



## Effect of Sun-dried Mango (*Mangifera spp*) Kernel Meal on the Nutrient Profile of Japanese Quails' (*Coturnix coturnix japonica*) Breast Muscles and Egg

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### ABSTRACT

A total of one hundred and forty-four (144) Japanese quails (*Coturnix coturnix japonica*) were assigned randomly to three different dietary groups. Each group was replicated three times, with sixteen quails in each replication. The diets consisted of varying levels of Sun-dried Mango (*Mangifera spp*) kernel meal (SMKM), replacing maize at 0%, 25%, and 50% respectively. At the conclusion of the experiment, three quails from each dietary group were selected for slaughter. Breast muscles were collected from the slaughtered quails, and three fresh eggs were collected from each dietary group for subsequent nutrient analysis. The findings indicated that as the level of SMKM in the diets increased, there was a decrease in the crude protein content of both the eggs and breast muscles. Conversely, the Nitrogen Free Extract (CHO) content in both the eggs and breast muscles increased across the dietary treatments. The mineral content (ash) of the breast muscles and eggs also increased with the supplementation of SMKM in the diets. However, the crude fiber content of the breast muscles and eggs did not follow a consistent pattern, suggesting that SMKM was not the sole factor influencing these variations. In conclusion, it was determined that SMKM had an impact on the quality of both the meat and eggs produced by the quails.

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### INTRODUCTION

The increased competition between man, livestock and industry for grains has resulted in acute shortage and hike in prices of cereal grains like; maize, guinea corn, millet, wheat etc. (Abang *et al.*, 2013a, 2023a). Maize account for about 45% to 55% of poultry feeds (Abang *et al.*, 2013b; 2016). Hence, any effort to substitute maize in poultry feed will significantly reduce the cost of production. The most relevant option to arrest the present feed crisis of livestock industry is by non-conventional feed and additive utilization (Ogana *et al.*, 2020; Gyang *et al.*, 2021; Adeyi *et al.*, 2021; Abang *et al.*, 2023b&c). The use of this alternative feedstuff in livestock production will cut down feed and additive prices, thus making them affordable by livestock farmers.

Mango (*Mangifera indica*) is a free crop well adapted to all ecological zones in Nigeria. Mango kernel, a by-product of Mango pulp is reported to be a good source of starch, vitamins A, B, and C and flavonoid (Abang *et al.*, 2017; 2018; 2023d).

Insufficient protein intake especially of animal sources among the human populace in the developing countries; has continue to be an issue of concern to many. According to Abang *et al.* (2016), quail is very prolific. As a result, quail has great advantage against many other farm animals as a quick and available source of animal protein in the diet of man. It is also important to note that quail meat contain lower fat and cholesterol and higher protein contents, low heritability for lipid content of whole carcass compared to the domestic chicken Abang *et al.*, 2013) . This is of

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particular importance considering the frequently reported cases of atherosclerosis, high blood pressure and strokes. Jensen *et al.* (1989) observed positive correlation of total cholesterol content of chicken eggs with egg weight and yolk weight and negative correlation with egg production and dietary protein level. This is an indicator of the likelihood of very low cholesterol in quail eggs. The New York Times (1989), registering its interest in quail, commented that at a time when people were searching for foods specifically animal protein with low fat and cholesterol, quails fill the bill.

The objective of this work is to carry out nutrient profile on quails breast muscle (meat) and whole egg in order to ascertain the effect of Sun-dried Mango kernel meal (SMKM) on their qualities.

#### MATERIALS AND METHODS

A total of one hundred and forty four two weeks old un-sexed Japanese quails of about the same weight were studied over a period of four weeks. The birds were raised in Federal University of Agriculture Makurdi Teaching and Research Farm. 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 (0.75m<sup>2</sup> x 0.38m<sup>2</sup>). 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<sup>2</sup> to 0.009m<sup>2</sup> per quail was provided. Artificial lighting was provided with the use of one kerosene lantern for each tier to ensure adequate feed intake. The experimental diets were subjected to laboratory analysis to determine the proximate composition. Feeds were weighed with a micro scale balance of 2kg before serving to ensure 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. At the end of the experiment (28<sup>th</sup> day or 4<sup>th</sup> week), three quails from each treatment were slaughtered, their breast muscle and three newly laid eggs from each treatment were collected and analyzed in the veterinary laboratory for nutrient profile according to AOAC (1995) method.

