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Blood Biochemicals of Broiler Chickens after Been Fed *Cassia obtusifolia* Seed Meal

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Abstract: The effect of processed *Cassia obtusifolia* seed meal as a replacement of protein on blood biochemistry (protein, albumin, globulin, Creatinine and cholesterol) was studied. One hundred and twenty (120) day old broilers chicks purchased from reputable source were randomly divided into four dietary treatments in a Randomized Complete Block Design (RCBD) with three replicates of ten birds each. Four experimental feeds were compounded with processed *Cassia obtusifolia* seed meal as replacement for protein at concentrations of 0, 2.5, 5.0 and 7.5% inclusion. The groups are as T1, T2, T3 and T4 groups, respectively, where T1 served as control. The experimental diet was fed to the birds for a period of 8 weeks. T2 (2.5%) and T3 (5.0%) groups had normal blood biochemical parameters while T4 (7.5%) did give normal range of biochemical values except for cholesterol level (172.86mg). The increase showed a level of significance ($P<0.05$) when compared to the normal range (52-148mg). The increase came from the high concentration (7.5%) of seed meal in feed (T4) in that T1 which was fed the conventional feed (control) did not show any change in the level of cholesterol. However, change in the concentration of cholesterol occurred with inclusion of *Cassia Obtusifolia* seed meal was made at higher percentage 7.5%, T4. This means that the level of cholesterol in chickens would be increased and becomes a risk factor to those who have preference for broiler meat. However, further investigations need to be carried out on the processing methods of *Cassia obtusifolia* seed that could enhance inclusion of seed meal beyond 7.5% with lesser risk of cholesterol build up in birds.

Key words: *Cassia obtusifolia*, seed meal, blood biochemistry, risk factor

INTRODUCTION

Cassia obtusifolia commonly called 'sickle pod', is a plant that mostly grows in the wild and can cover an extensive useful farm land area as weed, making farm lands either a waste or more costly to cultivate (Fig. 2). Other names for the plant include: Foetid Sassia (or *"Cassia"*), *Sickle senna*, *Coffeeweed or Arsenic Weed* and somewhat ambiguously as *"blunt-leaved senna", "coffee pod" or "java bean"* (English), *gyeolmyeongja* (Korean), *jué míng zi* (Simplified Chinese), *ebisu-gusa* (Japanese), *fedegoso* (Portugese) and *chirauta chokad* (Hindu), tapasa or tasba (Hausa).

The plant *Cassia obtusifolia* is leguminous and has been known to have the following composition: carbohydrate - 66-69%, protein- 14-19%, fats- 5-7% and anti-nutritional anthraquinones, 1-2% (Li *et al*., 2004; Harry-O'Kuru *et al*., 2009; Damron and Jacob, 2009).

In Nigeria, *Cassia abtusifolia* is mostly found in the northern part of the country in areas that have not been cultivated during the rainy season, these plants could become nuisance in agriculturally productive areas and this has led to extra cost of land clearing.

In Adamawa State, the plant abounds and is commonly called '*tasba*' and is both a nuisance and cash plant. The leaves are dried and used for making soup, which is a delicacy. The seeds are used locally to salvage eye problem and production of leaves to be dried and sold.

The seeds of this plant have been used in different forms by man, at times used as coffee (Ousman *et al*., 2005; Damron and Jacob, 2009). Attempts also have been made to include the dried leaves in feed of Holstein calves which gave negative average daily weight gains (Putnam *et al*., 1988). In birds, different results have been recorded, laying birds reacted faster when ground seeds are added to the feed and egg depression of 1.5% was noticed. When 3% of the seed was added to the feed, there was depressed feed intake in broilers which occurred within 24 hours but was attributed to the taste of the new feed (Damron and Jacob, 2009).

There is need to increase the animal protein consumption in Nigeria and other developing countries through provision of cheap meat, milk and eggs. To achieve this aim, cheap sources of feed may be the best answer as feed constitutes 55-80% cost of production in livestock industry (Ingweye *et al*., 2010). The competition between humans and livestock for animal protein may necessitate the need for alternate and cheaper protein source. It is therefore imperative that for animal protein to be increased for teeming population and to lessen

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competition between humans and livestock, a cheaper and readily available good source of protein is required to substitute the competitive known protein sources.

