.22	1.43	1.43	1.43	1.43	1.43	1.43	1.43
Methionine (%)	0.74	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Cysteine (%)	0.41	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Feed cost/kg (₦)	80.20	89.53	89.53	89.53	89.53	89.53	96.20	96.20

*Biomix chick premix provided per kg of diet: Vit A. 10,000 I.U; Vit D_3 32,000 I.U; Vit E 23,000 mg; Vit K 2,000mg; Vit. $B_1$1,800 mg; Vit. B_2 5,000mg; Pantothenic acid 7,500mg; Vit.B_{12}150mg; Folic acid 750mg; Biotin 100mg; Choline chloride; 300,000mg; Cobalt 3,000mg; Iodine 1,000mg; Iron 20,000mg; Manganese 40,000mg; Selenium 200mg; Zinc 30,000mg; Antioxidant 1250mg.

SBM = Soybeanmeal, PPSM = Pigeon Pea Seed Meal, ME = Metabolizable Energy

GNC = Groundnut cake

Results and Discussion

Table 2 shows the proximate composition of raw and processed pigeon pea seed meal (PPSM). The result showed that different processing methods had significant (P<0.05) effect on the proximate composition of pigeon pea seed meal (PPSM). There was no significant (P>0.05) difference in the dry matter content of raw pigeon pea seeds and that of the processed seeds. This suggested that processing methods employed had similar effect on the dry matter content of PPS. The crude protein (CP) content ranged between 21.25% for raw seeds to 24.75% for fermented PPS. This fell within the range 24 -30% of plant protein sources as reported by Aduku (1992) and 23.50% reported by Matthew *et al.* (2010). The highest crude fibre value of 7.32% was obtained in the raw PPS and this was significantly (P<0.05) higher than the values obtained in the processed seeds. This was an indication that processing effectively reduced the crude fibre content of PPSM, especially those boiled for 60 minutes and those roasted for 30 minutes. The reduction in crude fibre content indicates a significant improvement in the digestibility of processed PPSM by birds. The values of ether extract obtained in processed PPSM were significantly (P<0.05) lower than that of the raw seeds (1.89%). The significant decrease in the oil content of the processed seeds could be due to leaching of the oil into the water through soaking or boiling water or through volatilization of fats during roasting.

Total ash content was significantly (P<0.05) higher in raw PPSM (4.87%) compared to those of processed PPSM. This may imply that some minerals especially soluble inorganic salts in the processed PPSM got leached into the water through soaking and boiling. Other minerals may have been reduced by heat especially the heat labile minerals. The nitrogen free extract (NFE) obtained in raw pigeon pea seeds meal (64.67 %) was also significantly (P<0.05) higher compared to values obtained in processed PPSM.

Table 2: Proximate Composition of Raw and Differently Processed Pigeon Pea Seed Meal (PPSM)

Parameters (%)	Processing Methods							SEM
	Raw	Soaking (hours)			Fermentation (72 hrs)	Boiling (60mins)	Roasted (30mins)	
		24	48	72				
Dry matter	90.26	90.08	89.36	87.48	88.21	87.80	90.15	10.09
Crude protein	21.25^{c}	22.63^{bc}	23.44^{b}	23.8^{b}	24.75^{a}	23.88^{b}	24.25^{b}	0.24
Crude fibre	7.32^{a}	7.14^{a}	7.03^{a}	6.82^{b}	6.45^{b}	5.83^{c}	5.47^{c}	0.20
E.E	1.89^{a}	1.82^{b}	1.79^{bc}	1.78^{bc}	1.75^{c}	1.72^{d}	1.66^{e}	0.01
Ash	4.87^{a}	4.11^{b}	4.09^{b}	4.00^{b}	3.67^{bc}	3.96^{b}	4.06^{b}	0.06
NFE	68.67^{a}	64.30^{b}	63.69^{b}	63.50^{b}	63.38^{b}	64.61^{b}	64.56^{b}	0.33

Means within the same row with different superscripts differ significantly (P<0.05), SEM: Standard error means, EE: Ether extract NFE: Nitrogen free extract

The result of the treatment effects on the performance of quail chicks fed diets containing raw and processed pigeon pea seed meal (PPSM) is presented in Table 3. The result showed that the final body weight, weight gain, average daily feed intake, feed to gain ratio, feed cost per Kg gain, age at first egg (days) and first egg weight were significantly (P<0.05) affected by the dietary treatments. The final body weight and weight gain followed the same trend and were

