

Effect of feeding processed *Cassia tora* seed based diets on growth performance and biochemical indices of weaner rabbits

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Target audience: Animal nutritionists, Feed millers, Rabbits farmers.

Abstract

The effects of feeding Cassia tora seed based diets on the growth performance and biochemical parameters of growing rabbits over a 10 week period was investigated. Four dietary treatments were formulated such that diets 1, 2, 3, and 4 contained 0, 5, 10 and 15% Cassia tora seeds, respectively. Forty-eight mixed breeds weaner rabbits with an average weight of 500g were randomly distributed into four treatment groups in three replicates. Each replicate had 4 rabbits (2 males and 2 females). Chemical composition and anti-nutritional factors of Cassia tora seeds and the diets were determined. Cassia tora seeds were processed using dry heat at temperatures of 80°C for 20 minutes. The roasted Cassia tora seeds were milled and included in rabbit diets at 0, 5, 10 and 15% and designated T₁, T₂, T₃ and T₄ respectively. An average daily feed intake of 60g of concentrate diets and 90g of fresh Tridax forage was recorded for the Cassia tora groups, while an average daily feed consumption of 70g of concentrate diet and 95g of Tridax forage was observed for the control group. Data were collected on growth parameters, digestibility, carcass components of the rabbits, organ proportions and some biochemical parameters. The results showed that Cassia tora seeds contained high levels of phytate, saponins and alkaloids and low levels of cyanogens, tannins and trypsin inhibitor. Rabbits fed the control diet T₁ had significantly (P<0.05) reduced performance when compared to the performance (P>0.05) of the rabbits fed Cassia tora diets (T₂, T₃ and T₄). Cassia tora based diets significantly (P<0.05) lowered the serum blood cholesterol and triglyceride levels of the rabbit compared to the control diet. Conversely, the inclusion of Cassia tora seed in rabbit diets significantly (P>0.05) increased the total blood protein contents of rabbits. This study suggests that Cassia tora inclusion at the levels of 5 to 15% improved rabbit growth performance, and lowered blood cholesterol and triglyceride levels.

Keywords: Rabbits, Growth, *Cassia tora* seed, Biochemical indices

Description of problem

The rising demand for animal products occasioned by increasing population has led to increasing cost of animal product,

thus making it out of reach of the masses. Attention has recently been diverted to rabbit production due to their high production capability and short

production cycle, as one of the fastest ways of meeting the increasing demand for animal product needs (1).

The cost of grains and manufactured feeds are always on the increase, hence livestock for consumption in Nigeria should be those which are less dependent on grains. As the prices of cereal grains become very high and the demand for them become very competitive between man and livestock, those animals capable of converting grass into body meat become more important and more attractive to rear especially for profit making.

Research works have been carried out to determine the effect of *Cassia tora* seed protein on blood fat of rats with hyperlipemia. It was reported that different doses of protein of *Cassia tora* seeds as well as combining application of low doses of *Cassia tora* had effect on total cholesterol (TC), triglyceride (TG), low density lipo-protein cholesterol (LDLC) and high density lipo-protein cholesterol (HDLC) of rats with hyperlipemia. The results showed that protein of *Cassia tora* seeds can reduce the TC, TG and LDLC of rats with hyperlipemia (2). If this reduction is replicated in rabbits it will be a welcome development for rabbit consumers especially those who are hypertensive and those with chronic heart related diseases.

In another related study reported by (2), observed that *Cassia tora* seed enhanced faecal lipid excretion and may cause a reduction in serum and hepatic lipid concentrations in rats during lipid metabolism. *Cassia tora* contain anti-

nutrients such as tannins, phytate, saponin, lectins, trypsin inhibitor and alkaloids which are deleterious or indeed toxic to animals or man (3,4). This study was designed to evaluate the effect of *Cassia tora* seed based diets on growth performance, serum blood total protein, cholesterol and triglyceride contents of growing rabbits.

