



CARCASS AND ORGANS CHARACTERISTICS OF BROILER CHICKENS FED DIETARY LEVELS OF SICKLE POD (*CASSIA TORA*) SEED AND SUNFLOWER SEED MEALS

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ABSTRACT

An experiment was conducted to evaluate carcass and organs characteristics of broiler chicken fed dietary levels of sickle pod (*Cassia tora*) seed and sunflower seed meals. It was carried out at the poultry unit of Teaching and Research Farm, Federal College of Horticulture (FCH) Dadin kowa, Gombe State, Nigeria to evaluate carcass and organs characteristics of broiler chickens using sickle pod seed (*Cassia tora*) and sunflower seed meals based diets. Five experimental diets each for both starter (23% CP) and finisher (20% CP) were formulated in which *Cassia tora* meal replaced sunflower meal at 0, 20, 30, 40 and 50% designated as diets A, B, C, D and E respectively. Three hundred (300) day old broiler chicks were randomly allocated to the five diets in four replicates of fifteen birds each. The experimental feeds and water were supplied to the birds *ad libitum* and the feeding trial lasted for seven weeks. The results indicated that live (1.16-1.49kg) and carcass (0.81-1.10kg) weight as well as dressing percentage (68.56-73.87%) were significantly ($P<0.001$) influenced by the *Cassia tora* diets. Eviscerated weights (1.07-1.30kg) were not significantly affected by the dietary treatments. However, most organ parameters were not significantly affected except small and large intestine lengths with values of 169.25-216.67cm and 8.00-14.00cm respectively as well as gizzards (2.79-3.67%) at $P<0.001$. It was concluded that *Cassia tora* seed meal can be included into broiler chicken diets when properly processed. It can replace up to 50% sunflower seed meal in broiler chicken diets without affecting the carcass yield and other organs characteristics. It was recommended that 50% toasted *Cassia tora* seed meal can be used in broiler chicken diets to improve carcass yield.

Keywords: *Cassia tora*, Sun flower, Carcass, Organs, Broiler

INTRODUCTION

Domestic animals continue to make significant contributions to the global food supply and as a result, animal feeds have become an increasingly critical component of the integrated food chain. Not only is the demand for livestock products increasing markedly due to population growth, but feed suppliers also have to cope with increasing prices of feed ingredients, safety and welfare concerns. By 2050, the world's population is estimated to reach 9.1 billion, 34% higher than what it is today. The Food and Agriculture Organization (FAO, 2018) projects that the total global consumption of meat and dairy products will increase by 102 and 82% respectively, between 2000 and 2050. Global demand for poultry meat will increase by up to 85% and there will be an estimated 30% increase in egg production by 2050. Livestock industry is currently facing challenges in meeting demand. One of the limiting factor is the cost of feeding that takes 70-80% of broiler production (Jamaa *et al.*, 2022). Protein sources are usually the most expensive and scarce components of the diets. The over dependence of the feed industries on the conventional protein sources like soya bean worsen the situation. Protein intake among Nigerian is very low and continue to decline below the recommended level by United Nations. Searching for alternative become necessary to save the industry and to meet up the challenges of animal product supply (Williams and Jama'a, 2024). Among the available alternative is the sickle pod seed (*Cassia tora*). It is abundantly found in the study area and has little or no demand for both human and livestock. It contains up to 23.4% crude protein and little anti nutrients that can be removed easily by roasting, steaming and fermentation. Sickle pod seed can be a good substitute to the costly conventional soya bean in broiler chicken diets. A study by Kwari *et al.* (2023) found that chicken fed fermented sickle pod seed meal recorded superior final live weight, overall



weight gain and daily feed intake. However, ensuring adequate nutrient levels, such as phosphorus and calcium is crucial when using sickle pod seed meal in broiler chicken diets (Isah *et al.*, 2024b).

METHODOLOGY

Experimental Site

The research was conducted at the poultry unit of Teaching and Research farm of the Federal College of Horticulture (FCH) Dadin kowa, Gombe State, Nigeria. Dadin kowa is in the North-Eastern Agro-ecological zone of Nigeria in the humid tropical area of West Africa and is situated at 10.3145°N 11.5308°E with altitude of 240 meters above sea level and has temperature of about 24°C-40°C with mean annual rainfall of about 960- 1110 millimeters, and relative humidity is about 38°C - 50°C all year round (FCH, 2022).

Experimental Diets

Five experimental diets each for both starter (23% CP) and finisher (20% CP) were formulated in which *cassia tora* meal replaced sunflower meal at 0, 20, 30, 40 and 50% in diets A, B, C, D and E respectively. Other ingredients used were maize, soyabean, fishmeal, wheat offal, bone meal, limestone, salt, vitamin/mineral premixes, methionine and lysine.

