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CARCASS AND ORGAN CHARACTERISTICS OF GROWING JAPANESE QUAILS *(COTINTESTINEURNIX COTURNIX JAPONICA)* FED SUN-DRIED MANGO *(MANGIFERA SPP)* KERNEL MEAL

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ABSTRACT: *A study using complete randomized design (CRD) was carried out to assess the effect of Sun-dried Mango Kernel Meal (SMKM) on the carcass and organs characteristics of growing Japanese quails (Coturnix coturnix japonica). One hundred and forty four unsexed Japanese quails of about three weeks old were randomly selected and grouped into three treatments containing SMKM that replaced maize at 0%, 25% and 50% (TI, TII and TIII respectively) in properly compounded experimental diets. Each treatment was replicated thrice with sixteen (16) quails per replicate. The results of this study showed that SMKM did not influence the terminal live weights, carcass, dressed and neck weights of quails. In terms of organ weights, it was observed that SMKM affected the lungs, heart and kidney weights significantly (P<0.05) across treatments. The relative organs weights showed significant (P<0.05) differences in heart, intestine, lungs and kidney weights but the reverse was with the gizzard and liver weights. However, the relative weights of drum stick,back and breast muscles were significantly (P<0.05) different across treatments. It is concluded that sun-dried mango kernel meal could replace maize up to 50% in quails' diets, however, choice cut-part of quails were compromised.!*

KEYWORDS: Quails, Mango Kernel, Maize, Carcass And Organ Characteristics

INTRODUCTION

In recent times, a new genus of poultry, Japanese quail *(Coturnix coturnix japonica)* was introduced into Nigeria by the National Veterinary Research Institute (NVRI) Vom to expand the poultry sub sector and help supplement the domestic chicken production through meat and eggs (Edache *et al*., 2007; Ani *et al*., 2009). The quails have unique characteristics and advantages over other species of poultry which include early attainment of sexual maturity, short generation interval making it possible to have many generations in a year (Anon, 1991), high rate of egg production between 200-300 eggs in 360 days and are very resistant to common epidemics of poultry (NRC, 1991). Quails are birds which thrive very well in cages and are relatively inexpensive to maintain. They are birds that every household can keep without stress. The common Japanese quail matures in about six weeks and are usually in full egg production by 50 days of age. If properly mated, quail birds have high fertility and good egg hatchability.

The Quails are hardy birds that can adapt easily to different environments (Haruna *et al*., 1997). Their meat and eggs are renowned for their high quality protein, high biological value and low caloric content, making it a choice product for hypertensive patient (Haruna *et al*., 1997; Olubamiwa *et al*., 1999). Despite all these benefits, there are no improved feeding regimes, the most relevant option to arrest the present feed crisis of the livestock industry is

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by-product utilization (Atteh, 1986). These point clearly to alternative feed stuff for livestock feed production in order to cut down feed prices and make them more affordable by livestock farmers. As a result of shortage of conventional feed stuffs, livestock nutritionists have continued with their search for alternative feedstuffs. These alternative feed must be cheap, readily available and less competed for by man and industries or not competed for at all (Akinmutimi, 2004). The search for substitute has led to the discovery of non-conventional energy feed such as cocoyam, cassava, mango kernel etc (*Mangifera indica L.*) mango kernel is a good source of soluble carbohydrates (Saadany *et al.,* 1980; Jansman *et al.*, 1995; Teguia, 1995; Diarra *et al.*, 2008). The protein of the kernel (7.80 – 8.00 %) is comparable to that of maize but it has higher fats (7.80 – 9.00 %) than maize (Saadany *et al*., 1980). Mango kernel flour is reported to be equal to rice in food if tannin free (Morton, 1987). Tannins are known to interfere with protein digestibility and render it unavailable. There are other anti-nutrients contained in mango kernel such as; phytate, hydrogen cyanide, Trypsin inhibitor, oxalate, saponin etc. processing methods such as; boiling, fermentation, drying have been reported to be effective in reducing these anti-nutrients (Abang *et al.*, 2013; Diarra *et al.*, 2008).

