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HAEMATOLOGICAL PARAMETERS OF JAPANESE QUAILS (*Coturnix coturnix japonica*) FED DIETS CONTAINING RUBBER (*Hevea brasiliensis*) SEED MEAL BOILED AT VARYING DURATIONS

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ABSTRACT

*This study evaluated the effect of feeding diets containing raw and boiled rubber (*Hevea brasiliensis*) seed meal basal diets on the haematology 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 the wing web vein at the 6th week of the feeding trial. The results obtained in this study showed that all the haematological profile of birds were significantly ($p < 0.05$) influenced by the dietary treatments except Packed Cell Volume, haemoglobin, basophils, neutrophils, eosinophil, mean corpuscular haemoglobin (MCH). The results suggest that raw rubber seed meal (RRSM) and rubber seed meal boiled (BRSM) at varying durations possess good dietary protein quality for optimal growth and had no adverse effect on haematological parameters of quails at 20 % dietary level of inclusion.*

Keywords: Haematology, parameters, 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 about 10, 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 raw and rubber seeds boiled at varying durations on the haematological profile of Japanese quails.



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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° 11' 06" N and longitude 7° 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 (*H. brasiliensis*) seeds 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 durations of rubber seed meal

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 bird 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 (T₁), while raw rubber seed meal was included at 20 % level in treatment (T₂). The rubber seed meal boiled at different durations of 30, 40, 50 and 60 minutes were included at 20 % level represented as T₃, T₄, T₅ and T₆ 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 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 three from each replicate and 4.0mls of blood were collected from each bird by puncturing the jugular vein using hypodermic needle and a 5ml sterile syringe for haematological and 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 sample bottles containing anti-coagulant Ethylene Diamine Tetra acetic acid (EDTA) for haematological analysis while another portion (2.0ml) was collected in a plane bottle without EDTA for biochemical analysis. The samples were analysed in the laboratory for haematological parameters which included Packed Cell Volume (PCV), haemoglobin (Hb), Red blood cells (RBC), White blood cells (WBC), Neutrophils (N), Eosinophils (E), Lymphocytes (L), monocytes, Mean corpuscular volume (MCV), Mean corpuscular haemoglobin concentration (MCHC) and Mean corpuscular haemoglobin (MCH) according to the procedures described by (Dacie and Lewis, 2001).

Statistical model and analysis

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

RESULTS AND DISCUSSION

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 (30mins)	T4 (40 mins)	T5 (50 mins)	T6 (60 mins)	
PCV (%)	45.00	41.17	42.77	45.00	46.27	47.20	6.68
Hb (g/dl)	11.77	10.67	11.57	11.17	12.40	10.56	2.30
RBC ($\times 10^6/\mu\text{l}$)	5.59 ^a	5.11 ^b	4.92 ^c	6.91 ^a	5.53 ^b	6.55 ^{ab}	0.51
WBC ($\times 10^3/\mu\text{l}$)	68.40 ^a	60.73 ^a	66.20 ^a	57.47 ^b	68.80 ^a	63.07 ^a	3.58
Basophil (%)	0.67	0.27	0.27	0.00	0.60	0.40	0.16
Neutrophil (%)	7.03	9.03	5.13	7.60	8.10	6.73	2.71
Eosinophil (%)	2.83	1.50	1.30	2.03	3.53	2.20	1.66
Lymphocyte (%)	80.10 ^b	82.57 ^b	88.60 ^a	82.13 ^b	80.77 ^b	84.80 ^a	2.63
Monocyte (%)	8.70 ^a	4.70 ^b	4.70 ^b	6.73 ^a	7.00 ^a	5.73 ^a	1.69
MCV (f/l)	71.97 ^a	65.80 ^b	59.83 ^c	65.30 ^b	73.27 ^a	60.00 ^c	3.50
MCHC (g/dl)	24.33 ^b	26.03 ^a	28.03 ^a	28.63 ^a	25.33 ^a	27.53 ^a	1.02
MCH (pg)	15.30	15.73	16.13	16.77	16.07	16.00	1.60

^{a,b,c} = Means along the same row with different superscripts are significantly ($P < 0.05$) different from each other. SEM = StandardError of Means, mins- minutes , PCV=Packed cell volume, Hb=Haemoglobin, RBC=Red blood cell, WBC=White blood cell, MCV= Mean



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The results of the feeding raw and boiled rubber seed meal at varying durations on haematological parameters of Japanese quails is presented in Table 1. The significant effects of dietary treatments were observed in all the parameters measured across the dietary treatments except packed cell volume (PCV), haemoglobin (Hb), basophils, neutrophils, eosinophil and mean corpuscular haemoglobin (MCH). MCHC was significantly ($P < 0.05$) lower in quails on the control group compared to the other treatments. All the haematological values measured were within the normal reference range (Jain, 1993). Haematological parameters are good indicators of the effects of dietary treatments on the animals in terms of the type, quality and amounts of the feed ingested and available for the animals to meet their physiological, biochemical and metabolic necessities (Olorode *et al.*, 2007). The PCV values obtained in this study were within the normal range of 25 – 66 % reported for adult Japanese quails by (Agina *et al.*, 2017) which showed that the birds were not anaemic. Haemoglobin levels ranging from 10.56 – 12.40 g/dl among quail birds in all treatment groups also fell within the range of 8.61-50.57g/dl for healthy quails as reported by (Agina *et al.*, 2017) indicating that the birds had sufficient blood pigment for proper transportation of oxygen. Rastogi (2007) Reported that haemoglobin level and packed cell volume are generally affected by inadequate intake of energy and protein with lower values indicating anaemia. Hence, the results of both parameters in this study suggest nutritional adequacy. The values obtained for red blood cell count (RBC) for quails in all treatment groups were within the normal range of $(2.02-6.99 \times 10^6/\mu\text{l})$ for healthy quails as reported by (Jain, 1993), suggesting nutritional adequacy of the diets and safety of the test ingredient (processed RSM). The WBC was significantly ($P < 0.05$) lower in birds fed rubber seed meal boiled for 40 minutes compared to those on other treatments. The range of values $(57.47-68.80 \times 10^3/\mu\text{L})$ obtained for white blood cell counts (WBC) in birds across the dietary treatments were within the normal range for healthy quails as reported by Nanbol *et al* (2016), which suggested nutritional adequacy of the diets and that there was no microbial infection or the presence of foreign bodies in the circulatory system of the birds. The high values (80.10 - 88.60 %) of lymphocytes of birds across the dietary treatments suggest the resistance of the birds to disease conditions as a result of the safety of the test ingredient. The values for lymphocytes, Basophil, monocytes, Eosinophil, MCV and MCHC fell within the normal rang for healthy quail birds as reported by Nanbol *et al* (2016). There were significant ($P < 0.05$) differences in the values of Monocytes, MCV and MCHC obtained in this study between treatments which suggest nutritional adequacy of the diets, can be attributed to the boiling of rubber seed.

CONCLUSION

Inclusion of raw RSM and RSM boiled at varying durations at 20% level did not have any effects on the Haematological variables of quail birds measured as these were within the normal range for healthy birds. The diets contain adequate nutrients to support the health of the birds and had no negative effect on health status of the birds and are therefore safe for use in poultry.

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