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SERUM BIOCHEMICAL INDICES OF JAPANESE QUAIL CHICKS (*Coturnix coturnix japonica*) FED DIETS CONTAINING RUBBER *(Hevea brasiliensis*) SEED MEAL BOILED AT VARYING DURATIONS

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ABSTRACT

This study evaluated the effects of feeding diets containing raw and processed rubber (Hevea brasiliensis) seed meal basal diets boiled at varying durations on the serum biochemistry profile of Japanese quail chicks. Six (6) diets were formulated in which the control diet (T1) had no rubber seed meal, T2 contained raw rubber seed meal at 20 % level while the other diets contained rubber seed meal boiled for 30, 40, 50 and 60 minutes which represents T3, T4, T5 and T6 respectively. Four hundred and fourteen (414) two weeks old unsexed Japanese quails were allocated to the six dietary treatments each having three replicates of 23 birds in a Completely Randomized Design. The experiment lasted for 4 weeks Blood samples were collected from the birds wing web vein at the 6th week of the feeding trial. Blood samples were collected from the birds through the wing web vein at the 6th week of the feeding trial. The results obtained in this study showed that all the serum biochemistry profile of birds were significantly ($p<0.05$) influenced by the dietary treatments except albumin, globulin, aspartate amino transferase (AST) and alanine amino transferase (ALT) which were within the normal range for healthy birds. The results suggest that raw rubber seed meal (RRSM) and rubber seed meal boiled (BRSM) at varying durations possess good dietary protein quality and can be fed to Japanese quail birds for optimal growth without adverse effect on serum biochemical profile of quails at 20 % dietary level of inclusion.

Keywords: Serum biochemistry, profile, quail, rubber seed meal.

INTRODUCTION

Livestock and poultry farmers, especially those in Nigeria and neighbouring countries are faced with the problems of continual inadequacy of feedstuffs. The rubber tree is cultivated in Nigeria on an estimated 185,000 ha with seed collection of about10,175 tonnes/year (Njwe *et al*, 1988) The rubber seed is rich in oil which contributes up to 41.2 % of the total weight (Njwe *et al*., 1988). The major challenge confronting poultry production in Nigeria and other developing countries is the high cost of feed ingredients as it accounts for 70 - 80% of the total cost of production (Ghadge *et al*., 2009). Rubber seed grows abundantly in some states in Nigeria and can be obtained at low cost. It has protein content ranging from 23 to 30% hence, can be a good alternative protein source. More effort is needed towards the utilization of this novel feedstuff in the Nigerian livestock industry. Apparently, few studies have been found in literature regarding its utilization in poultry diets in Nigeria. This study may help to promote the potential of rubber seed in Nigeria and enhance its utilization in poultry nutrition. This study was therefore, undertaken to assess the dietary effect of diets containing rubber seeds boiled at varying durations on the biochemistry profile of Japanese quails chicks.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out in the Poultry Unit of the Teaching and Research farm of the Department of Animal Science, Ahmadu Bello University, Zaria. The Departmental farm is located on latitude 11^0 $11^{'}$ $06^{''}$ N and longitude 7^0 $38^{'}$ $55^{''}$ E, at an altitude of 706m above sea level. The temperature of the area

ranges between 26 - 32°C depending on the season while the relative humidity during the dry and wet seasons are 21 and 72% respectively. The wet periods in Zaria are between May and October with annual rainfall of about 1500mm (IAR, 2016).

Collection and processing of rubber seed meal

Rubber seeds (*H. brasiliensis*) Pb 260, Pb 235, GT 1, RRIC 100, Ircw 41, Irca 18, Irca 217 and Irca 230 varieties were collected from Rubber Estate of Nigeria Limited (RENL), Araromi-Obu rubber plantation in Odigbo Local Government Area of Ondo State and Ovia South–West Local Government Area of Edo State, Nigeria.

