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# EGG QUALITY INDICES OF JAPANESE QUAILS FED PALM KERNEL CAKE

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**Abstract**
Egg quality parameters were examined using two hundred uniform nine-week-old laying Japanese quails fed palm kernel cake. The quails were allotted into 5 sets of forty birds in four replicates in a six week trial. Palm kernel cake was used in the diets at 0%, 10%, 20%, 30% and 40%. The outcome in this study revealed that the shell percentage, yolk-albumen weight, albumen weight, yolk height, color and yolk index were significantly different ($p<0.05$). Conclusively, laying Japanese quails could tolerate up to 40% palm kernel cake without deleterious impact on the shell percentage, albumen weight and yolk index, however, the yolk colour becomes lighter with increased palm kernel cake inclusion.

**Key words**: Egg qualities, external, internal, Japanese quail, palm kernel

## INTRODUCTION

Japanese quails (*Coturnix coturnix japonica*) are predominantly raised for their eggs (Ojediran *et al*., 2018). Owing to their quick sexual maturity (NRC, 1991) and 35 day age at first lay (Hemid *et al*., 2010) among other benefits are part of the advantages of rearing Japanese quail especially for developing nation where protein affordability and consumption is low. However, feed price hike necessitates the need for least cost formulation, increasing income and profit, and quality products for consumers (Teguia and Beynen, 2004). However, amist other factors, feed plays an important role in egg quality (Ekine and Oruwari, 2012).

Palm kernel cake is by-product of palm kernel oil production. It has been used in cattle feed (Alimon, 2004), swine ration (Adesehinwa, 2009; Ojediran *et al*., 2020), cockrel diet (Bello *et al*., 2011), and broiler ration (Alshelmani *et al*., 2021), but dearth of knowledge persists on the use of palm kernel cake in laying Japanese quail feed.

This study therefore examined the egg quality parameters of laying quails fed palm kernel cake.

## MATERIALS AND METHODS

The experiment was performed at the Poultry Unit, Ladoke Akintola University of Technology Research Farm, Ogbomoso, Nigeria..

Uniform two hundred (200) laying Japanese quails of nine weeks old were grouped into five sets replicated four times with 10 layers each. The feeding trial lasted for six weeks. Palm kernel cake was incorporated in the diet at 0%, 10%, 20%, 30% and 40%.

Eggs for external and internal parameters were collected for consecutive 2 days, weighed and evaluated as described by Ojediran *et al*., (2018). The weights of egg, yolk, albumen and shell were taken using an electronic digital scale. Roche colour fan was used to score the yolk.

The data were analyzed by one-way ANOVA using SPSS for windows (SPSS v16). The significant means were separated using Duncans multiple range of the same software.

**Table 1:** Gross formulation of experimental diets

| Ingredients (%) | Diets | | | | |
|---|---|---|---|---|---|
| | 0% | 10% | 20% | 30% | 40% |
| Maize | 50.00 | 42.00 | 38.00 | 33.25 | 27.00 |
| Soybean meal | 12.00 | 11.00 | 11.00 | 12.00 | 15.00 |
| Groundnut cake | 26.00 | 25.00 | 20.00 | 15.75 | 10.00 |
| Corn bran | 4.25 | 4.25 | 3.25 | 1.25 | 0.25 |
| Palm kernel cake | 0.00 | 10.00 | 20.00 | 30.00 | 40.00 |
| Bone meal | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Fixed ingredients | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 |
| Total | 100.00 | 100.00 | 100.00 | 100..00 | 100.00 |
| Calculate Composition | | | | | |
| ME (Kcal $kg^{-1}$) | 2794.90 | 2737.80 | 2721.42 | 2703.34 | 2671.63 |
| Crude Protein | 21.65 | 21.95 | 21.18 | 21.02 | 21.05 |
| Ether extract | 4.04 | 4.23 | 4.34 | 4.47 | 4.54 |
| Crude fibre | 3.28 | 4.22 | 5.00 | 5.77 | 6.61 |
| Cost $kg^{-1}$ | 122.52 | 106.38 | 98.83 | 96.59 | 91.79 |

ME- Metabolizable energy
Fixed ingredients: Limestone = 4.85%, lysine = 0.15%, methionine = 0.25%, vitamin-mineral premix = 0.25%, salt = 0.25%

## RESULTS AND DISCUSSION

Table 2 shows the external egg quality parameters of layer quails fed varying levels of PKC. Egg shell percentage differ significantly ($P < 0.05$) unlike other parameters. Birds fed 10% and 30% PKC were significantly different while others compared favourably. According to Ojediran *et al*., (2018) egg shell traits are important quality because of protection it confers on the internal content in strength and thickness.