Table 1: Ingredients and Percentage Compositions of *Cassia tora* and Sunflower Seeds Fed to Starter Broilers (2-4 Weeks)

Diets					
Ingredients	A (0%)	B (20%)	C(30%)	D (40%)	E (50%)
Maize	47.00	47.00	47.00	47.00	47.00
Full fat soyabean	14.00	14.00	14.00	14.00	14.00
Sunflower seed	20.00	16.00	14.00	12.00	10.00
<i>Cassia tora</i>	0.00	4.00	6.00	8.00	10.00
Fish Meal	5.00	5.50	6.00	6.50	7.00
Wheat Offal	10.00	9.50	9.00	8.50	8.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Lime stone	1.30	1.30	1.30	1.30	1.30
Salt	0.25	0.25	0.25	0.25	0.25
Premix*(starter)	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	1.10	1.10	1.10	1.10
Total	100	100	100	100	100
Calculated Analyses (%)					
M. E. (Kcal/kg)	2818.30	2831.18	2844.07	2856.95	2869.84
Crude Protein	23	23	23	23	23
Crude Fibre	5.94	5.78	5.62	5.46	5.30
Ether Extract	3.38	3.40	3.42	3.45	3.47
Calcium	1.36	1.37	1.39	1.38	1.38
Phosphorus	1.05	1.08	1.12	1.15	1.19
Methionine	0.41	0.42	0.43	0.44	0.45
Lysine	0.72	0.80	0.88	0.96	1.04

*Vit/Mineral Premix Supplied/Kg of Diet: Vit A, 12500 IU, Vit D3 2500 IU; Vit E, 30IU; Vit K, 2.5 Mg, Riboflavin, 6mg, Pantothenic Acid, 10mg; Vit B2, 4mg; Niacin, 20mg; Vit B₁₂, 22mg; Biotin, 0.75mg; Folic Acid, 0.5mg; Vit B6, 1.5mg; Vit B, 1.6mg; Choline Chloride, 175mg; Cobalt,0.2mg; Copper 3mg; Iodine, 1mg; iron, 20mg; Manganese, 40mg; Selenium, 0.2mg; Zinc 20mg, Antioxidant 1.25mg

Table 2: Ingredients and Percentage Compositions of *Cassia tora* and Sunflower Seeds Based Diets Fed to Finisher Broilers (5-7 Weeks)

Ingredients	Diets				
	A (0%)	B (20%)	C(30%)	D(40%)	E(50%)
Maize	52.70	52.70	52.70	52.70	52.70
Full fat soya bean meal	8.00	8.00	8.00	8.00	8.00
Sunflower Seed	20.00	16.00	14.00	12.00	10.00
<i>Cassia tora</i>	0.00	4.00	6.00	8.00	10.00
Fish Meal	2.00	2.00	2.00	2.00	2.00
Wheat Offal	13.00	13.00	13.00	13.00	13.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.30	1.30	1.30	1.30	1.30
Salt	0.25	0.25	0.25	0.25	0.25
Premix*(finisher)	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Calculated Analyses (%)					
M. E. (Kcal/kg)	2892.01	2904.86	2917.62	2930.47	2943.23
Crude protein	20	20	20	20	20
Crude fibre	5.44	5.34	5.18	5.05	4.92
Ether extract	3.28	3.27	3.34	3.37	3.40
Calcium	1.5	1.5	1.5	1.5	1.5
Phosphorus	0.88	0.88	0.89	0.89	0.89
Methionine	0.45	0.46	0.46	0.46	0.47
Lysine	0.71	0.77	0.83	0.88	0.94

Vit/Mineral Premix Supplied/Kg of Diet: Vit A, 12500 IU; Vit D3 2500 IU; Vit E, 30IU; Vit K, 2.5 Mg; Riboflavin, 6mg; Pantothenic Acid, 10mg; Vit B2, 4mg; Niacin, 20mg; Vit B₁₂, 22mg; Biotin, 0.75mg; Folic Acid, 0.5mg; Vit B6, 1.5mg; Vit B, 1.6mg; Choline Chloride, 175mg; Cobalt, 0.2mg; Copper 3mg; Iodine, 1mg; Iron, 20mg; Manganese, 40mg; Selenium, 0.2mg; Zinc 20mg, Antioxidant 1.25mg.

Experimental Birds and their Management

A total of 300 unsexed day old broiler chicks were used for the study. Brooding and rearing houses were cleaned and disinfected before the arrival of the day old broiler chicks. Brooding was done for seven days during which electric bulbs were used to provide heat and light when needed. Feed and water were adequately given with no restriction. At the end of the brooding period, birds were randomly allotted to the five (5) diets in four replicates of 15 chicks each. The floor was covered with a wood shavings throughout the period of the research. Experimental feeds and water was served *ad libitum*. All necessary routine management practices were strictly adhered to. The experiment lasted for seven weeks (4 weeks starter and 3 weeks finisher phase).

Data Collection

At the end of seventh week, three broilers were randomly selected and prepared for carcass analysis. They were marked and starved over night to allow emptying of guts. Following morning, individual live weights of the selected birds were taken before slaughter. They were then dressed and data was collected on carcass and internal organs of each bird. Data generated was prepared and analyzed using version 17 MINITAB software.

The proximate composition and percentages of test ingredients is presented in Table 3 and 4.