Processing of rubber seed samples

Raw rubber seeds

Raw rubber seeds were washed to remove materials and sun dried. It was then dehulled and the nuts sun dried for seven days and stored for four months to further reduce the anti-nutrient content and subsequently milled to obtain raw rubber seed meal.

Boiling at different time durations

Twenty kilogramme (20 kg) of raw rubber seeds was poured into a pot containing 50 litres of water at boiling temperature (100 °C) using fire wood as the source of heat. The content was allowed to boil for 30, 40, 50 and 60 minutes respectively. Each batch of the seeds was drained and each batch of the boiled seeds was sun -dried separately for seven days and stored for four months after which they were milled and used as boiled rubber seed meal for the different boiling durations respectively.

Experimental diets

Quails birds diets were formulated to meet the nutrient requirement of the quails as recommended by (NRC, 1994). The tested ingredient meal were not included in diet of quails in the control treatment (T_1), while raw rubber seed meal was included at 20 % level in treatment (T_2). The rubber seed meal boiled at different durations of 30, 40, 50 and 60 minutes were included at 20 % level represented as T_3, T_4, T_5 and T_6 respectively

Experimental Design and management of experimental birds

A total of four hundred and fourteen (414) two weeks old Japanese quail birds purchased from National Veterinary Research Institute (NVRI), Vom were used at the starter phase. They were weighed and allotted to six dietary treatments of 69 birds each. Each treatment was replicated three times with twenty-three (23) birds per replicate. Diets were allocated to birds in a completely randomized design (CRD). The birds were raised in 75cm long × 75cm wide × 60cm high cages and Charcoal pots were used to provide heat while electricity bulbs were installed in each pen to provide light and heat during the brooding period. Feed and water were provided *ad libitum.* All routine management practices were duly observed. The experiment lasted for four weeks.

Blood sampling

At the 6th week, nine male birds per treatment were selected having from three each replicate and 2.0mls of blood samples were collected from each bird by puncturing the jugular vein using hypodermic needle and a 3ml sterile syringe for biochemical parameters. Blood collection was done in the morning at 7am before sun rise. A portion (2.0ml) of the blood samples collected was placed in clean plane sample bottle without EDTA for biochemical analysis. The samples were analysed in the laboratory for biochemical and lipid parameters which included total protein (TP), Albumin, Globulin, Triglycerides, Total cholesterol, low and high density lipoproteins, Aspartate amino transferase (AST), Alanine amino transferase (ALT) and Alkaline phosphatase (ALP) according to the procedures described by (Dacie and lewis, 2001).

Statistical model and analysis

Data obtained from all experiments were analyzed using Analysis of Variance (ANOVA) by General Linear Model Procedure of SAS, Version 9 (SAS, 2002). Significant differences among treatment means were separated and compared using the Dunnett's Test in the SAS package.

RESULTS AND DISCUSSION

The results of the feeding raw and rubber seed meal boiled at varying durations on biochemical profile of Japanese quail chicks is presented in Table 1. The significant effects of dietary treatments were observed in all the parameters measured across the dietary treatments expect albumin, globuin, Aspartate amino transferase (AST) and Alanine amino transferase (ALP).

Table 1: Haematological parameters of Japanese quails (2-6weeks) fed diets containing rubber seed meal (RSM) boiled at varying durations

