EVALUATION OF GROWTH PERFORMANCE AND HAEMATOLOGICAL RESPONSE OF BROILER CHICKS TO RAW AND BOILED *GARCINIA KOLA* SEED DIET.

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SUMMARY

This study was set to evaluate the effect of raw and boiled (100^{0}C) *Garcinia kola* seed diet on growth performance and haematological response of broiler chicks. A total 18 broiler chicks assigned into three treatment groups of six birds each were used for this study. Treatment one (control) received 0% inclusion of *Garcinia kola* seed. Treatment group two received 10% boiled *Garcinia kola* seed, while group three received 10% raw *Garcinia kola* seed in addition to basal feed (Vital starter and finisher rations).The growth performance indices of feed consumption, live body mass were taken on weekly basis whereas uncoagulated blood samples were collected 24 hours after administering the last treatment to the groups. The haematological indices of erythrocytic function were determined. The result obtained showed a significant (P<0.05) reduction in live body mass of broiler chicks treated with raw *Garcinia kola* seed diet. The haematological indices of erythrocytic function and live body mass were however not significantly (P>0.05) affected by heat treatment at 100^{0}C. This finding lends credence to the popular report in literature that heat treatment above 80^{0}C is one of the methods of removing or deactivating anti nutritional factors present in plant food for animal nutrition.

Key words: Evaluation, growth, haematolgical, boiled, *Garcinia kola, broilers*

INTRODUCTION

Plant food for animal nutrition may contain either poisonous agent or anti nutritional factor, thereby making it difficult for such nutrient present in the plant to be available for the animal. Several well known tropical forage plants contain toxic substances (Greig, 1952). *Leucaena leucocephala* contains toxic principle *mimosine* which inhibits cell division in animal, the legume *indigofera spicata* produces a serious hepatotoxin known as *idospicine*; and species of the grass genus *Setaria* contains high oxalate content (Williamson and Payne, 1978).

Phaseola lunata (Jova bean) contains carcinogenic glycoside (Phaseolunatin) which causes prussic acid poisoning in animal (Greig, 1952). Plant protein such as soya bean contains trypsin inhibitor which limits the availability of plant protein contained in soya beans (Smith, 1990). Cotton seed, another plant protein source for poultry contains gossypol that is poisonous to birds if consumed raw in appreciable quantity (Smith, 1990). *Garcinia kola* seeds are reputable for their medicinal uses which include treatment of bronchitis and colic (Lewis and Elvin Lewis, 1977), gonorrhea and wound (Iwu,

1993) and relief of toxic substances from the body (Husain *et al*., 1982). Their anti oxidant and free radical scavenging activities had been reported by Okwu, (2005) while Braide, (1991) reported their antihepatotoxic effect.
In spite of these numerous medicinal values, *Garcinia kola* seeds contain some active principles that limit the utilization of protein by animal consuming these seeds. The presence of tannins and guttiterins in the seed of *Garcinia kola* was reported by Etkin, (1981) and Okwu, (2005.)

Ebana *et al.,* (1991) reported the presence of bitter principle in *Garcinia kola* seeds. Most of the studies carried out with raw *Garcinia kola* seed or its extract on body mass of animal revealed reduction in body mass relative to control experiment. Uko *et al*., (2001) reported a depressive appetite and water intake of rats exposed to methanolic extract of *Garcinia kola*.
Similarly, Ibekwe *et al*., (2007) reported reduction in testicular weight of male albino rats exposed to *Garcinia kola* powder.

It is on record that haematological change by whatever means leads to serious physiological and biochemical problems in the affected animal, leading to improper maintenance of life (Frandson, 1981).

It has been reported that various feed ingredients, including unconventional sources affect animal physiology. Emenalom and Udedibie (1998) reported that 10% raw mucuna seed could be tolerated by broilers. Raw mucuna beans contain high level of trypisn phytate, cyanide and tannin which limit its use in animal feeding (Feenu et *al*., 2001). *Garcinia kola* seeds are not popular as unconventional sources of feed but highly reputable for its medicinal value. This high medicinal value of *Garcinia kola* is almost thrown over board in broiler production due to (anti-nutritional factor) present, rendering them indigestible (Peter and Richard, 1999). Anti-nutritional factors present in unconventional feed sources can be de-activated by application of heat above 80^{o}C (Smith, 1990).

This study therefore was set up to evaluate the effect of boiling of *Garcinia kola* seed at 100^{0}C on growth performance and haematological indices of erythrocytic function of broiler chicks.

