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Replacement value of *Cassia tora* seed meal for maize in broiler starter diets

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***Target Audience:** Animal Nutritionists, Feedmillers, Poultry farmers*

Abstract

The effect of dietary replacement of maize with raw cassia tora seed meal on the performance of broiler chicks was determined in a 28- day feeding trial. Raw Cassia Tora seed meal contains: carbohydrate -66-69 %, protein-14-19 %; Ether Extract 5-7 % and also contains some anti-nutritional factors (ANFs). Cassia Tora seeds were milled using a hammer mill with a sieve size of 3.36mm to produce the seed meal. The raw Cassia Tora seed meal so prepared was used to formulate broiler starter chicks diets replacing maize at 0.0 %, 25.0 %, 50. 0 %, and 75.0% dietary levels respectively using 120, day-old young Marshal broiler chicks, which were divided into four groups of thirty (30) birds and randomly assigned to the four treatment diets in a completely randomized design (CRD). Each treatment group was further sub-divided into three (3) replicates of ten (10) birds. Generally, the performance of birds on replacement diets containing raw Cassia Tora seed meal were significantly ($p< 0.05$) lower than the control group, except for the group on 25 % replacement level that compared favorably with the control group. Dietary replacement of maize with raw Cassia Tora seed meal at all levels reduced feed cost which reflected in the feed cost savings (%) but the cost of meat in ₦/kg produced increased with increased levels of replacement of maize with raw Cassia Tora seed meal. The results obtained from this trial suggests that Cassia Tora seed meal could partially replace maize in broiler starter diets at 25 % level without deleterious effects.

***Key words**: Broiler starter, Replacement value, Raw Cassia Tora, Maize.*

Description of Problem

In the last two decades, there has been gross animal protein deficiency in human nutrition in Nigeria (1). Poultry meat and eggs play very useful role in bridging the protein gaps in Nigeria, which is palatable and acceptable by all (2). The nutritional role meat plays in an economy is underscored by the fact that animal protein intake (of which meat is the most important), is a very important criterion for classifying countries as developed or developing nations (3), of the 70g of crude protein intake required by adult per day, at least one third should be of animal origin (4). Since feed is a major factor in poultry production, reducing feed cost is a priority for every poultry farmer and animal nutritionist. Currently feed ingredients for poultry, especially the conventional feedstuffs attract stiff competition with humans, scarce and expensive (5). Among the feed ingredients, protein and energy sources are the most expensive and scarce, for instance, soyabean meal the most widely used plant protein source and maize, the most widely used energy source are very expensive in Nigeria, due to the fact that demand for them outweighs the supply (6). The search for alternative sources of

animal feed resources with minimal or zero competition with man has been a subject of numerous cost-oriented studies (7, 1, 8). One of such, is the seed of the sickle pod (*Cassia Tora*), which has good potential as alternative, cost effective source of energy in monogastric diet, especially poultry. It is readily available and does not attract any competition between man and animals or industries (9). *Cassia Tora* seed is a common herbaceous animal plant (10) and an estimated 30, 000 metric tonnes of the seeds are available annually (11). It belongs to the family of Fabaceae (Caesalpinaceae) and other names for the plant include sickle senna, coffee weed, coffee pod or "java bean" (English), gyeolinyeongja (Korean) and tafasa (Hausa) (12). In Nigeria, *Cassia Tora* seed is mostly found in the Northern part of the country in areas that have not been cultivated during the rainy season. *Cassia Tora* tolerates a wide range of climate and temperature though, it prefers warmth and it is a good source of energy and protein (12, 13). *Cassia Tora* has the following composition: carbohydrate 66-69 %, protein 14-19 %, fat, 5-7 % and anti-nutritional anthraquinone, 1-2 %. (14, 15, 16). This study was designed to investigate the replacement value of *Cassia Tora* seed meal for maize in broiler starter diets.