Parameters	Treatments						SEM
	T1 (0 RSM)	T2 (0 raw)	T3 (30mns)	T4 (40 mins)	T5 (50 mins)	T6 (60 mins)	
Total protein (g/dl)	4.37^{a}	3.69^{b}	3.65^{b}	4.09^{ab}	3.80^{b}	4.33^{a}	0.26
Albumin (g/dl)	1.51	1.43	1.47	1.55	1.49	1.61	0.84
Globulin (g/dl)	2.86	2.26	2.19	2.54	2.31	2.72	0.96
Total Cholesterol (mg/dl)	194.87^{ab}	212.93^{a}	133.87^{c}	122.50^{c}	118.33^{c}	178.70^{b}	9.71
Triglycerides (mg/dl)	74.20^{a}	92.99^{a}	61.50^{b}	34.90^{c}	63.45^{b}	65.47^{ab}	9.40
LDL (mg/dl)	30.76^{c}	65.00^{a}	66.54^{a}	10.80^{c}	30.07^{c}	50.02^{b}	6.56
HDL (mg/dl)	63.59^{b}	78.84^{a}	82.92^{a}	76.84^{a}	75.88^{a}	35.57^{c}	8.77
AST (IU/L)	75.33	70.00	63.33	69.00	66.67	68.67	6.52
ALT (IU/L)	10.00	11.33	12.67	12.00	10.33	11.33	2.72
ALP (IU/L)	140.67^{ab}	116.33^{b}	140.00^{ab}	124.00^{b}	142.00^{ab}	153.33^{a}	8.47

^{a,b,c}=,Means along the same row with different superscripts are significantly ($P < 0.05$) different from each other. SEM = Standard Error of Means, LDL=low density lipoprotein, HDL=high density lipoprotein, AST=Aspartate amino transferase, ALT=Alanine amino transferase, ALP=Alkaline phosphatase.

The values obtained for total serum protein, albumin and globulin of birds across treatment groups (Table 1) were within the normal range recommended for healthy birds which suggest adequate protein intake in the birds and safety of the test ingredient. The significantly ($p<0.05$) lower cholesterol levels observed in quails fed diets containing RSM boiled for 30, 40, 50 and 60 minutes compared to those on the raw RSM diet and the control group may be due to the improvement in the nutritive value of the test ingredients which help to the lower cholesterol content of rubber seed meal. This is beneficial since normal body cholesterol level is useful as a component of cellular membranes, precursor of steroid hormones and bile acids hence abnormally high levels in the blood is injurious to the body as it causes cardiovascular diseases (Nelson and Cox, 2005) in man. The same phenomenon could possibly explain the low levels of triglycerides in the serum of quails fed the diets with RSM boiled for 40 minutes recovered from the treatment group. Quails fed RSM boiled for 30, 40 and 50 minutes based diets showed increased high density lipoprotein (HDL) levels compared to other treatments. This shows that boiled RSM based diets improves animal health as it encourages the build-up of high density lipoprotein (good cholesterol) with the exception of birds fed boiled RSM for 60 minutes based diets. This may also play a significant role on the consumers' viewpoint of quails raised on RSM based diets, as medical studies have shown that HDL can reduce the risk of developing atherosclerotic plaques around the soft organs in the body. LDL was significantly higher ($p<0.05$) in quails fed diets containing raw RSM and RSM boiled for 30 minutes compared to the other treatments. ALP was significantly higher in quails on diets containing RSM boiled for 60 minutes compared to raw RSM and RSM boiled for 40 minutes based diets but similar to those on the control and RSM boiled for 30 and 50 minutes based diets. There were no significant differences

(p>0.05) in the albumin, globulin, ALT and AST values across the treatments. Differences observed for serum biochemical parameters across the dietary treatments for ALT, AST, ALP, LDL and HDL agreed with the pattern observed by Kwari *et al* (2011) who reported that some blood components normally vary in concentration depending upon the nature of the nutritional intake and all the values were within the reference range reported by Jain (1993). The non-significant differences (p>0.05) observed in AST and ALT across the treatment groups indicates that the functional integrity of the organs was not affected by the treatment.

CONCLUSION

Inclusion of raw RSM and RSM boiled at varying durations included at 20% level in quail diets did not alter the serum biochemical variables measured as these were within the normal range documented for healthy birds. The diets contain adequate nutrients to support good health of birds and had no negative effect on health status as indicated by serum biochemical indices of the birds and are therefore safe for use in poultry.

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