PERFORMANCE AND SERUM BIOCHEMISTRY OF BROILER CHICKEN FED *CANARIUM SCHWEINFURTHII* SEED MEAL DIET WITH PHYTASE ENZYME

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Abstract
The study was conducted for six weeks to investigate the effect of Canarium schweinfurthii seed meal on performance and serum biochemistry of broiler chickens. One hundred and twenty arbo acre two weeks old broiler chicken were randomly allotted to four dietary treatments (T1 to T4) of 0%, 5%, 7.5% and 10% inclusion levels of Canarium schweinfurthii seed meal (CSSM) with three replicate of ten birds each in a completely randomized design. The parameters measured are performance (weight (g), average weight gain (g), feed intake (g), and feed conversion ratio (FCR) was calculated), serum biochemical indices (total protein (g/L), albumin (g/L), globulin (g/L), creatine (g/d) and cholesterol (mmol/L). The results showed significant variation ($p<0.05$) in average weight gain, average feed intake and final weight across the treatments while the FCR were not significantly different ($p>0.05$). The serum biochemical indices were significantly different ($p<0.05$) across the treatments. Therefore, Canarium schweinfurthii seed meal with phytase enzyme can be included in the diets of broiler chickens without having a negative effect on the growth performance and biochemical indices of the birds.

Key words: *Canarium schweinfurthii*, broiler chickens, performance, serum, phytase

Introduction
In developing countries like Nigeria, the supply of animal protein is grossly inadequate. It is established that an average Nigerian consumes only 8.6g of animal protein per day as against 53.3g by the inhabitants of developed countries (Ojo, 2003). Sanni and Ogundipe (2005) reported that poultry industry occupies a major position in livestock production as birds reproduce much quicker to produce meats and eggs for human consumption. According to FAO (2006) poultry is considered to be a means of livelihood and a way of achieving a certain level of economic independence. Nutrition is perhaps the most important consideration in livestock management. Therefore, the major interest of the farmer is to reduce the feed cost, which accounts for 60 to 70 % of the total cost of production (Igwebuike *et al*., 2001 and Ogundipe, *et al*; 2003). Research efforts are geared towards evaluating alternative feed ingredient that are less costly and yet efficient for poultry. In essence, to overcome the problem of feed shortage in the poultry industry, the recent trend is the usage of non-conventional feedstuff that is readily available, cheap and nutritionally safe in poultry feed formulation. One of such non-conventional feedstuffs with great potential is *Canarium schweinfurthii* seed. *Canarium schweinfurthii* is a suitable source of edible oil which can also serve as alternative source of energy with valuable minerals such as calcium, potassium, magnesium, sodium, phosphorous, iron, zinc and copper (Adelowo *et al*., 2019a). Adelowo *et al*., (2019b) in their findings reported that, the inclusion of roasted *Canarium schweinfurthii* seed meal up to 7.5% significantly improve the final weight, weight gain and feed intake of broiler chickens. Hence, this study evaluates the growth performance and serum biochemistry of broiler chickens fed graded level of *Canarium schweinfurthii* seed meal with phytase enzyme.

Materials and methods
The study was carried out at the Poultry Department of the National Veterinary Research Institute (N.V.R.I.), Vom, Plateau State. One hundred and twenty day-old broiler Arbo acre chicks were acquired from a local hatchery. The chicks were brooded for 14 days (at a density of 20 chicks/$m^{2)}$ using a commercial feed and thereafter the experimental diets were introduced. The chicks were weighed at the beginning of the experiment to obtain the initial weight. The 120 broiler chicks of fourteen days old were randomly allotted in a completely randomized design to 4 dietary treatments 0% (T1), 5% (T2), 7.5% (T3) and 10% (T4) inclusion levels of *Canarium schweinfurthii* seed meal (CSSM). Each dietary treatment had 30 chicks with 3 replicates of 10 birds. *Canarium schweinfurthii*

seeds were sourced in a local market from Pankshin L.G.A., Plateau state, dried, grounded and mixed with other ingredients in the experimental diets. Thirty grams of phytase enzyme was weighed and added to the dietary treatments; the composition and calculated analysis of the experimental diets are presented in Table 1. The diets were isonitrogenous and isocaloric to meet the recommended crude protein and Metabolisable energy requirements as stated by NRC (1994). Feeds and water were given *ad libitum.* The parameters were measured weekly: the performance data taken include feed intake, initial and final weight, body weight gain while the feed conversion ratio (FCR) was calculated weekly. Daily feed consumption was recorded as the difference between feed offered and the left over. The birds were raised on deep litter standard management and hygiene, the recommended vaccines for broilers were administered accordingly. The duration of the experiment was six weeks. At the end of the six weeks study, 2 birds from each treatment were randomly selected and blood samples were collected for serum biochemistry analysis. For each chicken, 2ml of blood was collected with a syringe via the wing vein and transferred into an anti-coagulant free bottle. Meanwhile, after centrifugation, blood free from anticoagulant, serum was collected and preserved at -20^{0}C for the evaluation of serum biochemical parameters (Total protein, Albumin, Globulin, Total cholesterol and Creatinine) using a colorimetric method as prescribed by the commercial kits (Chronolab® kits).

Statistical Analysis

Data obtained from the experiment were analysed using the statistical analysis of variance (ANOVA) procedure of SAS (2010) and significant level of p=0.05 was used. The treatment means were compared using the New Duncan Multiple Range test of the same software.

