Journal of Agriculture and Veterinary Sciences
Volume 11, Number 2, 2019
ISSN: 2277-0062

AND ORGAN CHARACTERISTICS OF JAPANESE QUAILS FED FERMENTED MANGO KERNEL COMPOSITE MEAL

Yerima Shettima Kolo[1], Samson Ishaya[2], and Felicia Ayuba[1]
[1] Department of Animal Production, University of Agriculture, Makurdi
[2] Department of Animal Science, University of Maiduguri,
Email: Yerimabshettimakolo@gmail.com

ABSTRACT

A Study on carcass and organ characteristics of Japanese quails fed fermented mango kernel composite (FMKCM) was carried out using complete randomized design (CRD). One hundred and ninety five (195) unsexed Japanese quails were randomly allotted to five dietary treatments comprising of 0%, 10%, 15%, 20% and 25% inclusion levels of fermented mango kernel composite meal for T1, T2, T3, T4 and T5 respectively. Each treatment was replicated thrice with thirteen (13) birds per replicate. The result of this study showed that there were no significant differences (P>0.005) across treatments with respect to meat yield and meat distributions among carcass cut-off parts. In terms of organ weights, significant difference (P<0.05) were observed in the heart and spleen weights, however, the result did not follow a regular pattern implying that, treatments would not have accounted for these differences. It is therefore concluded that, fermented mango kernel composite meal could be used up to 25% in the diets of Japanese quails without compromising the carcass and organ weights.

Keywords: Fermented Mango, Japanese quail, Maize, Carcass Indices, Organ Indices

INTRODUCTION

The protein of high biological value (BV) especially that of animal origin is limited in supply particularly in developing countries like Nigeria. This emanates from as a stiff competition of cereals grains (especially maize) between man, animals and industries due to seasonal availability, which leads to unavailability and consequently high cost of production which is translated into the high cost of animal products. The incorporation of agro-industrial by-products and non-conventional feedstuff that are available, cheap, safe and nutritionally adequate is now been encouraged and explored to sustain poultry industry. The situation has necessitated the need to source for an alternative or partial replacement of one of the most highly competitive feed ingredient such as maize, which contributes about 60-80% of most formulated diets [1]. Some of the unconventional feed resources that have been experimented includes: Taro cocoyam cormel meal (*Colocasia esculenta*), Cassava root meal (*Manihot spp*), sweet potato meal (*Ipomea batata*), Coffee pulp meal (*Coffee Arabica*), Prosopis africana seed coat meal (Iron tree) and Mango seed kernel meal(*Mangifera indica*)[1,2]. However, most of these feeds contain anti-nutrients and toxic components such as saponins, lectins, tannins, trypsin inhibitors and cyanogenic glycosides which make them unsafe as carbohydrate sources in livestock production [2]. These anti-nutrients chelate divalent ions like Ca^{2+}, Mg^{2+}, Fe^{2+} and Zn^{2+} also react with the charged groups of protein and polysaccharides thereby forming indigestible complexes while the toxic substances interfere with nutrient bioavailability and utilization[3]. Processing methods such as; boiling, oven drying, autoclaving, fermentation etc could reduce these anti nutrients to a more tolerable state [3]. Mango kernel is a good

source of soluble carbohydrate [3]. 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 [4].

Mango kernel flour is reported to be equal to rice in food if tannin is free [5]. Tannin is known to interfere with protein digestibility and rendering 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 has been reported to be effective in reducing these anti-nutrients [6, 3]. Research in the past have indicated the suitability of mango seed kernel in livestock feeding but the level of inclusion in poultry diets has been low because of the presence of tannins which has inhibit chicks growth [6, 3].

Japanese quails are hardy birds that thrive in small cages. It is this attribute of hardiness, ability to withstand diversified agro-climatic conditions and inexpensive to keep that makes it viable commercial poultry enterprise. Japanese quails mature in about 6 weeks and are usually into full egg production by 50 days of age. With proper care, hens should lay 200 eggs in their first years of lay. Life expectancy is 2 to 2 $\frac{1}{2}$ [7]. These attributes make it an ideal experimental bird for the provision of supplemental income and protein. The objective of this study is to determine the effect of graded levels of fermented mango kernel composite meal on the carcass and organs characteristics of Japanese quails as a replacement for maize.

MATERIALS AND METHODS

Experiment site

This experiment was conducted at the poultry unit of the Teaching and Research farm of the Federal University of Agriculture, Makurdi, Benue state. Makurdi is located at the longitude 6° 10′ East and latitude 6°8′ North. The area is warm with a minimum temperature range of 29.8-35.6°C. Rainfall is between 508-1016mm and relative humidity is 47%-87% [8]. One important geographical features of this area is the river Benue which divides Makurdi into the Northern and Southern parts. Makurdi local Government has an area of 16km radius. It lies within the Guinea savannah region of the Nigeria vegetative belt located in the Benue valley. Makurdi experiences a typical tropical climate with two distinct seasons (dry and wet). The dry season begins in November and ends in March while the wet season starts in April and ends in October. Harmathan with cool weather is experienced from December to early February [8].