Materials and Methods

The research was conducted at the Teaching and Research farm of the School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri, Imo State, Nigeria. Owerri is in the South-Eastern Agro-ecological zone of Nigeria in the humid tropical area of West Africa and is situated on Longitude 7^{o} 01^{1} 06" E and 7^{o} 03' 00" E and latitude 5" 28' 24' N and 5' 30' OON and altitude of 90m. The mean annual rainfall, temperature and relative humidity are 2500mm, 26.5- 27.5^{o} C and 70-80 % respectively. The dry season duration is five months and annual evaporation is 1450mm. The soil texture is sandy loam with an average pH of 5.5 (17). The *Cassia Tora* seeds used for this experiment was procured from Kano state and other feed materials purchased from local feed stores in Owerri, Imo State. The raw *Cassia Tora* Seeds were ground in a hammer mill to produce raw Cassia Tora seed meal. The proximate composition of the sample was carried out according to AOAC (18) and phytochemical analysis (Table 1).

Table 1: Proximate and phyto chemical analysis of *Cassia tora* seed meal

Components (%)	
Moisture content	7. 80
Dry Matter	92.20
Crude Protein	18.22
Crude Fibre	12.22
Ether Extract	2.67
Ash	4.35
Nitrogen free Extract	54.74
Phytco Chemical Analysis (mg/100g/DM)	
Saponin	185. 00
Tannins	388.
Oxalate	83.25
Phytate	240. 50
Alkaloid	260.00

Table 2: Composition of broiler chick's experimental diets

	Dietary Replacement Levels (%)			
Ingredients	0.0	25	50.0	75.0
Maize	50.00	37.50	25.00	12.50
Cassia Tora seed meal	0.00	12.50	25.00	37.50
Soya bean meal	28.0	25.00	22.00	20.00
Wheat offals	8.00	9.00	9.00	9.00
Fish meal	2.00	2.00	2.00	2.00
Palm kernel meal	6.00	7.00	8.00	10.00
Brewer's Dried grain	2.00	3.00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Vitamin/premix*	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25
	100	100.00	100.00	100.00
Chemical composition				
Crude protein	22.14	22.23	22.26	22.42
Crude fibre	4.11	4.86	5.11	5.12
Ether Extract	5.33	4.80	4.29	4.10
Calcium	0.94	0.97	0.99	0.98
Phosphorus	0.56	0.56	0.55	0.55
Metabolizable Energy	2872.75	2872.35	2788.05	2755.70

* To provide the following per kg of feed: Vitamin A 10, 00 iu, Vitamin D_3, 2000 iu, Vitamin E, 5iu; Vitamin k, 2mg; riboflavin, 4.2mg; vitamin B12, 0.01mg; pantothenic acid, 5mg; nicotinic acid, 20mg; folic acid, o.5mg; choline, 3mg, mg, 56mg; fe, 20mg; cu, 1.0mg Vitamin D3, 1, 500iu; vitamin k, 2mg; riboflavin, 3mg, panthothenic acid, 6mg, Niacin, 15mg; chlorine chloride, 3mg, vitamin B12, 0.08, Folic acid, 4mg, mn, 8mg; 0.5mg, iodine, 1.0mg; co, 1.2mg; cu, 10mg, fe, 20mg.

Experimental diets

Four experimental broiler starter diets were formulated such that the diets contained 0 %, 25 %, 50 % and 75 % raw *Cassia Tora* seed meal replacing maize in the diets respectively. Other ingredients were adjusted such that the diets were iso-nitrogenous and nutrient requirement of the broiler starter birds met. The, ingredients and chemical composition of the experimental diets are shown in Table 2.

