

Original Research Article**SERUM BIOCHEMICAL COMPOSITION OF LAYING JAPANESE
QUAILS (*COTURNIX COTURNIX JAPONICA*) FED DIETS
CONTAINING FERMENTED TARO COCOYAM (*COLOCASIA
ESCULENTA VAR. ESCULENTA*) MEAL****Abstract**

Two hundred and twenty five Japanese quails (*Coturnix coturnix japonica*) were randomly allotted to five dietary treatments (I –V) of 36 hens and 9 cockerels each. Each treatment was replicated thrice with 12 hens and 3 cockerels per replicate. In each of the five diets, 48 hours fermented taro cocoyam meal (*Colocasia esculenta var. esculenta*) was used to replace maize at 0%, 25%, 50%, 75%, and 100% respectively. Serum Na^+ , K^+ , Cl^- , HCO_3^- , urea, creatinine, ALT, AST and Total bilirubin were determined on the 70th day. The results of serum biochemistry showed that, Cl^- , urea, Hco_3^- , creatinine, ALT and AST were within normal range. However, it was observed that serum k^+ increased above the upper limit whereas serum k^+ , Na^+ was slightly below the lower limit in all the treatments. Total bilirubin was above normal range beyond 25% replacement of maize in the diets. It was concluded that, fermented taro cocoyam in laying Japanese quails diets did not influence their serum biochemical composition except for total bilirubin. The observed abnormal values in serum k^+ and Na^+ were not peculiar to quails fed fermented taro cocoyam meals.

Keywords: Serum biochemistry, fermented taro cocoyam meal, maize and laying Japanese quails.

Introduction

The production of Japanese quails (*Coturnix coturnix japonica*) has the potential of improving the very low animal protein consumption of humans in the developing countries, including Nigeria (Okon, et al., 2007). However, the expensive nature of conventional feed types for the formulation of concentrates has always been a major limiting factor in its production. Quails are highly resistant to diseases, they have short generation interval making it possible to propagate many generation in a year;- early sexual maturity, fast growth rate, high rate of lay, high

biological value and low caloric value makes it a choice for hypertension prone individual (Harunna, 1995). Therefore, there is the need to urgently incorporate non – conventional feedstuff in quail's diets for the reduction of cost of production.

Taro cocoyam (*Colocasia esculenta* var. *esculenta*) is an indigenous African root crop found only in warm, humid forest areas because of their need for high annual rainfall and a long wet season. (Viotti, 2004). Cocoyam though rich in carbohydrate also has anti nutritional factors like phytate, oxalate, tannins and acidity factors which can be inactivated by fermentation, cooking and other forms of heat treatments (Sakai, 1979, Kelsely,1985) Against this background, the study was designed to assess the serum biochemical composition of laying quails fed diets containing 48 hours fermented taro cocoyam meals.

Materials and methods

The study was carried out in Cross River University of Technology Teaching and Research Farm, Calabar, Nigeria. A total of two hundred and twenty five Japanese quails (180 hens and 45 cockerels) of about 7 weeks of age with average way weights ranging from 133g to 163g were studied over a period of ten weeks. Quails were randomly allotted to five dietary treatments (1-v) of 36 hens and cockerels each. Each treatment was replicated three with 12 hens and 3 cockerels per replicate. In each of the five diets, 48-hours fermented taro cocoyam meal (FTCM) replaced maize at 0l, 25l, 50l, 75l and 100l as treatments I,II,III,IV and V respectively.