In Nigeria, there is paucity of information on *Cassia obtusifolia* seed on its utilization as protein source replacement in compounding poultry feed. Therefore, the study was done to find out the quantity/level of *Cassia obtusifolia* seed meal as a protein substitute that could be added in feed of broilers and its consequences in the biochemistry of blood.

MATERIALS AND METHODS

Study area: The study was carried out at Adamawa State University Teaching and Research Farm, Poultry Unit. Mubi is located between Latitude 9°30' and 11° North of the Equator and Longitude 13° and 13°45' East of the Greenwich Meridian (Adebayo, 2004).

Identification of *Cassia obtusifolia*: The plant and seeds were identified by a Weed Scientist in the Department of Biological Sciences, a Botanist of Adamawa State University, Mubi, Nigeria.

Experimental diets and treatments: Four experiment diets (T_1-T_4) were compounded for both starter (23% of crude protein) and finisher (19% crude protein). Processed seeds of *Cassia obtusifolia* seed meals were included at 0, 2.5, 5 and 7.5% for T_1, T_2, T_3 and T_4, respectively. Treatment T_1 has no processed seed meal included and therefore, served as the control.

Analyses of treatments: The compositions of the different experimental diets were analyzed using the procedures of AOAC (2000) and are presented in Tables I and II, respectively.

Experimental design

Animals: One hundred and twenty (120) day old broilers chicks purchased from a reputable source were randomly divided into four dietary treatments in a Randomized Complete Block Design (RCBD) with three replicates of ten birds each.

Management: The birds were intensively managed on a deep litter system and vaccinated against New Castle disease; Infectious bursal disease (Gumboro) and Fowl pox at appropriate times. At all times, experimental feed and clean water were provided *ad libitum*. Necessary precautionary measures were also provided.

Processing of *Cassia obtusifolia* seeds: Seeds collected from the field were toasted in oven at a temperature of 120°C for 30 minutes; the entire quantity was treated in same manner.

Proximate composition of *Cassia obtusifolia*: Proximate composition of the processed *C. obtusifolia* seed meal and experimentally compounded diets were determined by AOAC (2000).

Blood sampling and analyses: Blood samples were collected through the wing web (venupuncture), 3mls was collected at week 8 when the experiment was terminated.

Samples were analyzed for protein, albumin, cholesterol, globulin and Creatinine according to Sood (2003).

Statistical analysis: The result was subjected to the analysis of ANOVA (SAS, 2004).

RESULTS

Table 1 showed the concentrations of some bio chemicals in the serum of broiler birds fed different levels of *Cassia obtusifolia*. Figure 1 provides biochemical levels of individual treatment where treatment 1 (T1) serves as the control, with no *Cassia obtusifolia* Seed Meal (CSM). Treatments 2, 3 and 4 had 2.5, 5 and 7.5% of CSM, respectively.

However, Table 2 is the mean values of the different treatments. The result shows the means of T2, T3 and T4 which are all within the normal range of Total protein (5-7g/dL); Albumin (2.0 - 3.5g/dL); Globulin (2.5-3.5g/dL), Creatinine (0.5-6mg/dL) and Cholesterol (52-148mg/dL). However, the level of cholesterol for T4 was 172.86mg/dL which is above the normal range (Banerjee, 2006).