MATERIALS AND METHODS

A total of one hundred and forty four two weeks old un-sexed Japanese quails of about the same weight (26.56±0.02) were studied over a period of four weeks. The birds were raised in Federal University of Agriculture Makurdi Teaching and Research Farms. Quails were randomly allotted to three dietary treatments (I-III) of 48 quails each. Each treatment was replicated thrice with 16 quails per replicate. In each of the three diets, Sun-dried Mango Kernel Meal (SMKM) replaced maize at 0%, 25% and 50% as treatments I, II and III respectively. The experimental birds were managed intensively in cages of three tiers. Each tier was separated with wood. Wire mesh was used for the walls and doors to allow adequate ventilation/lighting. The dimension of each tier was ($1.00m^2$ x $0.78m^2$). Litter materials (wood shavings) were used on the wooden floors. Each tier was equipped with adequate drinkers and feeding troughs. A floor space of $0.007m^2$ to $0.009m^2$ per quail was provided. Artificial lighting was provided with the use of one kerosene lantern for each tier to ensure adequate feed intake.However, care was taken to ensure that the lanterns did not produce sooth as this will affect their eyes and respiration. Feeds were weighed with a micro scale balance of 2kg before serving to obtain a uniform amount across treatments. Quails were served with 200gms of feed for the first week at about 8.am on a daily basis, the quantity was increased by 50gms on weekly basis. Fresh clean water was supplied daily *ad-lib*. Drinkers and feeders were washed and disinfected using izal when appropriate and rinsed thereafter. At the end of the experiment (28^{th} day or 4^{th} week), three quails per treatment (one from each replicate) were randomly selected and weighed. Quails were slaughtered by cutting their jugular veins with a sharp knife and allowed to bleed. After that the carcasses were weighed one after the other in the various treatments and scalded in warm water to soften the follicle of the feathers for easy removal followed by de-feathering and then evisceration. The carcasses were finally cut into various parts and each part was weighed and kept separately according to treatments. The data obtained on all the parameters studied were subjected to one-way analysis of variance (ANOVA) and least significant method (LSD) was used to separate means that differed significantly (steel and Torrie 1980). Result were presented as mean ± standard error of mean (SEM).

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Table 1: Composition of diets with Sun-dried Mango *(Mangifera spp)* Kernel meal for broiler Japanese quails *(Coturnix coturnix japonica)*.

	Level of inclusion		
Ingredients	**0%**	**25%**	**50%**
Maize	55.20	39.90	26.60
Mango	0.00	13.30	26.60
Full-fat soybean	26.67	25.87	25.37
Fish meal	5.20	6.00	6.50
Wheat offals	6.93	6.93	6.93
Bone meal	7.00	7.00	7.00
Salt	0.50	0.50	0.50
Vit/Min premix	0.50	0.50	0.50
Total	**100.00**	**100.00**	**100.00**
Calculated nutrients:			
Crude protein (%)	21.87	21.63	21.34
M.E (Kcal/Kg)	2836.47	2846.12	2846.39
Analysed nutrients:			
Crude protein (%)	22.02	21.75	21.70
M.E (Kcal/Kg)	2845.01	2900	2950

RESULTS AND DISCUSSION

Terminal carcass cuts are presented in table 2 and terminal organ weights in table 3. Live weight, carcass, neck and dressed weights showed no significant (P>0.05) difference across the treatments. This result was different from the reports of Okon *et al.* (2008) who recorded significant (P<0.05) differences in all these parameters when quails were fed boiled taro cocoyam meal . The heads and shanks weights of quails fed the control diet were significantly (P<0.05) higher than those fed 50% SMKM. Quails fed 25% SMKM had similar results with those fed 50% diets. It was observed that, the back, breast and drum stick weights of quails fed 0% diet were heavier than those fed other diets. However, quails in TII had significantly (P<0.05) higher values than those in TIII. Lastly, the wing weights of quails fed 50% SMKM had the least values when compared with the control, however, quails placed on 25% and 50% had similar results.The low values recorded with increased supplementation may be due to the presence of anti nutrient as sun-drying could not reduce these phytochemicals to a more tolerable level.

Terminal liver, gizzard and intestine weights were not different across the treatments. However, significant (P < 0.05) differences were recorded on heart, lungs and kidney weights. These results were in contrast with those of Okon *et al.* (2008) who observed only significant (P<0.05) differences in the intestine weights .Quails fed 50% diets had least kidney and heart weights whereas those fed control diet had highest weights. The lungs weight of quails fed 50% SMKM were higher than those fed control diet but there was no significant (P > 0.05) difference between quails fed 25% SMKM and those fed control diet.The differences observed may be as a result of the processing methods adopted and the test ingredients.