Preparation of Experimental Materials

Different cultivars of both indigenous and improved mango were collected during the month of May (peak of the mango season) in Gboko and Makurdi area of Benue state, Nigeria. Mango kernel was removed by cracking manually with the aid of hammer. The fresh kernels are soaked in water at room temperature to allow it ferment for a period of 2 days (48hrs) in order to reduce the anti-nutrients to a more tolerable level and rinsed thoroughly with clean cool water. The fermented kernel was sundried in order to reduce the moisture content to less than 10% to prevent microbial build up and for prolonged storage. The ingredients were crushed separately into fine grit and were later mixed at varying

inclusion levels with other ingredients to formulate the various diets.

Chemical Analysts

Chemical analysis of fermented mango kernel and experimental diets were analyzed using [9].

Formulation of Diets

Feeds were formulated to meet the nutritional requirements for quails during the growing phase. Fermented mango kernel composite meal replaced maize at 0% (control diets was compounded with 100% maize and 0% FMKCM) 10% (diet was compounded with 90% and 10% FMKCM) 15% (diets was compounded with 85% maize and 15% FMKCM) 20% (diet was compounded with 80% maize and 20% FMKCM) and 25% (diet was compounded with 75% maize and 25% FMKCM) in treatments I, II, III, IV, V respectively.

Animal Grouping

A total of one hundred and ninety five two weeks old un-sexed Japanese quails of about 33.60g of weight purchased with the national veterinary research institute Vom –Jos, Nigeria. At the start of the feeding trial, three groups were allotted to five dietary treatments of 39 quails each. Each treatment was replicated thrice with 13 quails per replicate.

Housing

The 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 ($1.0m^2$ x $0.78m^2$). Litter materials (wood shaving) were used on the wooden floors. Each tier was

equipped with adequate drinkers and feeding troughs. A floor space of about 0.007 m^2 to 0.009 m^2 per quail was provided. Artificial lighting was provided with the use of one battery lantern for each tier to ensure adequate feed intake.

Routine Operations

Feeds were weighed with a micro scale balance of 5kg before serving to ensure a uniform amount across treatments. Quails were served with 250grams of feeds for the first week at about 8am on daily basis; the quantity was increased by 50grams on weekly basis. Fresh clean water was supplied daily *ad-lib*. Drinkers and feeders were washed and disinfected using izal when appropriate. Litter materials were changed when due and replaced accordingly.

Table 1: Composition of Diets with Varying Levels of Fermented Mango Kernel Composite (FMKCM) Meal for Growing Quails (Kg)

INGREDIENTS	T1 (0%)	T2 (10%)	T3 (15%)	T4 (20)	T5 (25)
Maize	45.00	40.50	38.25	36.00	33.75
FMKCM	0.00	4.50	6.75	9.00	11.25
Soybean meal	21.00	21.00	21.00	21.00	21.00
Groundnut cake	15.95	15.95	15.95	15.95	15.95
Maize offal	9.00	9.00	9.00	9.00	9.00
Bone meal	4.00	4.00	4.00	4.00	4.00
Blood meal	2.50	2.50	2.50	2.50	2.50
Fish meal	2.00	2.00	2.00	2.00	2.00
Vit/min premix	0.30	0.30	0.30	0.30	0.30
Salt	0.25	0.25	0.25	0.25	0.25
Analyzed Nutrients:					
ME(Kcal/kg)	2968.03	2995.84	3006.95	3018.05	3029.16
Crude protein	24.46	24.53	24.59	24.64	24.70

Design and Analysis

At the end of the experiment (7 weeks of age) three (3) birds were randomly selected from each replicate and slaughtered. Birds were slaughtered by cutting their jugular veins with a sharp knife and allowed to bleed. After that the carcass were weighed one after the other in the various treatments and scalded in warm water to soften the follicle of the feather for easy removal followed by de-feathering and evisceration. The carcasses were finally cut into various parts and each part was weighed and kept separately according to treatments. Weight of cut-off parts and internal organs were determined using a sensitive digital scale. The data obtained on all the parameters studied were subjected to one-way analysis of variance (ANOVA) using Minitab statistical software version 14 [10] and least significant method was used to separate means that differed significantly [11].