DISCUSSION

After 8 weeks of feeding the broilers, there was no significant change in the concentration level of plasma protein despite the increase in levels of the *Cassia*

Table 1: Composition of experimental starter feed

Ingredient (%)	T1 (0%) CSM	T2 (2.5%) CSM	T3 (5%) CSM	T4 (7.5%) CSM
Maize	40.0	40.0	40.0	40.0
Soybean	22.0	21.0	20.0	20.0
G/cake	20.35	19.0	18.0	15.0
C.S.M.	0.00	2.50	5.00	7.50
Maize offal	13.00	12.85	12.35	9.85
Salt	0.50	0.50	0.50	0.50
Bone meal	3.50	3.50	3.50	3.50
Methionine	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
ME (Kcal/kg)	2782.01	2725.84	2670.21	2615.85
CP (%)	23.35	22.85	22.89	23.16
CF (%)	4.48	4.59	4.69	4.70
Fat (%)	7.03	6.84	6.65	6.63
Calcium (%)	1.44	1.44	1.44	1.43
Phosphorus (%)	0.90	0.89	0.88	0.87

CSM: Cassia obtusifolia seed meal

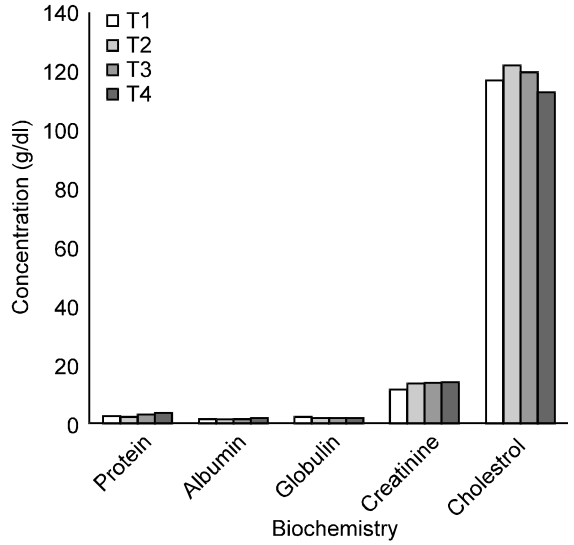

Fig. 1: Mean concentration of lipids in different treatments with *Cassia obtusifolia* seed meal

Fig. 2: Flowering *Cassia obtusifolia* plant. Source: Wikipedia (2011)

obtusifolia Seed Meal (CSM) in the feed. There was neither hypoproteinemia nor hyperglobulinemia, where hyperglobulinemia usually forms the basis for increase and maintenance of total plasma protein concentration. Hypoproteinemia is commonly associated with lack of proper diet or poor absorption of dietary constituents from the intestinal tract (Coles, 1974), which was not observed in this study.

Albumin an integral part of total serum protein (40-60%), is responsible for stabilization (Osmotic gradient) between inter and intracellular fluid of the body. Hyperalbuminemia is rarely seen except in conditions of acute dehydration or shock but also, the condition could be masked by increase in total plasma volume. In all four treatments there was no significant difference (P>0.05) in the level of albumin, Table 3.

Table 2: Composition of finisher feed

Ingredient (%)	T1 (0%) CSM	T2 (2.5%) CSM	T3 (5%) CSM	T4 (7.5%) CSM
Maize	39.00	38.00	37.00	38.00
Soybean	17.00	14.00	15.00	12.00
G/cake	15.00	13.00	13.00	12.00
C.S.M.	0.00	2.50	5.00	7.50
Maize offal	15.00	15.00	14.00	13.55
Rice offal	13.05	13.55	12.05	10.00
Salt	0.40	0.40	0.40	0.40
Bone meal	3.00	3.00	3.00	3.00
Methionine	0.15	0.15	0.15	0.15
Lysine	0.15	0.15	0.15	0.15
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
ME (Kcal/kg)	2905.33	2792.68	2696.83	2656.21
CP (%)	19.31	19.07	18.95	19.06
CF (%)	5.81	5.84	5.84	5.97
Fat (%)	7.49	6.92	6.91	6.90
Calcium (%)	1.23	1.22	1.22	1.22
Phosphorus (%)	0.82	0.92	0.92	0.92

Table 3: Mean values of the biochemical compounds

	T1	T2	T3	T4	SEM
Protein (mg/dL)	2.68^{a}	2.46^{a}	3.61^{a}	3.60^{a}	0.19*
Albumin (mg/dL)	1.49^{a}	1.49^{a}	1.61^{a}	1.80^{a}	0.14*
Globulin (mg/dL)	1.98^{a}	1.80^{a}	1.63^{a}	2.00^{a}	2.80*
Creatinine (mg/dL)	11.03^{a}	13.33^{a}	13.43^{a}	14.20^{a}	8.46*
Cholesterol (mg/dL)	112.80^{b}	117.47^{b}	115.07^{b}	172.87^{a}	11.33**

Means with the letter are not significantly different.
*: Not significant. **: Significant.
Least Significance Difference was used for the separation of means.