Table 3 shows the internal egg parameters of layer quails fed varying levels of PKC. Mean yolk and albumen weight, albumen weight, average yolk height, yolk colour, albumen percentage and yolk index differ significantly ($P > 0.05$). The average yolk-albumen (internal content) weight and albumen weight had similar pattern. Birds offered diets 10% and 40% does not differ significantly ($p>0.05$) but differ significantly ($p<0.05$) from those given diets 20% and 30% while those fed diet 0% PKC compares favourable. The yolk height was lowest ($p>0.05$) in quails offered diets 20% and 30% and highest in those given diet 10% ($p<0.05$) while quails offered diets 0% and 40% compares favourably. The yolk colour decreased linearly with increasing PKC ($p<0.05$). The albumen percentage values were 54.34, 58.71, 57.19, 53.82 and 55.73 for birds fed diets 0% – 40% PKC respectively. The yolk index of quails offered 0%, 20% and 30% were lowered ($p<0.05$) in comparison with those supplied diet 2 ($p<0.05$).

Internal egg characteristics are crucial in egg product industries that package liquid egg, powdered egg or yolk (Scott and Silversides, 2001). The liquid content of egg (yolk and albumen) can influence the weight of newly hatched chicks (Kurshid *et al*., 2003). Yolk colour in quail is not affected by genotype (Hrncar *et al*., 2014) but nutritional composition (Ojediran *et al*., 2018). Feeding PKC upto 40% as demonstrated in this trial does not adversely affect the yolk index and haugh unit which are more desirable internal quality assurance parameter of egg as opined by Adeogun and Amole, (2004).

**Table 2:** External Egg quality parameters of layer quail fed varying level of PKC

| Parameters | 0% | 10% | 20% | 30% | 40% | SEM | P-value |
|---|---|---|---|---|---|---|---|
| Av Egg length (cm) | 3.19 | 3.19 | 3.15 | 3.17 | 3.19 | 0.01 | 0.78 |
| Av Egg width (cm) | 1.69 | 1.69 | 1.68 | 1.66 | 1.67 | 0.01 | 0.52 |
| Av shell weight (g) | 2.07 | 1.64 | 1.67 | 2.00 | 1.83 | 0.14 | 0.14 |
| Av shell thickness (mm) | 0.70 | 0.69 | 0.69 | 0.69 | 0.69 | 0.51 | 0.51 |
| Shell Percentage (%) | 17.93$^{ab}$ | 14.67$^{b}$ | 15.48$^{ab}$ | 18.58$^{a}$ | 16.01$^{ab}$ | 0.56 | 0.02 |
| Egg shape index | 52.81 | 53.02 | 53.27 | 52.48 | 52.42 | 0.19 | 0.66 |

$^{a, b}$ – means with different superscripts in the same row are significantly different
SEM – Standard error of mean

**Table 3:** Internal Egg Parameter of layer quail fed varying level of PKC

| Parameters | 0% | 10% | 20% | 30% | 40% | SEM | P-value |
|---|---|---|---|---|---|---|---|
| Av yolk-albumen weight(g) | 9.47$^{ab}$ | 9.53$^{a}$ | 9.11a$^{b}$ | 8.80$^{b}$ | 9.58$^{a}$ | 0.11 | 0.01 |
| Av Albumen weight (g) | 6.27$^{ab}$ | 6.56$^{a}$ | 6.17$^{ab}$ | 5.81$^{b}$ | 6.36$^{a}$ | 0.09 | 0.05 |
| Av yolk weight (g) | 3.20 | 2.97 | 2.94 | 3.00 | 3.22 | 0.07 | 0.62 |
| Av albumen height (cm) | 4.97 | 5.02 | 4.84 | 4.78 | 5.08 | 0.05 | 0.19 |
| Av yolk height (cm) | 0.71$^{ab}$ | 0.76$^{a}$ | 0.70$^{b}$ | 0.70$^{b}$ | 0.74$^{ab}$ | 0.01 | 0.05 |
| Av yolk length (cm) | 2.26 | 2.22 | 2.19 | 2.22 | 2.24 | 0.01 | 0.57 |
| Av yolk colour | 5.07$^{a}$ | 4.72$^{ab}$ | 4.72$^{ab}$ | 4.36$^{b}$ | 4.00$^{c}$ | 0.10 | 0.00 |
| Albumen percentage (%) | 54.34$^{c}$ | 58.71$^{a}$ | 57.19$^{ab}$ | 53.82$^{c}$ | 55.73$^{bc}$ | 0.56 | 0.01 |
| Yolk percentage (%) | 27.74 | 26.62 | 27.32 | 27.86 | 28.28 | 0.56 | 0.93 |
| Yolk index | 0.32$^{b}$ | 0.34$^{a}$ | 0.32$^{b}$ | 0.32$^{b}$ | 0.33$^{ab}$ | 0.00 | 0.05 |
| Yolk:albumen | 0.51 | 0.45 | 0.48 | 0.52 | 0.51 | 0.01 | 0.55 |
| Av Haugh unit | 92.17 | 92.78 | 92.06 | 91.79 | 92.78 | 0.18 | 0.30 |