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Table 4 showed that, there were no significant (P > 0.05) differences in the relative live weights, dressed weights, carcass weights, neck weights and wing weights across treatments. However, significant (P < 0.05) differences were recorded in relative breast, back, and drum stick weights. These results were different from those reported by Okon *et al.* (2008) who observed no significant (P < 0.05) differences in these aforementioned parameters when quails were fed boiled sun-dried taro cocoyam meal. Quails fed the control diet had significantly (P < 0.05) higher values of relative breast weights than quails fed 50% sun-dried mango kernel meal (SMKM). However, quails fed 25% SMKM were mid- way 0% and 50%. The relative back weights of quails fed 0% (control) were significantly (P<0.05) different from those placed on 25% and 50% diets . However, quails fed 25% SMKM had significantly (P<0.05) higher values than quails fed 50% SMKM. In terms of relative drum stick weight, quails fed sun-dried mango kernels meal in TII and TIII recorded significantly (P<0.05) lower values than those fed 0% SMKM, Probably, because of the presence of anti nutrients.

Relative organ weights are presented in Table5 . The results did not record significant (P > 0.05) differences in the relative liver and gizzard weights of quails fed sun-dried mango kernel meal (SMKM). The relative heart weights of quails fed 0% SMKM had significantly (P < 0.05) higher values than quails fed 50% SMKM. Moreover, quails fed 25% SMKM showed no significant (P > 0.05) difference with quails fed 0% and 50% diets. It was observed that, the relative lungs weight of quails fed control diet and 25% SMKM were significantly (P < 0.05) different from those fed 50% SMKM. The result equally revealed that quails in TII and TIII had significantly (P<0.05) lower values of relative kidney weights than those in TI. Intestine weight of quails in T11 and T111 were significantly(P<0.05) higer than those of T1. The result of relative organ weights were in contrast with those of Okon *et al.* (2008) who observed no significant (P>0.05) differences in the organ parameters except for the intestin weight

Table 2: Effect of graded levels of sun-dried mango on terminal carcass weight of quails at six weeks of age (g)

Incusion levels.

Parameter	0%	25%	50%
Live weight	86.06±6.18	82.68±7.65	74.64±3.49
Carcass weight	80.84±5.44	72.29±6.04	63.94±2.66
Dressed weight	60.29±4.68	55.92±5.49	47.40±2.40
Head	4.89 ± 0.10^{a}	4.19 ± 0.15^{b}	3.95 ± 0.13^{c}
Neck	4.42±0.25	4.73±0.30	4.21±0.28
Breast	19.06 ± 1.86^{a}	15.85 ± 1.50^{b}	10.55 ± 0.71^{c}
Back	13.48 ± 0.95^{a}	10.75 ± 1.54^{b}	7.10 ± 1.14^{c}
Shank	1.69 ± 0.11^{a}	1.38 ± 0.11^{b}	1.19 ± 0.09^{c}
Drumstick	14.08 ± 1.46^{a}	10.10 ± 1.03^{b}	8.97 ± 0.99^{c}
Wing	4.98 ± 0.48^{a}	4.72 ± 0.054^{a}	3.29 ± 0.23^{b}

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Different superscripts (a, b and c) within row indicate significant ($p<0.05$) differences at specified levels

Table 3: Effect of graded levels of sun-dried mangokernel meal on terminal organs weight of Japanese quails at six weeks of age (g).

Incusion levels.

Parameter	0%	25%	50%
Liver	1.38±0.18	1.55±0.18	1.27±0.07
Heart	0.91±0.13[a]	0.76±12[b]	0.51±0.04c
Lungs	0.71±0.06b	0.74±0.07[b]	1.27±0.07[a]
Gizzard	2.45±0.20	2.44±0.14	2.08±0.18
Kidney	1.36±0.25[a]	0.70±0.20[b]	0.60±0.10b
Intestine (intact)	2.90±0.16	3.27±0.25	3.11±0.28

Different superscripts (a, b and c) within row indicate significant ($p<0.05$) differences at specified level

Table 4: The effect of graded levels of sun-dried Mango kernel meal as on relative carcass weight of Japanese quails at six weeks of age (g).