One hundred and twenty (120), day-old-broiler chicks of Marshal strain were divided into four groups of thirty (30) birds each and randomly assigned to the four treatment diets in a completely randomized design (CRD). Each treatment was sub-divided into three (3) replicates of ten (10) birds each. Feed and water were provided ad-libitum, feed intake was recorded daily and birds weighed weekly. Other routine poultry management procedures were maintained. The feeding trial lasted 28 days. The data collected were subjected to analysis of variance (19) where significant treatment effects were detected from analysis of variance, means were compared using Duncan's New Multiple Range Tests, as outlined by (20).

Table 3: Performance of broiler starter chicks on replacement value of *Cassio tora* seed meal for maize diet.

	Replacement levels of maize (%)				
Parameter	0.0	25.0	50.0	75.0	SEM
Initial body weight (gm)	215.51	215.00	216.00	216.66	3.25
Final body weight gain (gm)	1134.50[a]	882.76[a]	514.81[b]	359.26[b]	15.50
Daily weight gain (gm)	43. 76[a]	31.80[a]	14.20[b]	6.80[b]	10.50
Daily feed intake	82.88[a]	78.91[a]	68.30[b]	63.76[b]	3.85
Feed conversion Ratio	1.85[a]	2.63[a]	5.32[b]	9.66[b]	5.75
Cost Benefit Analysis					
Feed cost (N/kg)	144.40	126.68	109.05	92.53	-
Meat produced (N/kg)	267.14	333.17	580.15	893.84	-
Feed cost savings (%)	-	12.30	24.50	35.90	-

ab: Means within rows with different superscripts are significantly ($p<0.05$) different.

Results

The proximate and phytochemical composition of *Cassia Tora* seed meal are shown on Table 1, while the nutrient composition of the experimental diet is shown on Table 2. Data on the performance of the birds on the various dietary replacement level of maize with *Cassia Tora* seed meal are presented on Table 3.

Feed intake of the birds on diets containing *Cassia Tora* seed meal were significantly ($p<0.05$) lower than the control (0 %) group, except for the group on 25 % replacement level that compared favourably with the control group. Body weight gain and feed conversion ratio of the birds on *Cassia Tora* seed meal were significantly ($p< 0.05$) lower than the control (0 %) group. Dietary inclusion of *Cassia Tora* seed meal reduced cost of producing one kilogram of feed which was also reflected in the feed cost savings (%) but the cost of birds in ₦/kg produced increased with replacement levels of maize with *Cassia Tora* seed meal

Discussion

Raw *Cassia Tora* seed meal was used to partially replace maize in the diet of broiler chicks. Generally, the treatment groups did not compare favourably with the control group except at 25% replacement level. The performance of the birds decreased as the dietary replacement level of maize with raw *Cassia Tora* seed meal increased. Feed intake values of the treatment groups were inconsistent with the level of replacement. The result of the proximate composition of Cassia Tora used in this study was similar to previous analysis by (13) but however differs from the analysis of (21). *Cassia Tora* seed contains some anti-nutrients such as tannins, saponins, phytate, alkaloid and hydrogen cyanide (22, 13).

The poor performance of the broiler starter chicks on the different replacement levels of maize with *Cassia Tora* seed meal recorded in this study was however not surprising. These diets had lower energy values and high fibre content. Enzyme production, efficacy and system of the birds at this stage is not yet fully developed to handle such high fibrous material resulting in low digestibility of nutrients particularly protein and energy required to sustain rapid growth (23, 24). Moreover, the poor performance of these broiler chicks could also probably be as a result of the presence of the anti-nutritional factors present in raw *Cassia Tora* seed meal (25, 13). Dietary replacement of maize with raw *Cassia Tora* seed meal at all levels

reduced feed cost which was also reflected in the feed cost savings (%) but the cost of meat in ₦/kg produced increased with increased levels of replacement of maize with raw *Cassia Tora* seed meal.

Conclusion and Application

1. The results obtained from this study suggests that raw *Cassia Tora* seed meal could replace maize at 25 % dietary level in broiler starter diets.
2. Replacement of maize with raw Cassia Tora reduced cost of feed while meat cost increased.

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