RESULTS AND DISCUSSION

The mean value for the cut off parts of Japanese quails fed different inclusion levels of FMKCM is presented in table 3 below. The mean value for live weight range from 125.33g to 140.67g, carcass weight 121.77g-136.22g, plucked weight 116.00g-131.00g, dressed weight 82.94g-89.00g, breast weight 24.59g -27.20g, thigh weight 8.77g-10.00g, back weight 11.45g-12.37g, wing weight 6.89g-7.73g, head weight 5.00g-5.49g, neck weight 5.90g-7.10g and shank weight 1.87g-2.40g. All the treatment showed no significant ($P>0.05$) difference on the carcass and cut off parts. This result agrees with the findings of [12, 13, and14] who reported no significant ($P>0.05$) difference in the parameters measured when boiled mango kernel composite meal (BMKCM) and

fermented mango kernel composite meal (FMKCM) was replaced with maize in the broiler finisher diets. The results for the present study contracts the finding of [14] who observed significant (P<0.05) difference in head weight, breast weight, back weight and shank weight across treatment groups, with quails fed control diets having the highest mean weight and those place on 50% least weight in all the aforementioned parameters when quails were fed sundried mango kernel meal. It appears the weights of these various cut off part reduced with increased supplementation of sundried mango kernel meal across treatment. Mango kernel is a rich source of tannin; tannins are known to interfere with protein digestion and thereby rendering it unavailable, sun drying process may not have efficiently reduced the anti nutrient to a more tolerable level and this may have accounted for the better results recorded with bird fed fermented mango kernel composite meal(FMKCM). Similarly low weights of cut off parts were also recorded across treatment by [15, 16] when broilers were fed heat treated mango kernel meal (HMKM) and sundried mango kernel respectively.

The mean values for heart ranged from 0.61g-0.97g, lungs 0.71g-0.91g, kidney 0.07-0.27, spleen 0.24-0.53, pancreas 0.09g-0.46g, liver 1.70-3.03, gizzard 3.26g-3.70g and intestine 5.00g-6.07g.There were no significant (P>0.05) difference across the treatment for lung, liver intestine, pancreas, kidney and significant (P<0.05) difference were recorded across the treatment group for heart and spleen weight. This result partially agrees with the finding of [14} who found no significant (P>0.05) difference across the treatment for liver, Gizzard and intestine and significant

(P<0.05) difference were recorded in the heart, lungs and spleen when quails were fed sundried mango kernel meal (SMKM). The result disagree with the finding of [15] who reported significant (P>0.05) difference in the internal organs of broiler fed heat treated mango kernel meal on all the parameters measured with the control experiment having the highest weight, This may be due to the processing method employed. Fermentation is a better way of reducing anti nutrients when compared with sun drying and boiling [17]. Birds placed on 25% inclusion level were found to record the highest value for lung, kidney, pancreas, liver and intestine with the exception of heart and spleen whose weight was highest in 0% and 10% inclusion level.

Table 2: Carcass Characteristic of Japanese Quails Fed Fermented Mango Kernel Composite Meal (FMKCM).

Parameters (g)	(0%)	(10%)	(15%)	(20%)	(25%)	SEM	P-Values
Fasted live weight	125.33	130.00	133.31	137.67	140.67	6.52	0.99
Carcass weight	121.77	127.75	129.15	132.62	136.22	5.22	0.98
Plucked weight	116.00	124.23	126.12	128.67	131.00	5.01	0.97
Dressed weight	82.94	83.11	85.47	87.83	89.00	4.56	0.95
Breast weight	24.59	25.80	25.83	26.07	27.20	1.81	0.93
Thigh weight	8.77	9.07	9.13	9.92	10.00	0.87	0.76
Back weight	11.45	11.51	11.74	13.20	12.37	0.89	0.71
Wing weight	6.89	7.18	7.50	7.17	7.73	0.70	0.82
Head weight	5.00	4.83	5.06	5.22	5.49	0.33	0.53
Neck weight	5.90	5.92	6.03	6.03	7.10	0.24	0.67
Shank weight	1.87	2.07	2.18	2.19	2.40	0.10	0.61

SEM= Standard error of mean

Table 3: Organ Weight of Japanese Quails Fed Fermented Mango Kernel Meal

Parameters	(0%)	(10%)	(15%)	(20%)	(25%)	SEM	P-Value
Heart weight	0.97^{a}	0.68^{c}	0.75^{b}	0.62^{d}	0.60^{d}	0.06	0.04
Lung weight	0.71	0.72	0.80	0.86	0.91	0.04	0.53
Kidney weight	0.07	0.10	0.16	0.20	0.27	0.02	0.52
Spleen weight	0.48^{b}	0.53^{a}	0.42^{c}	0.33^{d}	0.24^{e}	0.03	0.01
Pancreas weight	0.09	0.11	0.25	0.32	0.46	0.02	0.54
Gizzard weight	3.26	3.33	3.37	3.50	3.70	0.16	0.65
Liver weight	1.70	2.17	2.33	2.63	3.03	0.013	0.11
Intestine weight (Intact)	5.00	5.23	5.40	5.80	6.07	0.21	0.87

^{abcde} Means within the same row bearing different superscripts are significantly different ($P<0.05$)
SEM= Standard error of mean

CONCLUSION

Results revealed that Fermented mango kernel composite meal could replace maize in Japanese quails diet without affecting the carcass and organ weight of quails.