Inclusion levels

Parameters(g)	0%s	25%	50%	SEM
Live weight	86.06	82.68	74.64	14.77
Carcass weight	95.06	92.10	85.86	10.61
Dressed weight	70.74	67.79	63.66	8.81
Head weight	5.77	5.25	5.33	0.82
Neck weight	5.27	5.87	5.65	0.96
Breast weight	22.35[a]	19.87[ab]	14.16[b]	4.02
Back weight	16.18[a]	13.32[b]	9.47[c]	4.16
Shanks weight	2.01	1.78	1.64	0.48
Drum stick	17.34[a]	13.09[b]	12.19[b]	5.73
Wing weight	5.52	5.92	4.40	1.40

Different superscripts (a and b) within row indicate significant ($p<0.05$) differences at specified levels.

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Table 5: The effect of graded levels of sun-dried Mango kernel meal on relative organ weights of Japanese quails at six weeks (g).

	Inclusion levels			
Parameters	0%	25%	50%	SEM
Heart weight	1.05[a]	0.92[ab]	0.67[b]	0.22
Lungs weight	0.83b	0.89b	0.95a	0.19
Liver weight	1.57	1.99	1.70	0.50
Gizzards weight	2.94	3.17	2.79	0.96
Kidney weight	1.5[a]	0.91[b]	0.6c	0.42
Intestine weight	3.34[b]	4.09[a]	4.15[a]	0.83

Different superscripts (a and b) within row indicate significant ($p<0.05$) differences at specified level.

SUMMARY/CONCLUSION/RECOMMENDATION.

The inclusion of sun-dried mango kernel meal in quails' diet as an alternative energy source affected the choice quails' parts like the drum stick, breast muscles and back weights with quails fed 0% diets having the highest values. There was no significant ($P > 0.05$) difference in terminal liver, heart, gizzard, intestine weights and relative gizzard and liver weights across treatments. However there was hypotrophy (reduction in size) of the kidney with increased levels of SMKM across treatments and hypertrophy (increase in size) of the lungs with increased supplementation across treatments. It is recomended that sun-dried mango kernel meal should not exceed 25% inclusion level in quails' diets as it exerted a negative influence on most cut-parts and organ weights beyond this inclusion level. I recommend that another processing method such as fermentation be employed inorder to reduce these anti nutrients to a more tolerable state.

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APENDIX

Table 4: The effect of graded levels of sun-dried Mango kernel meal on relative carcass weight(g) of Japanese quails at six weeks of age.

	Inclusion levels			
Parameters(g)	0%	25%	50%	SEM
Live weight	86.06	82.68	74.64	14.77
Carcass weight	95.06	92.10	85.86	10.61
Dressed weight	70.74	67.79	63.66	8.81
Head weight	5.77	5.25	5.33	0.82
Neck weight	5.27	5.87	5.65	0.96
Breast weight	22.35^{a}	19.87^{ab}	14.16b	4.02
Back weight	16.18^{a}	13.32^{b}	9.47^{c}	4.16
Shanks weight	2.01	1.78	1.64	0.48
Drum stick	17.34^{a}	13.09^{b}	12.19^{b}	5.73
Wing weight	5.52	5.92	4.40	1.40

Different superscripts (a, b and c) within row indicate significant ($p<0.05$) differences at specified levels.

Table 5: The effect of graded levels of sun-dried Mango kernel meal on relative organ weights (g) of Japanese quails at six weeks of age).

Parameters	0%	25%	50%	SEM
Heart weight	1.05^{a}	0.92^{ab}	0.67^{b}	0.22* S
Lungs weight	0.83^{a}	0.93^{a}	0.55^{b}	0.19 *S
Liver weight	1.57	1.64	1.70	0.50 NS
Gizzards weight	2.94	3.17	2.79	0.96 NS
Kidney weight	1.55^{a}	0.64^{b}	0.91^{b}	0.42* S
Intestine weight	3.34^{b}	4.09^{a}	4.15^{a}	0.83* S

Different superscripts (a and b) within row indicate significant ($p<0.05$) differences at specified levels.

SUMMARY/CONCLUSION

The inclusion of Sun-dried Mango Kernel Meal in quails' diet as an alternative energy source affected the choice quails' parts like the drum stick, breast muscles and back weights with quails fed 0% diets having the highest values. There was no significant ($P > 0.05$) difference in terminal liver, heart, gizzard, intestine weights and relative gizzard and liver weights across treatments. However there was hypotrophy (reduction in size) of the kidney with increased levels of SMKM across treatments and hypertrophy (increase in size) of the lungs with increased supplementation across treatments. It is concluded that sun-dried mango kernel meal should not exceed 25% inclusion level in quails' diets as it exerted a negative influence on carcass and organ weights beyond this inclusion.

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