$^{a, b}$ – means with different superscripts in the same row are significantly different
SEM – Standard error of mean

## CONCLUSION AND RECOMMENDATION

This study proved that up to 40% PKC in the diets of laying Japanese quails had improved shell percentage, albumen weight and yolk index but the yolk colour becomes lighter with increased PKC inclusion.

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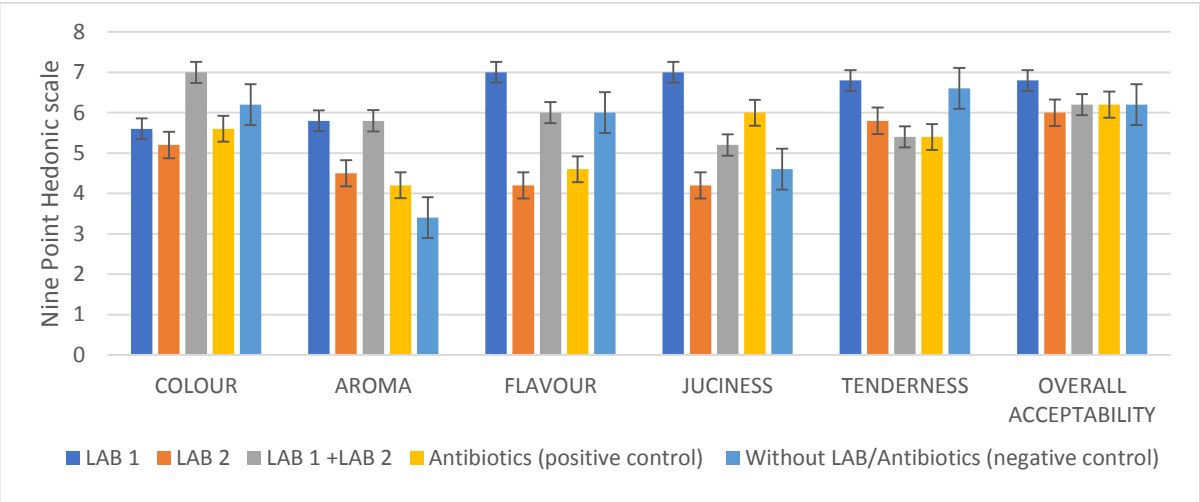


Figure 1: Sensory evaluation of broiler chickens fed with LAB and without LAB

## DISCUSSION

The extract released volume (ERV) is a measurement of meat quality and spoilage. When the ERV value obtained is higher, it shows that the meat is of good quality but when the values obtained is low, it shows that meat is of poor quality. In this study both LAB 1 and 2 with its combination promote good meat quality compared to meat from broiler chicken fed no LAB and antibiotics. Meat from broiler chickens fed LAB 1 had

the highest score for aroma, flavor, juiciness, tenderness and overall acceptability with meat from broiler chicken fed no LAB and antibiotics had the least score for aroma while LAB 2 had the least score for colour, flavor juiciness and overall acceptability. This findings in this study was in line with the result obtained by Kabir (2009). Mahajan et al. (2000) stated in their study that the scores for the sensory attributes of the meat balls; appearance, texture, juiciness and overall acceptability were significantly higher and those for flavour were lower in the probiotic (Lacto-Sacc) fed group. However, the present results differ from Loddi *et al.* (2000) who observed that neither probiotic nor antibiotic affected sensory characteristics (intensity of aroma, strange aroma, flavour, strange flavour, tenderness, juiciness, acceptability, characteristic colour and overall aspects) of breast and leg meats.

## CONCLUSION

LAB 1 could be added to the diet of broiler chickens due to its improvement quality on both the meat quality and sensory characteristics which showed no adverse effect.

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