Table 3: The Proximate Composition (%) and Mineral Content of the Test Ingredients on Dry Matter Basis.

Ingredients	(%)	CP	CF	EE	Ca	P
Soyabeans seed	44	3.5	7.5	1.5	0.81	
Sunflower seed	40	5.63	3.27	1.5	0.72	
<i>Cassia tora</i> seed	23.4	4.92	3.40	1.5	0.89	

CP = Crude Protein, EE = Ether Extract, CF = Crude Fibre.

Table 4: Anti-nutritional Factors in the Test Ingredients Expressed in Percentage

Antinutrients				
Ingredients (%)	Saponin	Phytate	Tannin	Oxalate
Soya bean seed	0.187	0.068	0.049	0.030
Sunflower seed	0.005	0.006	0.017	0.008
<i>Cassia tora</i> seed	0.257	0.041	0.155	0.062

RESULTS AND DISCUSSION

Table 5 shows the carcass and organs characteristics of broiler chickens fed sickle pod diets.

Table 5: Carcass and organ characteristics of broiler chickens fed diets containing graded levels of sickle-pod seed (*cassia tora*) seed and sunflower seed meals

Parameters	Diets					SEM
	A (0%)	B (20%)	C (30%)	D (40%)	E (50%)	
Live weight (kg)	1.16 ^c	1.31 ^b	1.49 ^a	1.26 ^b	1.49 ^a	0.01***
Eviscerated weight (kg)	0.99	1.13	1.30	1.07	1.07	0.01 ^{NS}
Carcass weight (kg)	0.81 ^d	0.95 ^b	1.10 ^a	0.87 ^c	0.87 ^c	0.009***
Dressing percentage	70.08 ^b	72.47 ^a	73.87 ^a	68.56 ^b	73.19 ^a	0.22***
Organs weight expressed as percent live weight						
Head (%)	2.51	2.77	2.62	2.69	2.44	0.03 ^{NS}
Legs (%)	4.59	3.80	3.84	3.83	3.52	2.75 ^{NS}
Small intestine (%)	3.74	3.86	5.31	4.07	5.00	0.10 ^{NS}
Small intestine (cm)	185.67 ^b	169.25 ^b	216.67 ^a	173.73 ^b	204.17 ^a	2.20***
Large intestine (%)	0.30	0.32	0.33	0.44	0.24	0.01 ^{NS}
Large intestine (cm)	8.00 ^b	9.17 ^b	14.00 ^a	13.55 ^a	9.17 ^b	0.22***
Caeca (%)	0.56	0.55	0.57	0.53	0.55	0.06 ^{NS}
Caeca (cm)	16.75	16.33	16.83	17.36	16.67	0.28 ^{NS}
Gizzard (%)	2.79 ^b	3.69 ^a	3.28 ^a	3.16 ^b	2.83 ^b	0.04***
Lungs (%)	0.44	0.43	0.40	0.43	0.39	0.009 ^{NS}
Liver	1.61	1.64	1.65	1.52	1.48	0.03 ^{NS}
Heart (%)	0.37	0.48	0.41	0.46	0.40	0.009 ^{NS}
Abdominal Fat (%)	0.58	1.31	0.99	1.10	1.02	0.05 ^{NS}
Kidney (%)	0.16	0.15	0.13	0.16	0.13	0.001 ^{NS}
Pancrease (%)	0.26	0.24	0.24	0.26	0.24	0.005 ^{NS}
Pancrease (cm)	11.42	12.00	12.08	12.00	11.67	0.12 ^{NS}

abc=Means bearing different superscripts within the same row differ *** = (p<0.001)

NS = Not significant, SEM = Standard Error of the means.

The results for carcass parameters indicated that live (1.16-1.49kg) and carcass (0.81-1.10kg) weight as well as dressing percentages (68.56-73.87%) were significantly (P<0.001) influenced by the *Cassia tora* diets. Eviscerated weights (1.07-1.30kg) were not significantly affected by the dietary treatment. This result agrees with the findings of Amaza *et al.* (2020) and Kwari *et al.* (2023) who fed fermented *Cassia tora* seed meal to broiler chicken at 10% inclusion level. However, all organs parameters were not significantly affected except small and large intestine lengths with 169.25-216.67cm and 8.00-14.00cm respectively as well as gizzard (2.79-3.67%) that were significantly (P<0.001) affected by the dietary levels of *Cassia tora*. This finding differ with that of Isah *et al.* (2024a) who found no significant difference in using fermented *Cassia tora* seed meal to replace soyabean meal in broiler chicken diets. The significant differences obtained on small and large intestine lengths and gizzard percentages may be due to the fibrous and some anti-nutrients contents of *cassia tora* seed (Isah *et al.*, 2024b)

CONCLUSION AND RECOMENDATION

It was concluded that *Cassia tora* seed meal can be included into broiler chicken diets when properly processed. It can replace up to 50% sunflower seed meal without affecting the carcass yield and other organs characteristics.



Based on the findings of this study, 50% toasted *Cassia tora* seed meal is recommended for inclusion in broiler chicken diets for better carcass yield.

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