significantly (P<0.05) higher for birds fed the control diet compared to those fed pigeon pea seeds based diets. However, among the birds fed pigeon pea seeds based diets, those fed Diet 6 containing fermented, raw PPSM (T2), PPSM soaked for 24 hours (T3) and those roasted for 30 minutes (T8) were significantly (P<0.05) better. This result could be attributed to good nutrient utilization traceable to effectiveness of processing by soaking the PPS for 24 hours, fermented and roasted for 30 minutes compared to those on diet T1. This is in agreement with the findings of Omeje (1999) and Kaankuka *et al.* (2000) who reported that processing improves the utilization of proteins and energy contained in legumes. The average daily feed intake were significantly (P<0.05) higher for birds fed PPSM diets compared to their counterparts in the control group. The improved feed intake observed in PPSM based diets could be due to the impact of processing in reducing the anti-nutritional factors (ANFs) which led to the improved palatability of the diets. This observation agreed with the findings of Nidaullah *et al*. (2010) who reported that smell and taste were critical traits in food selection. However, the feed to gain ratio and feed cost per kg gain (₦) were lower and significantly (P<0.05) better in birds fed the diet T1 and those on T6 containing fermented PPSM. The lower feed to gain could be attributed to improved rate of utilization of the dietary nutrients and conversion to gains. This is in agreement with the findings of Gebhart and Kabanov (2001) who reported that better feed conversion ratio signified that more feed was retained in the animals and less waste to the environment. The significantly (P<0.05) lower feed cost per kg gain (₦) observed in diet T1 (control) and T6 containing fermented PPSM could be due to the lower feed to gain recorded in these treatments, hence, reduction in feed cost per kg gain of the diets. Generally, the higher feed intake recorded for birds fed other PPSM based diets consequently resulted in poor feed to gain ratio with the attendant increase in the cost per kg gain (₦) of the diets. Birds fed the diet T1 and those on T7 containing boiled PPSM for 60 minutes had significantly (P<0.05) lower age at first egg (days) compared to those in other treatment groups. This implied that birds on these diets came on lay earlier than those fed other diets. The similarity observed in the age of the birds at first egg (days) across the treatments especially among the processed PPSM based diets could be attributed to high plane of nutrition with balanced amino acids in soybean–pigeon pea combination in the diets and its utilization for early maturity.

Table 3: Effects of Diets containing Raw and Differently Processed Pigeon Pea Seed Meal on Growth and Early Laying Performance of Quail Chicks (2- 6 weeks).

Parameters	TREATMENTS								
	1 (Control)	**2 Raw PPSM**	**3 Soaked PPSM (24hrs)**	**4 Soaked PPSM (48hrs)**	**5 Soaked PPSM (72hrs)**	**6 Soaked+ Fermented PPSM**	**7 Boiled PPPSM (60mins)**	**8 Roasted PPSM (30mins)**	**SEM**
Initial Weight (g/bird)	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	0.00
Final Body Weight (g/bird)	138.33^{a}	133.33^{abc}	131.00^{abc}	127.33^{bc}	128.33^{bc}	136.33^{ab}	126.33^{c}	131.00^{abc}	1.99
Total Weight Gain (g/bird)	116.63^{a}	111.30^{abc}	109.30^{abc}	105.63^{bc}	106.63^{bc}	114.63^{ab}	104.63^{c}	109.30^{abc}	1.99
Daily Weight Gain (g/bird/day)	4.16^{a}	3.97^{abc}	3.89^{abc}	3.77^{bc}	3.81^{bc}	4.09^{ab}	3.73^{c}	3.89^{abc}	0.07
Total Feed Intake (g/bird)	296.67^{b}	361.11^{ab}	353.34^{ab}	353.33^{ab}	371.11^{a}	354.44^{ab}	381.11^{a}	371.11^{a}	8.32
Daily Feed Intake (g/bird/day)	10.59^{b}	12.89^{ab}	12.62^{ab}	12.62^{ab}	13.25^{a}	12.65^{ab}	13.61^{a}	12.82^{ab}	0.29
Feed/Gain Ratio	2.54^{a}	3.25^{b}	3.24^{b}	3.35^{b}	3.48^{b}	3.09^{ab}	3.64^{c}	3.29^{b}	0.08
Feed Cost (₦)/kg Gain	204.21^{a}	290.82^{bc}	289.96^{bc}	299.59^{bc}	311.68^{cd}	277.27^{ab}	350.79^{d}	316.32^{cd}	7.33
Age at First Egg (days)	39.00^{a}	41.00^{b}	42.00^{b}	42.00^{b}	42.00^{b}	41.00^{b}	39.00^{a}	42.33^{b}	0.89
First Egg Weight (g)	7.36^{a}	7.03^{a}	7.50^{a}	7.53^{a}	6.73^{b}	7.73^{a}	7.43^{a}	7.10^{a}	0.38
Mortality (%)s	4.45^{b}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	0.78

abcd: Means within the same row with different superscripts are significantly different ($P<0.05$), SEM = Standard Error of Means,

PPSM: Pigeon Pea Seed Meal

However, the non-significant (P>0.05) difference observed in first egg weight of birds across the treatments except those on Diet 5 containing PPSM soaked for 72 hours may suggest balanced utilization of nutrients to produce the first eggs in relation to the age of the birds. This result agreed with the findings of Udeh (2010) who reported that a high correlation existed between the egg weights and the age of the birds. No mortality occurred among birds fed PPSM based diets except the few recorded in the control group. The little or low mortality recorded in the study gave credence to the findings of Jadhav and Saddiqui (2010) who reported that quails are hardy birds and perhaps less disease prone than other poultry birds.