MATERIALS AND METHODS

Preparation of raw *Garcinia kola* seed diet

Garcinia kola seeds weighing 1000g were purchased from Watt Market Calabar in Cross River State of Nigeria. The seeds were sun dried for 24hours to ease the removal of the testa. The seeds were sliced with sharp kitchen knife to increase the surface area of the seeds exposed to drying. The drying was consummated in an electric oven (Gallen Kamp grade USA). The dried seeds were ground to power by a motor powered milling machine. The *Garcinia kola* seed diet was prepared by mixing 10% of *Garcinia kola* powder with 90% vital starter or finisher feed. The diet produced was used as one of the treatments in this study.

Preparation of boiled *Garcinia kola* seed diet

Peeled *Garcinia kola* seeds weighing 1000g were subjected to heat treatment by placing them in boiling water at 100^{o}C for 10 minutes. The *Garcinia kola* seed powder and the diet were prepared following the same procedure as described for raw *Garcinia kola* seeds above.

Animal and Animal Treatments

A total of 18 broiler chicks of Anak 2000 strain were assigned into 3 treatment groups of 6 broiler chicks each. The birds were properly marked for easy identification. Treatment group one (control) received 0% of *Garcinia kola* seed powder. Treatment group two

received 10% of boiled (100^{o}C) *Garcinia kola* seed powder, while group three received 10% raw *Garcinia kola* seed powder. All groups received vital starter and finisher feed as the basal diet.

Collection of blood samples and analysis

Blood samples were drawn from each broiler chicks 24 hours post last administration of *Garcinia kola* seed diet by decapitation and blood was collected in sample bottles containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant.

The fresh blood samples for R B C was collected from the comb or wattle of each bird using a spirit sterilized puncturing needle to puncture the comb or wattle. The first drop of blood was wiped away cleanly using a sterile cotton wool. The next stream of blood was gently and slowly sucked into the red blood cell pipette up to the 0.5 mark. This was immediately plunged into Hayem's diluting fluid sucked up to 101 mark on the pipette while being rotated gently. The pipette was firmly griped between the finger and the thumb. This was thoroughly but gently shaken for two minutes after detaching the rubber tube on the posterior aspect of the pipette.

The rubber tube was re-attached to the pipette and all unused diluting fluid was discarded. The cover glass was gently placed on top of the Neubauer's counting chamber or ruled slide. The diluted blood was run under the cover glass on to the Neubauer's counting chamber. All cells in 5 secondary squares were counted including those which touched the top and the right hand line of the secondary squares.

The number of R B C's/min is given by this formula.

Number of R B C's/min = $\frac{N \times D \times 10 \times 400}{\text{Number of Small Square counted (80)}}$

Where N = Number of cells counted

D = Dilution factor (200 times)

10 = depth in counting chamber (0.1 mm)

400 = product of 25 secondary and 16 tertiary squares

80 = Number of small (tertiary) squares in 5 secondary squares counted.

The uncoagulated blood collected was kept for haemoglobin concentration and Packed cell volume (P C V) determinations. The haemoglobin concentration (Hbg/dl) was determined by the cyanomet-haemoglobin method using a Beckman model spectrophotometer.

The Packed cell volume (P C V) was determined with the Q B C II centrifugal haematology system.

Statistical Analysis

The Student's t-test analysis was used to compare the significance of differences between control and treated groups. Analysis of variance was used to compare significance of differences among and within groups of treatment (Nwabuoike, 1986).

RESULTS

Results in Tables I and II are the proximate compositions of the basal feed, raw and boiled *Garcinia kola* seeds to throw more light on the nutrient composition of the feed ingredients administered to the animal. Table III shows the qualitative phytochemical constituents of *Garcinia kola* seeds (raw and boiled above 80^{0}C) as adapted from previous work of Ibekwe *et al.,* (2007). The mere absence of tannins in boiled *Garcinia kola* seed suggests that heat treatment may have effect on *Garcinia kola* seeds. The result in table IV is the mean final live mass of birds treated with 10% raw and boiled *Garcinia kola* seeds at 100^{0}C. The result obtained showed a significant ($P<0.05$) reduction in live body mass of broilers treated with raw *Garcinia kola* seeds relative to control. The boiled *Garcinia kola* seeds caused a non-

significant (P>0.05) reduction in live body mass of broiler birds. Table V on the other hand is the haematological indices of body function. The result obtained indicated that there was no significant (P>0.05) changes in the erythrocytic parameters analyzed.

Table I: Proximate composition of basal feed

Proximate fraction	**Percentage composition(%)**	
	Starter ration	Finisher ration
Moisture content	11.20	11.00
Dry matter	88.80	89.00
Crude protein	21.00	19.00
Crude fiber	5.00	5.40
Ether extract	8.50	8.60
Crude ash	1.65	1.61
Nitrogen free extract	52.65	54.39
Metabolizable energy (Kcal/g)	2,800.00	2,900.00

Courtesy of Grand Cereals and Oil Mills Limited.