Unpeeled taro cocoyam corns were bought from Bendeghe village, stung, Cross River, Nigeria. Corns were peeled and then chopped into sizeable chips of about 14gm each. These chips were put into a big black plastic put like container with a tight lid and fermented in water at room temperature (28°C-29°C) for 48 hours. Sun drying lasted for a week (7 days) and thus reduced moisture content to less than 10%. The 48 hours fermented taro cocoyam corns and other ingredients were milled separately and used to formulate the experimental diets (Table 1). The experimental diets were analyzed according to the procedure of AOAC(2000).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 0.75m² × 0.38m². Litter materials (wood shavings) were used on the wooden floor. Each tier was equipped with adequate drinker and feeding troughs. A floor space 0.007m² to 0.009m² per quail was provided. Artificial lighting was provided with the use of ore (200 watts) bulb for each

tier to ensure adequate feed intake. Feeds were weighed with a micro scale balance of 2kg before serving to ensure a uniform amount across treatments. Quails were served with 300gms of feed for the first week at about 8:am on a daily basis, the quantity was increased by 50gms on weekly intervals. Fresh clean water was supplied ad-lib. Drinkers and feeders were washed and disinfected using izal when appropriate. At the end of the experiment (70th day/10th week), three (3) laying quails per treatment (one from each replicate) were randomly selected and weighed. Quails were slaughtered by cutting their jugular very with a sharp knife. The blood samples were collected at slaughter into sterile vacutainers and the serum was separated by centrifuge at 75⁰c<fu/g for 15 minutes and stored in a deep freezer until use for serum biochemistry analysis. Serum biochemistry indices were carried out using routine standard clinical chemistry procedures (Olerede, *et al*; 1996).

Table 1: composition of experimental diets for laying Japanese quails

Ingredients	0%	25%	50%	75%	100%
Maize	46.00	34.50	23.00	11.60	0.00
Cocoyam	0.00	11.50	23.00	34.50	46.00
Soybean	20.80	21.00	19.70	19.90	20.00
Fish meal	4.20	4.60	5.80	6.00	6.00
Palm kernel cake	10.90	10.00	10.00	10.00	10.00
Wheat offals	10.00	10.00	9.75	9.10	8.30
Bone meal	7.00	7.00	7.00	7.00	7.00
Salt	0.50	0.50	0.50	0.50	0.50

Palm oil	0.10	0.40	0.75	1.00	1.20
Vit/min.premix	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100	100	100

Calculated nutrient composition

Crude protein%	20.35	20.39	20.40	20.35	20.37
ME(Kcal/kg)	2674.44	2669.78	2584.60	2553.68	2538.34

73 Analyzed nutrients:

74	Crude protein (%)	21.20	20.89	20.78	20.63	20.59
75	ME(Kal/kg)	2690.30	2679.58	2593.20	2562.20	2552.90

76 Results and discussion

77 The results of the serum biochemical composition of laying Japanese quails fed diets
78 containing 48-hour fermented taro cocoyam are presented in Table 2.

79 A condition of hyponatremia was observed across the treatments(126-133 μ mol/L) when
80 compared with the established reference interval for 16weeks old female Japanese quails by
81 Scholtz et al, 2009 (135-155 μ mol/L). This result was in contrast with that of Nwani (2014) who
82 reported that the serum sodium (Na⁺) of quails fed sun-dried mango kernel meal (SMKM) was
83 within normal range across treatments. These low levels could not be attributed to the
84 experimental diets as quails fed control diet also showed similar result. It could be associated
85 with rapid deterioration of minerals in feed due to oxidative reaction in a very warm climate.
86 Considering the fact that cocoyam is poorer in minerals when compared with mango, the
87 deteriorating effect will be more in feed containing cocoyam.

88 The serum potassium (k⁺) of quails rose slightly above the upper limit (hyperkalemia) (6.8-7.2
89 μ mol/L) when compared with the normal reference range by scholtz *et al*; 2009 (3.6-5.0
90 μ mol/L). Serum potassium tells us about the heart condition. It controls the heart beat rate and

the blood pressure (Elboushy *et al* 2004 Diarra *et al*; 2008) from the fact that the diversions from the normal range were not outrageous, the heart would not have manifested any symptom of disorder. Serum chloride was within normal range in all the treatments (98-100 $\mu\text{mol/L}$) when compared with the normal reference range by scholtz *et al*; 2009 (98-106 $\mu\text{mol/L}$).