Materials and methods

Experimental site

This research work was conducted at the Rabbit Unit of the Teaching and Research Farm, School of Agriculture and Agricultural Technology, Federal University of Technology Minna. Minna is located on longitude 6⁰33' East and latitude 9⁰45' North.

Sources of feed ingredients

Cassia tora seeds were procured from the National Animal Production Research Institute (NAPRI), Zaria. Other feed ingredients were purchased from a reputable commercial feed mill in Kaduna.

Experimental design

Complete Randomized Design (CRD) was used in allotting forty-eight weaned rabbits to four experimental Treatments, with each treatment group having three replicates. Each replicate had four rabbits in mixed sexes of ratio 2:2 (2 males to 2 females). Each of the four treatment diets contained 0, 5, 10 and 15% *Cassia tora* seeds levels, respectively. The composition of experimental diets is shown in Table 1

The proximate composition of the experimental diets was determined by (5) methods. The proximate composition results are shown in Table 2.

Management of experimental rabbits

The rabbits were about 5 weeks old and had an average weight of 500g. The rabbits on arrival at the farm were given antibiotics, mineral vitamin mix and dewormer. The rabbits were housed in a two-tiers hutches partitioned into twelve compartments, with each compartment measuring 0.7m x 0.6 x 0.5m. There were four rabbits per compartment. The cages were designed to ensured cross ventilation and exclude rodents and other pests. The cages were provided with wire mesh floor that allows for separate collection of urine and faeces. Each compartment was also provided with both feed and water troughs. The cages were thoroughly disinfected before stocking.

Management of performance of rabbits

Weighed quantities of Tridax and *Cassia tora* seed diets was supplied to the rabbits daily and the remnant feed in feed bag were also weighed. The feed consumed by a rabbit for a day was obtained by difference between feed supplied and the remnant feed.

Feed and water were given *ad libitum*. Body weight was determined by weighing the rabbit in each replicate on weighing scale on arrival (initial body weight) and at the end of each week. The difference between initial live weight of rabbit and that computed as final live

body weight at the end of the feeding trial constituted the final body weight gain.

Chemical analysis

Ground samples of raw and processed *Cassia tora* seeds were taken to the National Research Institute for Chemical Technology (NARICT), Zaria for the determination of the following anti-nutrients. Tannins: using the spectrophotometric method (6), Cyanogens using Alkaline pictrate method (7). Alkaloids: were determined using the gravimetric method (8). Phytate using method for rapid determination of phytate (9), Trypsin inhibitor: These were determined by spectrophotometric method (10) and Saponins: were determined using spectrophotometric method (11).

Processing of Cassia tora seeds

The processing method involved soaking *Cassia tora* seeds in water at room temperature for an hour to reduce seed hardness after which the seeds were thoroughly washed to ensure elimination of sand and other particles and then air dried for 30 minutes to reduce the moisture contents of the seeds. The air dried seeds were then subjected to heat treatment (toasting) for 20 minutes at temperature of 80°C until its beany taste disappears. This is because low temperatures of dry heat are known to be unable to destroy several anti-nutrients.

The roasted *Cassia tora* seeds were then weighed with a weighing scale and milled before mixing it in the diets. The mixed diets designated T₁, T₂, T₃ and T₄ were then pelleted.

Biochemical studies

At the end of the feeding trial, blood samples of rabbits were collected at slaughter from the slit jugular vein. About 2.5ml of blood was collected from a rabbit per replicate into tubes containing Ethylene diamine tetra acetate (EDTA) and another 2.5ml of blood collected into hypodermic (insulin) syringes. Plasma was separated from the blood samples in EDTA bottles with a micro pipette into a test tube for triglyceride and cholesterol chemistry evaluation. The cholesterol and triglyceride assay of blood plasma were done by Enzymatic colorimetric methods using RandoX^R diagnostic cholesterol kit (BIO LAB with code 80106.2 x 100ml cholesterol CHOD-PAP^R) and RandoX^R diagnostic triglyceride reagent procedure (GPO-PAP method RandoX Laboratory Ltd, UK) respectively as described by (12). While the blood samples in the hypodermic syringes were used to determine serum total protein. The serum total protein was analyzed colometrically using diagnostic reagent kits described by (13).