Table II: Proximate composition of *G. kola* seed

Proximate fraction	**Percentage Composition (%)**	
	Raw (0^oC)	Boiled (100^oC)
Moisture content	14.50	15.45
Dry matter	85.40	82.50
Crude protein	0.58	1.44
Crude fiber	0.10	0.20
Ether extract	3.00	2.60
Crude ash	5.00	5.50
Nitrogen free extract	76.72	74.81

Table III: Phytochemical constituents of *G. kola* seed.

Constituents	
Raw (0^0c)	Boiled (100^oC)
Phenols	Phenols
Alkaloids	Alkaloids
Tannins	Not available
Saponins	Saponins
Flavonoids	Flavonoids

Adapted from previous study. Ibekwe (2007)

Table IV: Mean final live mass of birds (Kg)

Number of birds	Percentage inclusion level		
	0% (control)	10% (ht.tr.)	10% (raw)
1	2.6	2.5	2.3
2	2.4	2.6	2.4
3	2.4	1.9	2.1
4	2.0	2.0	2.0
5	2.3	2.0	2.1
6	1.9	2.0	1.8
Mean	2.27 ± 0.26^{a}	2.17 ± 0.30	2.12 ± 0.23^{b}

Mean values on the same row with different superscripts are significantly (P<0.05) different.

Table V: Haematological values

Haematological parameters	**Treatment groups**		
	0% (control)	10% (ht.tr.)	10% (raw)
RBC (X $10^{6}mm^{3}$)	4.10 ± 0.20^{a}	3.97 ± 0.12^{a}	3.97 ± 0.29^{a}
Hb. Conc. (g/dl)	12.37 ± 0.42^{a}	12.03 ± 0.30^{a}	12.13 ± 0.58^{a}
PCV (%)	37.67 ± 1.53^{a}	36.67 ± 1.15^{a}	36.67 ± 2.08^{a}

Means on the same row with the same superscripts are not significantly (P>0.05) different.

DISCUSSION

The significant reduction in the mean body mass of birds fed 10% raw *Garcinia kola* seed powder is in consonance with the findings of Ibekwe *et al.,* (2009) who reported a significant reduction in live body mass of broiler chicks exposed to graded doses of aqueous extract of *Garcinia kola* seed. This finding was further supported by Ibekwe *et al*., (2007) who observed presence of tannins in qualitative phytochemical screening of raw *Garcinia kola* seed. A plausible explanation for this finding may be due to the presence of tannin, an anti-nutritional agent, present in the seeds of raw *Garcinia kola*. Tannins and glycosides when hydrolyzed bind to almost any available protein making this nitrogenous source indigestible or unpalatable to birds maintained on such feed ingredients (Peter and Richard, 1999).

The birds exposed to 10% (100^{0}C) boiled *Garcinia kola* seed powder did not show significant (P>0.05) reduction in live body mass. This may be due to the application of heat which renders anti-nutritional agents ineffective thereby increasing the availability of proteins to the birds (Smith, 1990). The absence of tannin in qualitative phytochemical screening of heat (> 80^{0}C) treated *Garcinia kola* seed lends credence to this finding (Ibekwe *et al.*, 2007). The depressed appetite and water intake caused by raw *Garcinia kola* seed (Uko *et al.*, 2001) was drastically reduced by application of heat. The poor proximate composition of raw *Garcinia kola* seeds (Ibekwe *et al.*, 2007) may not likely improve the body mass of birds exposed to them. This composition was however not improved by application of heat even at 100^{0}C. It therefore, points to the fact that application of heat will rather alter the principles such as flavonids, phenols, tannins, alkaloids etc.

The haematological indices determined revealed a non-significant change in values obtained for raw and heat treated *Garcinia kola* relative to control. This is not uncommon as even repeated evaluation of the same treatment under specified

conditions yielded no significant result (Conley, 1974).

The findings in this study agreed with the direct variation existing among total erythrocyte count, hemoglobin concentration and packed cell volume (Schalm *et al.,* 1975) as there was no significant change in total erythrocyte count. This may be attributed to the complexes formed by flavonoid with metals like iron, zinc and copper thereby making them unavailable (Siegenberg *et al.*, 1991). Therefore, since iron is needed for synthesis of erythrocyte, it becomes difficult to have increased number of erythrocyte where there is iron deficiency. Heat application however, would not ameliorate this thereby supporting the non-significant changes in haematological indices determined. Heat treatment at above 80^0C is therefore very importance so as not to compromise the body mass of broilers while utilizing *Garcinia kola* seed in disease management in poultry enterprise.