Globulin fractions (alpha, beta and gamma), increase in volume of either alpha and beta fractions seldom occur but more often is the globulin during infections with bacteria, viruses, parasitism or liver diseases (Coles, 1974; Banerjee, 2006). There was no increase in total globulin in this study which shows the health status of the birds.

Creatinine which is a non protein nitrogen (NPN: Urea, Creatine, Uric acid, ammonia and amino acids) usually product of intermediary metabolism of both tissues and ingested protein and increase in any of the components may increase the total NPN in serum.

Cholesterol is a fat-like substance, a lipid present in all animal cells produced in the liver and in animal-based foods but not in plants (Olberding, 2011). Cholesterol is an essential nutrient necessary for many functions, including: repairing cell membrane, manufacturing vitamin D on the skin's surface and producing hormones such as estrogen and testosterone. (www.ocaheart.com/what_affects_blood_cholesterol_level) Low values of cholesterol have been associated to liver diseases and it indicates that the esterification of cholesterol with fatty acids is principally a function of the liver parenchyma (Coles, 1974). After all, most of the cholesterol in our bodies are in body cells and tissues and not stored in our fat deposits. www.self/com/fooddiet/blogs/nutritiondata/.

This study has shown an increase in cholesterol levels above the normal value. The cholesterol aside that of the

normal body manufactured by the liver, additional could come from the feed taken by animals as is the case in this study. The different levels of cholesterol in the trials (T1-T3) showed normal levels but T4 showed a higher than normal value which is significant ($P<0.05$). The increase results from the availability of cholesterol in the feed especially the CSM fed to the birds at a higher value of 7.5%, whereas, the CSM was included in other formulated feeds (2.5 and 5%) but did not show increase in cholesterol level. Hamilton and Carroll (1976), have earlier reported that rabbits became hypercholesterolemic when feed was changed from commercial diet to that of low fat diet, http://en.wikipedia.org/wiki/cholesterol/. Although in this study, there was no diet change but increased cholesterol level which came from the CSM. However, cholesterol in plants, called phytosterols are similar to cholesterol in animals, when fed to animals can cause the level to rise. Some legumes in the tropics are known to contain cholesterol and if added to animal feed can raise its level. These legumes are: cotton seed oil which contain 45mg; soybean oil, 29mg; peanut oil, 24mg; sunflower oil, 14mg; palm oil, 20mg; palm kennel, 16mg; corn oil, 55mg and coconut oil, 14mg (Nates *et al*., 2010) http://melpor.lubpages.com/lub/believe.

These ingredients when used in compounding feed will increase or decrease the level of cholesterol in the birds as earlier observed by Hellminch (2002) but Aydin and Dogan (2010) reported insignificant difference of cholesterol levels in yolk of dried egg after change in feed at different levels (0, 10 and 20 gm/Kg) of purslane (*Portulaca oleracea*) in hens.

Although 55-80% cost of poultry production goes into feed (Ingweye *et al*., 2010), an accepted protein source should be that which is not too much competitive with man and also those that do not provide much change in the levels of cholesterol when fed to broilers. The use of soybean, maize and sunflower as source of both energy and protein and their subsequent production of eggs that cause less oxidative damage could be the reason why North Americas and the tropical countries use these ingredients for bulk feed formulations (Shapira, 2011).

In conclusion, further investigation should be intensified to find a better method of processing the seed of *C. Obtusifolia* as an alternate to protein source in broiler feed formulation. It is also important to look at the cholesterol build up in animal tissues especially for those who care to check their cholesterol level but broiler is first choice meat.

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