**Table1:** Composition of diet with Sun-dried Mango (*Mangifera spp.*) Kernel for broiler Japanese quails (*Coturnix coturnix japonica*) Levels of inclusion (%)

Ingredients	0%	25%	50%
Maize	53.20	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 offal	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	0.05	0.05
Total	100.00	10.00	100.00
Calculated nutrients:			
Crude protein (%)	21.87	21.63	21.34
M.E (Kcal/Kg)	2836.47	2846.12	2846.39
Analyzed nutrients:			
Crude protein (%)	22.02	21.75	21.70
M.E (Kcal/Kg)	2845.01	2900	2950

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## RESULTS AND DISCUSSION

The nutrient profile of quails' breast muscle fed varying levels of sun-dried mango (*Mangifera spp*) kernel meal is shown in table 1. The dry matter contents of quails' meat were 86.33%, 89.33% and 91.05% for treatment I (TI), treatment II (TII) and treatment III (TIII) respectively. The dry matter contents of breast muscles of quails fed 50% had highest values when compared to those fed 0% and 25% levels of Sun-dried Mango kernel Meal (SMKM).

The dry matter content of quails' meat in this study had lower values compared with those obtained by Jadhav *et al.* (2010). Jadhav *et al.* (2010) reported that quails breast muscles fed 0%, 25% and 50% parboiled Mango kernel Meal (PMKM) had 91.5%, 90.05% and 91.10% respectively. This indicates that the carbohydrate contents of quails fed PMKM was higher than those fed SMKM.

The crude proteins (CP) in quails' meat were 77.08%, 76.76% and 72.26% for TI, TII and TIII respectively. The CP content of breast meat of quails fed 0% had highest value compare to those fed 25% and 50% levels of SMKM. However, quails fed 25% SMKM had higher values than those fed 50% SMKM.

The CP content observed in this study was lower when compared with values reported by Abang *et al.* (2014). The findings showed that breast muscle of quails fed 0%, 25% and 50% taro cocoyam had CP of 84%, 82.70% and 76% respectively. The processing methods may have accounted for these differences. SMKM is rich in tannins and fermentation has proven to be the best method of reductions (EL Boushy *et al.*, 2000). Tannins are known to be interfering with protein digestibility and thereby render them less available.

The Crude Fibre (CF) content of quails' meat was 1.90%, 1.87% and 1.92% for TI, TII and TIII respectively. CF content of breast meat of quails fed 50% SMKM had highest values when compared to those fed 25% and 0% SMKM. However, quails fed 25% SMKM had higher value than those fed 0%. The result obtained in this study was higher than those reported by Abang *et al.* (2014). This could probably be as a result of taro cocoyam being less fibrous than mango. The

results obtained in this study do not follow a regular pattern indicating that SMKM was not responsible for these deviations.

The Ash contents of quails' meat were found to be 3.24%, 3.60% and 3.72% for TI, TII and TIII respectively. The ash content of breast of quails fed 50% had highest value when compared to those fed 25% and 0% SMKM. However quails fed 25% SMKM had higher values than those fed 0%. This result was in contrast with the report of Abang *et al.* (2014), who observed higher Ash value. Again this could be attributed to the processing methods. Mangoes and Taros contain phytates and oxalates which interfere with bioavailability of minerals e.g Ca, Mg e.t.c. fermentation being a better means of reduction than sun-drying would have accounted for increased ash content in the breast muscles of quails fed with FTCM (fermented taro cocoyam meal).

The Ether Extract (EE) contents of quail's muscles were 4.70%, 4.00% and 4.40% for TI, TII and TIII respectively. The EE content of the breast of quails fed 0% had highest value compared to those fed 25% and 50% SMKM. However quails fed 50% had higher value than those fed 25% SMKM. This result was in disagreement with the report of Abang *et al.* (2014) who observed the breast muscles of quails to be fattier. Lean meat (low fatty meat) is a choice meat for hypertensive prone patients. The result of this experiment has shown that SMKM enhanced the lean quality of the breast muscle.

The Nitrogen Free Extract (NFE) contents of quails' meat were 2.09%, 3.11% and 8.76% for TI, TII and TIII respectively. The NFE content of breast muscle of quails fed 50% SMKM had highest values compared to those fed 25% and 0% SMKM. However the meat quails fed 25% had higher values than those fed 0% SMKM. The NFE contents of quails' meat obtained in this study observed higher values when compared with those recorded by Abang *et al.* (2014); who reported that quails' muscles fed 0%, 25%, 50% fermented taro cocoyam had NFE of 0.52%, 0.54% and 0.70% respectively, indicating that type of feed served to the animal affect their meat quality.

The dry matter contents of quails' egg were 92.17%, 93.56% and 91.95% for TI, TII and TIII respectively. The dry matter of

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eggs of quails fed 25% had highest values when compared to those fed 0% and 50% SMK. M.