The result of the nutrient digestibility by quails fed diets containing raw and processed pigeon pea seed meal is presented in Table 4. It was observed that percentage digestibility of dry matter, crude protein, ash and nitrogen free extract by birds across the treatments followed the same trend. These were significantly (P<0.05) higher for birds on the control diet (T1) compared to those on PPSM based treatments. This may be attributed to high nutrient profile of the diets in terms of balanced protein (amino acid profile) as more amino acids and other nutrients were consumed and efficiently used for the improved higher weight gain observed in the birds. In addition, similarity observed in nutrient digestibility by birds fed processed PPSM based diets was an indication of equal and balanced nutrient utilization by birds across the treatment groups. This agreed with the findings of Omeje (1999) and Kaankuka *et al*. (2000) who reported that processing improves the utilization of proteins and energy contained in legumes. The percentage digestibility of crude fibre was comparable in birds fed diets T1, T2, T5, T7 and T8 and these were significantly (P<0.05) higher than those in other treatment groups. This was an indication that soaking, boiling and roasting of PPS drastically reduced the crude fibre content of the diets, thus enhanced CF digestibility. This finding agreed with Balogun *et al.* (2001) who reported that heating improved the nutritional value of legume grains and also destroyed all the heat labile anti-nutritional factors.

Table 4: Effects of Diets containing Raw and Differently Processed Pigeon Pea Seed Meal on Nutrients Digestibility by Quail Chicks (2 - 6 weeks)

Parameters	TREATMENTS								
	1 (Control)	**2 Raw PPSM**	**3 Soaked PPSM (24hrs)**	**4 Soaked PPSM (48hrs)**	**5 Soaked PPSM (72hrs)**	**6 Soaked + Fermentation**	**7 Boiled PPPSM (60mins)**	**8 Roasted PPSM (30mins)**	**SEM**
Dry Matter	82.88^{a}	77.90^{b}	74.76^{b}	72.73^{b}	77.63^{b}	72.26^{b}	77.58^{b}	74.47^{b}	3.16
Crude Protein	92.29^{a}	89.72^{b}	88.68^{b}	88.27^{b}	89.64^{b}	86.96^{b}	89.36^{b}	87.66^{b}	1.42
Crude Fibre	88.61^{a}	84.87^{ab}	78.96^{b}	79.38^{b}	84.66^{ab}	78.71^{b}	84.29^{ab}	82.15^{ab}	2.69
Ether Extract	91.90^{a}	90.91^{a}	86.67^{b}	87.15^{b}	91.55^{a}	83.39^{b}	87.18^{b}	87.25^{b}	2.22
Ash	86.67^{a}	81.59^{b}	82.48^{b}	78.92^{b}	83.36^{b}	79.36^{b}	80.45^{b}	77.64^{b}	2.39
NFE	75.88^{a}	69.28^{b}	64.84^{b}	62.28^{b}	68.50^{b}	62.85^{b}	70.22^{b}	65.47^{b}	4.41

ab = Means within the same row with different superscripts are significantly different (P<0.05), SEM = Standard Error of Means,
PPSM = Pigeon Pea Seed Meal

Significantly (P<0.05) higher percentage ether extract digestibility was observed in birds fed the control diet (T1), T2 (raw PPSM) and T5 (PPSM soaked for 72 hours) compared to those on other dietary treatments. This may be attributed to good nutrient utilization in these treatment groups. However, the observed improvement in the digestibility of nutrients by birds fed T2 containing raw PPSM probably may be due to the unique ability of quails to tolerate and handle anti-nutritional factors (ANFs) in PPSM compared to other poultry species especially because of their adaption in the wild.

Generally, the observed improvement in the digestibility of nutrients by birds fed differently processed PPSM based diets which compared favourably with those on the control agreed with the findings of Omeje (1999) and Kaankuka *et al* .(2000) who reported that processing improves the utilization of proteins and energy contained in legumes.

CONCLUSION AND RECOMMENDATIONS

From the fore going, the growth performance of the experimental birds was significantly affected by the dietary inclusion of processed pigeon pea seed meal (PPSM) especially those soaked for 24 hours, fermented and those roasted for 30 minutes compared to those subjected to other processing methods. Digestibility of nutrients was higher in birds fed the control diet compared to those fed raw and processed PPSM diets. Thus, the use of raw PPSM, those soaked for 24 hours, fermented and those roasted for 30 minutes can be recommended for improved performance and nutrient digestibility especially in those locations where production of pigeon pea is abundant especially during harvesting seasons. Therefore, raw PPSM can be incorporated in quail diets as it removes stress and cost of processing without posing any threat to performance and health status of quails.

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