This finding were different from that of Nwani (2014) who observed slight increase in serum chloride above upper limit in quails fed control diet and 50% SMKM. Hyperchloremia is sometimes associated with excessive fluid loss, Such as diarrhea. Hyperchloremia can be symptomatic with signs of weakness and intense thirst.

Serum bicarbonate (HCO_3^-) was within normal range (22-24 $\mu\text{mol/L}$) as established by scholtz *et al.*, 2009 (22-30 $\mu\text{mol/L}$). This result was in agreement with the report of Nwani (2014) who observed that serum HCO_3^- quails fed SMKM were within normal range. This implies that, the acid-base ratio was balanced. Low levels of serum HCO_3^- results in metabolic acidosis (kesimatis *et al.*, 2005). HCO_3^- of less than 22 $\mu\text{mol/L}$ is compatible with metabolic acidosis.

Serum uric acid (urate) and creatinine were within normal ranges (15.8-16.6 $\mu\text{mol/L}$; 4.0-6.2 $\mu\text{mol/L}$ respectively) comparing with the established reference range by scholtz *et al*; 2009 (15.8-42.2 $\mu\text{mol/L}$).

The report of creatinine agrees with that of Nwani (2014) who had similar results but was in contrast with the reports Sobayo *et al.*, 2013 who observed values below the lower limit across treatments. The fact that urate was within normal range, is an indicator of a healthy kidney and heart as rise in serum uric acid could cause acute kidney injury, by causing poor blood flow to the kidney, kidney stone and heart failure (Cheng *et a.*, 2013). It was observed that serum AST and ALT were within normal ranges (242-538 u/L; 4.5-8.0 u/L respectively) when compared with the established reference range by scholtz *et al.*, 2009 and Robin; 2013 (243-562 u/L (AST); 4.5-8.5 u/L (ALT). These results were in agreement with those of Nwani (2014) and Sobayo *et al.*, (2013) who fed SMKM to laying quails and Garcinia kola to broiler respectively. This implies that, the liver of quails fed fermented cocoyam were normal and healthy as high values usually represent liver damage. Total bilirubin was slightly above the upper limit (15.17 $\mu\text{mol/L}$) beyond 25% replacement of maize in the diet when compared with the normal reference range by scholtz *et a.*, 2009 (3.6-14.2 $\mu\text{mol/L}$). High values of bilirubin signifies liver disease such as hepatitis or blockage of tubes (bile ducts) or diagnose conditions that cause increased destruction of red blood cell (Robin, 2013). The deviations observed could be associated with

diagnose conditions that would have caused increased destruction of the red blood cells as the buds were intermittently treated with penthyl (antibiotic) as serum ALT and AST which are equally liver function test were within normal ranges.

Table 2: Serum biochemistry of laying quails fed varying levels of 48 – hours fermented taro cocoyam meal (*Colocasia esculenta* var. *esculenta*).

Parameter	0%	25%	50%	75%	100%
Na ⁺ (μmol/L)	128.0	126.0	132.0	130.0	133.0
K ⁺ (μmol/L)	12.80	12.90	13.00	13.10	13.20
Cl ⁻ (μmol/L)	98.00	96.00	100.00	97.00	98.00
HCO ₃ ⁻ (μmol/L)	23.0	22.0	24.0	24.0	24.0
Urea (μmol/L)	15.40	16.60	15.80	15.30	15.00
Creatinine(μmol/L)	4.00	6.20	4.00	4.80	4.60
ALT(μ/L)	4.50	5.00	4.50	4.80	8.00
AST(μmol)	242.0	253.0	262.0	332.0	538.0
Total bilirubin(μmol/L)	13.0	14.0	15.0	16.0	17.0

Conclusion

This study revealed that fermented taro cocoyam meal did not have any (significant) effect on the serum biochemistry of laying Japanese quails. The deviations observed in serum Na⁺ and k⁺ values were not peculiar to quails fed fermented cocoyam except for total bilirubin, where abnormal increase in value was revealed beyond 25% levels of cocoyam replacement of maize in quails diets.

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