CONCLUSION

Raw *Garcinia kola* seeds at inclusion levels in poultry feed at 10% and / or above tend to limit the growth performance of broiler chicks. Since heat treatment does not affect much of the active principles of *Garcinia kola* seed involved in disease control, heat application above 80^0C, is therefore required to deactivate anti-nutritional principle present in *Garcinia kola*. Therefore heat application (100^0C) helps to reduce the adverse effect of raw *Garcinia kola* seed on growth performance but does not however, alter the body physiology.

REFERENCES

BRAIDE, V.B. (1991): Antithepatotoxic biochemical effects of kolaviron: A biflavonoid of *Garcinia kola.* Phytotherapy Res.**5**:35-37

CONLEY, C.L. (1974): The Blood in Medical Physiology 3rd Ed. B.M. Veron. Tokyo; 1027-1057.

EBANA, R.U. MADUNAGA, B.E. EKPW, E.D. and OTUNG, D. N. (1991): Microbiological exploitation of cardiac glycosides and alkaloids from *Garcinia kola, Borreri ocymoides, Kola nitida and Citrus aurantifolla*. *Journal of Applied Bacteriology*, **71(5):** 398-401.

EMENALOM, O.O. and UDEDIBIE, A.B.J. (1998): Effect of dietary raw, cooked and toasted mucuna pruriens seed (Velvet bean) on the performance of finisher broilers. *Nigerian Journal for Animal Production*, **25**:115-119.

ETKIN, N.L. (1981): A Housa Herbal Pharmacopeia. Biomedical evaluation of commonly used plant medicines. Journal of Ethnopharmacology**, 4**:75- 98

FEENU, R.A., ROSENTHAL, G.A., DAHLMAN, D.L and JANZEN, D.H. (2001): A Novel means for dealing with *Mucuna pruuriens* toxic metabolites. *Science*, **192:** 256-258

FRANDSON, R.D (1981): Anatomy and Physiology of Farm Animals. Lea and Febiger, Philadelphia; 229-238.

GREIG, W.A. (1952); Banham's the Veterinary Surgeon's Vade Mecum. 8th Ed. Bailliere, Tindall and Cox. London. Henrietta street, W.C.**2**; 87-92.

HUSAIN, R.A. CWEGBY, A.G., PARIMOO, P and WATERMAN, P.G. (1982): A novel polyisopremylated benzophenone

with antibacterial properties from fruit of *Garcinia kola*. *Plant Medicine*, **44**:78-81

IBEKWE, H.A., ETENG, M.U. and ANTIGHA, E. (2007): Proximate and phytochemical composition of *Garcinia kola* and *Vernonia amygdalina*. *Global Journal of Agricultural Science*, **6(2):** 207-209.

IBEWKE, H.A., AKPAN, I. A and BIKOM, P.M (2009): Effect of graded doses of aqueous extraction of *Garcinia kola* seeds on growth performance and haematological response of broiler chicks. Continental Journal of Animal and Veterinary Research, **1**:1-7.

IWU, M. M. (1993): Hand Book of African Medicinal plant. C.R.C press London, Beccles and Colchester; 183-184.

LEWIS, W. and ELVIN-LEWIS, M. P. F. (1977): Medical Botany. John Willey and Sons New York, Buffalo; 140-250.

NWABUOIKE, H. (1986): Fundamentals of Statistic. New Edition. Koruna Books. Nigeria, Aba; 95-109.

OKWU, D.E (2005): Phytochemicals, vitamins and mineral contents of two Nigerian medicinal plants. International Journal of Molecular Medicine and Advanced Sciences, **1(4):** 375-381.

PETER, J.L. and RICHARD, C.L (1999): Plant Biochemistry and Molecular Biology 2nd Ed. John Wiley and sons. New York, Chichester, 231-232

SCHALM, O.W., JAR N.C. and CARROLL, E.J. (1975): Veterinary Haematology. 3rd Ed. Lea and Febiger. London, Colcester and Beecles; 385-390.

SIEGENBERG, D., BAYNES, R.D. CAR, N.G., MACPHAIL., P., SCHMIDT, U., TAIL, A. and MAYET, F.(1991): Ascorbic acid rpenfents the doses dependent inhibitory effect of polyphenols and phytate on non-heme iron absorption. A.M.J. Clin. Nutri, **53(2):** 537-541.

SMITH, A.J (1990): The Tropical Agriculturist. Centre for Tropical Veterinary Medicine. Macmillan Publishers, University of Edinburgh London, Beecles and Colchester; 113-114.

UKO. O.J., USMAN, A. and ATAJA, A.M. (2001): Some biological activities of *Garcinia kola* in growing rats. Veterinarski Arhiv, **7(5)**: 287-297.

WILLIAMSON, G. and PAYNE, W.J.A. (1978). An Introduction to Animal Husbandry in the Tropics. Longman Group Limited. New York. Buffalo; 140-141.