Data analysis

Data obtained were subjected to statistical analysis using one way analysis of variance (ANOVA), as described by (14). Significant means were separated using the Duncan's Multiple Range Test (15). The computer package used was Statistical Package for Social Sciences (16).

Results and Discussion

Table 1 showed that almost all the nutrient values were within the range recommended by (17, 18, 19, 20) for rabbits in the tropics. The crude fibre of the experimental diets which ranged between 6.00% in Treatment 2 to 8.00% in Treatment 1 was lower than the 10% recommended by (21), 7.5-8.0% by (22) for weaner rabbits. However, the crude fibre content of the diet was in agreement with the values obtained by (23) who recommended 6-10% crude fibre levels for weaner rabbits. Generally, the CP and CF contents of the diet in Table 2 were adequate for weaned rabbits (24, 25, 26).

Table 1: Composition of the experimental diets fed to the weaner rabbits

Ingredients (%)	<i>Cassia tora</i> inclusion levels (%)			
	0.00 (T ₁)	5.00 (T ₂)	10.00 (T ₃)	15.00 (T ₄)
Maize	30.45	28.15	26.00	24.00
Wheat offal	27.46	25.00	26.00	25.55
Full fat Soya bean	20.89	22.65	20.25	19.25
Groundnut cake	15.00	13.00	11.55	10.00
<i>Cassia tora</i>	0.00	5.00	10.00	15.00
Oyster shell	1.50	1.50	1.50	1.50
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.60	0.60	0.60	0.60
Methionine	0.55	0.55	0.55	0.55
Salt	0.30	0.30	0.30	0.30
Vitamin premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
<i>Calculated analysis (%)</i>				
Protein	18.0	18.0	18.0	18.0
Crude fibre	7.45	8.20	8.15	8.35
Calcium	1.74	1.68	1.81	1.87
Phosphorus	0.88	0.84	0.86	0.80
Energy (Kcal/kg ⁻¹) ME	2.75	2.80	2.82	2.85

Premix supplied per 2.5kg contains:

Retinol acetate (10000000 iu), Vit. D₃ (2000000 iu), Vit E (15000 iu), Vit B (3000mg), Niacin (15000mg), Calcium pantothenate (800mg), Vit. B₆ (3000mg), Vit. B₁₂ (10mg) Vit. K₃ (2000mg), Biotin (20gm), Folic acid (500mg), Choline chloride (250,000mg), Manganese (75000mg), Iron (25000mg), Copper (5000mg), Zinc (70000mg), Selenium(150mg), Iodine(1300mg), Magnesium (100mg), 500g ethoxyquin and BHT (700g)

Table 2: Proximate composition of the experimental diets fed to the weaner rabbits

Parameters	Dietary <i>Cassia tora</i> levels (%)			
	0.00	5.00	10.00	15.00
Dry matter (%)	91.20	91.00	91.20	91.30
Moisture content (%)	8.80	9.00	8.80	8.70
Crude protein (%)	20.50	18.55	17.50	16.75
Crude fibre (%)	8.00	6.00	6.17	6.10
Ether extract (%)	15.00	13.50	11.00	11.50
Total ash (%)	7.00	5.50	4.00	4.00
Nitrogen free extract (%)	40.70	47.45	52.53	52.95

Table 3 shows the anti-nutrients in both raw and processed *Cassia tora* seeds. *Cassia tora* seeds contain high levels of phytate, saponins and alkaloids and low levels of cyanogens, tannins and trypsin inhibitor. On processing, the results

showed a significant reduction of all the anti-nutrient contained in the seed by 64-81%. These levels of reduction had to a large extent, rendered the anti-nutrients inactive and the seeds safer for rabbits consumption (27).