The dry matter content of eggs obtained in this study had lower values compared with the result obtained by Ojo *et al.* (2002). Ojo *et al.* (2002) reported that the dry matter of quails' eggs fed 0%, 25% and 50% sun-dried cassava peel (SCP) had 71.86%, 53.49% and 57.81% respectively. This is so because SMK. M is less fibrous than SCP.

The percentage crude proteins (CP) in quails' eggs were 53.45%, 51.82% and 48.77% for T1, TII and TIII respectively. The CP of quails eggs fed 0% had highest value when compare with those fed 25% and 50% SMK. M. However, quails fed 25% SMK. M had higher value than those fed 50% SMK. M. The CP content of quails' eggs was lower than those recorded by Ojo *et al.* (2002). Who observed that the eggs of quails that were fed with 0%, 25% and 50% SCP had 74.96%, 62.05% and 61.24% respectively? This could be attributed to the high presence of tannins in sun-dried mango kernel meal which interfered with the bioavailability of proteins.

Crude fibre (CF) contents of quails' eggs were 1.03%, 1.00% and 1.03% for T1, TII and TIII respectively. The CF of quails' egg fed with 0% and 50% had higher values when compared with 25% SMK. M. The CF of egg obtained in this study were lower than those reported by Ojo *et al.* (2002), who observed that the eggs of quails fed with 0%, 25% and 50% of SCP had 81.77%, 76.41% and 67.97% respectively. This could be due to the high crude fibre content of SCP in the diets. However the deviation recorded in this study did not follow a regular pattern showing that SMK. M was not responsible for these deviations.

The ash content of quails' whole egg was found to be 5.14%, 5.69% and 5.82% for

T1, TII and TIII respectively. The ash content of quails' eggs fed 50% SMK. M had highest values when compared with those fed 0% and 25% SMK. M. However quails fed 25% SMK. M had higher ash values than those fed 0% SMK. M.

The ash content of quails' eggs had lower values when compared to the result reported by Ojo *et al.* (2002), who asserted that the eggs of quails' fed with 0%, 25% and 50% of SCP had 68.64%, 57.36% and 61.62% respectively. This could be due to the presence of phytate and oxalate known to limit the bioavailability of minerals (Calcium, Magnesium, iron etc).

Ether extract (EE) of quails' eggs were found to be 23.41%, 23.53% and 22.34% for T1, TII and TIII respectively. The EE content of quails' eggs fed with 25% had highest values when compared to those fed 0% and 50% SMK. M. However quails fed 0% had higher values than those fed 50% SMK. M. The EE content of quails' whole egg obtained in this work had lower values compared to the result obtained by Ojo *et al.* (2002), who observed that quails eggs fed with 0%, 25% and 50% SCP had 68.64%, 63.03% and 91.56% respectively. This indicates that the cholesterol levels of quails' eggs fed SMK. M were lower.

The Nitrogen free extract (NFE) of quails' eggs were 10.60%, 11.56% and 12.99% for T1, TII and TIII respectively. The NFE content of quails eggs fed with 25% SMK. M had highest values than others which have similar values. The NFE of quails' eggs obtained in this study were lower compared with the findings of Ojo *et al.* (2002), who that quails' egg fed with 0%, 25% and 50% of SCP had NFE of 75.54%, 73.94% and 61.26% respectively. This could be as a result of SCP containing more calories than mango.

**Table 2:** Nutrient Profile of Quails' Breast Muscle Fed Varying Levels of Sun-Dried Mango (*Mangifera spp*) Kernel Meal

Parameters	T1 (%)	TII (%)	TIII (%)
Dry matter	86.33	89.33	91.0
Crude protein	77.08	76.76	72.26
Crude fibre	1.90	1.86	1.92
Ether extract	3.70	4.00	4.40
Ash	3.24	3.60	3.72
Nitrogen free extract	2.09	3.11	8.76

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**Table 3:** Nutrient Profile of Whole Egg of Quails Fed Varying Levels of SMK

Parameters	TI (%)	TII (%)	TIII (%)
Dry matter	93.63	93.63	91.95
Crude protein	53.45	51.82	48.77
Crude fibre	1.03	1.00	1.03
Ether extract	23.53	23.41	23.34
Ash	5.14	5.69	5.82
Nitrogen free extract	10.6	11.56	12.99

**CONCLUSION**

It is concluded that, SMK affected quails breast muscles and egg quality in all but one parameter: crude fibre (as the deviations did not follow a regular pattern).

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