Table 1: Composition of the experimental diets

Ingredient	T1 (0%)	T2 (5%)	T3 (7.5%)	T4 (10%)
Maize	50.00	44.00	40.00	40.00
Soybean cake	20.00	17.00	17.00	16.50
Wheat offal	8.00	13.00	13.0	11.0
Groundnut cake	17.30	15.30	15.80	15.80
Atili (CSSM)	0.00	5.00	7.5	10
Bone meal	2.00	2.00	2.00	2.00
Vegetable oil	2.00	3.00	4.0	4.0
Methionine	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10
Premix	0.15	0.15	0.15	0.15
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

Nutrient Analysis				
Crude P. %	22.44	20.50	20.32	19.75
Energy(M.E.kcal/kg)	2999.40	2835.90	2792.90	2742.00
Calcium	0.80	0.80	0.80	0.79
Average phosphorus	0.59	0.62	0.62	0.59
Lysine	1.11	1.00	1.00	0.98
Methionine	0.52	0.49	0.49	0.48
Fibre	3.85	3.86	3.80	3.60

CSSM= *Canarium schweinfurthii* seed meal, P=Phosphorous, ME = Metabolisable energy,

Table 2: Proximate composition of *Canarium schweinfurthii* seed

Parameter	g/100g
Protein	4.55
Fat	3.14
Moisture content	13.20
Ash	3.96
Crude fibre	3.62
Energy(M.E.kcal/kg)	2448.81

Results and Discussion

Table 3: Growth performances of broiler chickens fed *Canarium schweinfurthii* seed meal

Parameters	Treatments				
	T1 (0%)	T2 (5%)	T3 (7.5%)	T4 (10%)	SEM
Initial weight(g\bird)	235.00	235.00	232.00	230.00	0.12
Average Feed intake (g\bird)	970.00^{a}	893.50^{b}	842.50^{b}	768.00^{c}	14.8
Average weight gain (g\bird\week)	294.00^{b}	323.50^{a}	314.00^{a}	295.00^{b}	9.4
Final weight (g\bird)	1999.00^{b}	2271.00^{a}	2150.00^{ab}	2000.00^{ab}	65.0
FCR	3.29	2.76	2.68	2.90	0.37

abc Means along the same row with different superscripts are significantly different ($p<0.05$)
SEM =Standard Error of Mean

In Table 3, it was observed that final weight/bird, average weight gain/bird/week and average feed intake/bird increased significantly ($P<0.05$) across the treatments. The final weight/bird values ranges from highest 2271.00g (T2), to lowest 1999.00g (T1) respectively. The average weight gained/bird increases from 294g (T1), 295g (T4), 314g (T3) to 323.50g (T2) and the average feed intake/bird

decreases from 970g (T1), 893g (T2), and 842g (T3) to 768g (T4) respectively. The FCR values were not significantly different ($p>0.05$) across the treatments. The final weight value was higher in birds fed diet with 5% and 7.5% CSSM compared to those fed with the control diet (T1) this result agree with the findings of Adelowo *et al*., (2019) that broiler chickens can tolerate roasted *Canarium schweinfurthii* seed meal up to 7.5% without affecting their performance. The introduction of phytase enzyme in T2 to T4 had positive effect on the FCR which agree with the report in the findings of Agboola *et al*. (2015) that enzymes addition to diet had positive effect on broiler growth. The average weight gain and final weight of the broiler chickens were significantly different. Hence, CSSM can be included in broiler diet up to 10% because the seed contained appreciable amount of nutritionally valuable minerals such as calcium, potassium, magnesium, sodium, phosphorous, iron, zinc and copper while glutamic and aspartic acids dominated the amino acid profile also appreciable amount of essential amino acids which was more than fifty percent of total amino acid contents (Aigade *et, al.* (2017). Table 4 shows the effect of feeding different levels of *Canarium schweinfurthii* seed meal on serum biochemical indices of broiler chickens is shown in Table 3. The total protein levels were 52.50g/L, 58.50g/L , 47.00g/L, and 48.00g/L respectively. The albumin levels were 28.00g/L, 30.00g/L, 25.00g/L and 25.00g/L respectively. The globulin were 25.00g/L, 28.50g/L, 22.00g/L and 23.00g/L respectively, the creatinine levels were 1.95mg/dL, 1.65mg/dL, 2.15mg/dL and 1.55mg/dL respectively while the cholesterol levels were 2.80mmol/L, 1.75mmol/L, 2.30mmol/L and 2.25mmol/L from T1 to T4 respectively. There were significantly variations ($p<0.05$) in all the biochemical indices measured in this study across the treatments. Although, the total protein, albumin and globulin were not statistically different for treatments T1 and T2.

Table 4: The Serum biochemistry of broiler chickens fed *Canarium schweinfurthii* seed meal

Parameters	Treatments				
	T1 (0%)	T2 (5%)	T3 (7.5%)	T4 (10%)	SEM
Total protein (g/L)	52.50^{ab}	58.50^{a}	47.00^{b}	48.00^{b}	1.68
Albumin (g/L)	28.00^{ab}	30.00^{a}	25.00^{b}	25.00^{b}	0.78
Globulin (g/L)	25.00^{a}	28.50^{a}	22.00^{b}	23.00^{b}	1.12
Cholesterol (mmol/L)	2.80^{a}	1.75^{b}	2.30^{ab}	2.25^{ab}	0.15
Creatine (mg/dL)	1.95^{a}	1.65^{b}	2.15^{a}	1.55^{b}	0.08

abc Means along the same row with different superscripts are significantly different ($p<0.05$)
SEM =Standard Error of Mean

Conclusion and Recommendation

Canarium schweinfurthii seed is readily available with little or no economic value and its inclusion in diets of broiler chickens up to 10% without adverse effects on performance will reduce the cost of production of broiler chickens especially for farmers in the rural areas. It can also serve as cheap income for farmers who produces *Canarium schweinfurthii* olive oil from the fruits where the seeds serve as waste products.

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