RECOMMENDATION

Fermented mango kernel composite meal can be recommended as a replacement for maize in Japanese quails feed up to 25% level of inclusion.

REFERENCES

1. Kperegbeyi, J. I, Onwumere, O.S. (2007), Effect of Raw and Toasted Bambara Groundnut (*Vigna subterranean* L.) on Performance of Growing Cockerels. 32nd Annual Conference, NSAP, Held at the University of Calabar, Calabar, Nigeria. 32:188 - 91.

2. Faniyi, G.F. (1998). Effect of Including Rarrciled Mango Seed Kernel in Broiler Starter Diet. *Journal of Professional Teacher trainers*, 2(1):62-68.

3. Diarra, S.S., Usman, B.A. and Igwebuike, J.U. (2010). Replacement Value of Boiled Mango Kernel Meal for Maize in Broiler Finisher Diets. *Journal of Agricultural and Biological Science,* 5(1):47-52.

4. Teguia, A. (1995). Substituting Ground Mango Kernels (Mangifera indica L) for Maize in Broiler Starter Diets. *Animal Feed Science*, 56:155-158.

5. Morton, J.F. (1987). In: Fruits of Warm Climates, Florida Flair Books, Miami; 1987.

6. Jansman, A.J.M. Vestegen, M.W.A. Huisman, J. Van den Berg, J.W.O. (1995). Effect of Hulls Faba Beans (Vivia faba L.) with a Low or High Content of Condensed Tannins on the Apparent Illeal and Fecal Digestibility of Nutrients and the Excretion of Endogenous Protein in Illeal Digesta and Faeces of Pigs. *Journal of Animal Science*.73:118-127.

7. Haruna, E.S. Musa, U. Lombin, L.H. Tat, P.B. Shamaki, P.D. Okewole, P.A. Molokwu, J.U. (1997). Introduction of Quail Production in Nigeria. *Nigeria Veternary Journal*, 1997; 18:104-107.

8. Anon, A. (1995). Council on Regulation of Environmental Information. 1-3.

9. Official Methods of Analytical Chemists (AOAC).16th edition, Arlington, Virginian, U.S.A; 1995.

10. MINITAB Statistical Software. MINITAB Inc. P.A. USA. 2014:6.

11. Steel, R.G.D. and Torries, J.H. (1980). Principles and Procedures of Statistics. A Biometrical Approach 2nd Edition. McGraw Hills Books CO. New York U.S.A. 1980.

12. Diarra, S.S., Usman, B.A. and Igwebuike, J.U. (2010). Replacement Value of Boiled Mango Kernel Meal for Maize in Broiler Finisher Diets. *Journal of Agricultural and Biological Science,* 5(1):47-52

13. Ate-Biam, M. (2017). Carcass and Organ Characteristic of Broiler Chicken Fed Diets Containing Fermented Mango Kernel Composite Meal as a Replacement for Maize. A Project Report to the Department of Animal Production, Federal University of Agriculture, Makurdi, Nigeria.

14. Abang, F.B.P. Egahi, J.O. and Gbakoron, D. (2018). Carcass and Organ Characteristics of Broiler Chicken Fed Boiled Mango Kernel Composite Meal. *International Journal of Applied Science,* 1(2):2576-7240.

15. Amao, E.A. and Siyanbola, M.F. (2013). Carcass and Physiological Response of Broiler Fed Dry Heated Mango Kernel Based Diet. *International Journal of livestock Production*, 4(3) 30-34.

16. Rafiu, T.A. Babatunde, G.M. and Odunsi, A.A. (2014). Performance, Carcass and Meat Characteristics of Broilers Chicken fed Processed Mango Kernel Meal Based Diets. *International Journal of Applied Research and Technology,* 3(9) 23-30.

17. Kumar, R. (1991). Anti-nutritional Factors, the Potential Risks of Toxicity and Methods to alleviate them. In: Proceedings of FAO. *Expert consultation at the Malaysian Agricultural Research and Development institute*, Kuala lumpur , Malaysia. October 14-18th.

References to this paper should be made as follows Yerima Shettima Kolo et al., (2019), Carcass and Organ Characteristics of Japanese Quails Fed Fermented Mango Kernel Composite Meal. *J. of Agriculture and Veterinary Sciences,* Vol. 11, No. 2, Pp. 1-13