Table 3: Effect of processing on anti-nutrients in *Cassia tora* seeds

Anti-nutrients	Raw Cassia	Processed Cassia	% Reduction
Tannins (mg/100g)	103.20(b)	28.60	72.30
Phytate (mg/100g)	789.00(a)	152.00	80.70
Cyanogenic glycoside (mg/100g)	0.558(b)	0.124	77.80
Alkaloid (%)	2.50(a)	0.90	64.00
Saponin (%)	3.60(a)	1.00	72.20
Trypsin inhibitor (Tui/mg)	13.70(b)	2.60	81.00

a: anti-nutrients above lethal levels.

b: anti-nutrients below the lethal levels.

The growth performance of rabbits fed the different levels of *Cassia tora* seed diets supplemented with Tridax forage is shown in Table 4. Although all the rabbits showed positive growth rate, *Cassia tora* fed rabbits had higher final body weights. The body weights of rabbits increased as the level of *Cassia tora* increased except in 10% *Cassia tora* level. This result is similar to that obtained by (28), that increasing the *Cassia tora* content of concentrate diets had significant effect on final body weights of rats. Feed efficiency values of the treatment groups showed that *Cassia tora* seed diets were superior and significantly ($P > 0.05$) different from those of the control diet. Similarly, rabbits on *Cassia tora* seed diets converted their feeds at almost the same level of efficiency.

The results of chemical evaluation of serum total protein cholesterol and triglyceride are shown in Table 5. Rabbits fed the control diet had significantly ($P < 0.05$) lower blood protein than rabbits fed 5, 10 and 15% *Cassia tora* seed diets. However, feeding of the control diet led to significantly ($P < 0.05$) elevated serum blood cholesterol and triglyceride levels compared to the levels in the other groups of rabbits (T_2 - T_4). Cholesterol levels were higher in the control group and reduced as *Cassia tora* inclusion levels increased. This trend is similar to the findings reported by (2) in rats. The author observed that varying doses of protein of *Cassia tora* seeds had effects on levels of triglyceride and cholesterol in blood fat of rats due to Oxytotoxic activities.

Table 4: Growth performance of rabbits fed different levels of processed *Cassia tora* seed diets supplemented with *Tridax procumbens* for 10 weeks

Parameters	<i>Cassia tora</i> levels (%)				LS
	0.00	5.00	10.00	15.00	
Initial body weight/rabbit (g)	496.67	496.67	496.67	496.67	NS
Final body weight (g)	2203.33 ^b	2553.33 ^a	2493.33 ^a	2556.67 ^a	*
Daily body weight gain (g)	24.38 ^b	29.38 ^a	28.52 ^a	29.57 ^a	
Final body weight gain (g)	1706.66 ^b	2056.66 ^a	1996.66 ^a	2070.00 ^a	*
Daily forage intake (g)	105.03 ^a	90.03 ^d	95.05 ^c	98.57 ^b	*
Daily concentrates intake (g)	71.21 ^a	63.50 ^d	68.55 ^b	66.21 ^c	*
Total feed intake (g)	12336.80 ^a	10741.00 ^d	11451.60 ^c	11536.30 ^b	*
Feed efficiency	0.13 ^c	0.19 ^a	0.17 ^b	0.17 ^b	*

a, b, c, d: Mean values with different superscripts along the same row are significantly different (P<0.05) LS: level of significance *: significant difference (P<0.05) NS: not significant (P>0.05)

In this study, values for total protein, cholesterol and triglyceride in 5, 10 and 15% levels were not significantly (P>0.05) different from each other. Low levels of cholesterol and triglyceride in blood play important role in the

prevention of vascular diseases. Artherosclerosis which is narrowing of blood vessels and hypertension are all side effects of high consumption of cholesterol and triglycerides. (29).

Table 5: Chemistry evaluation of some biological indices

Parameter	<i>Cassia tora</i> levels (%)			
	0.00	5.00	10.00	15.00
Total Protein in blood (g/dl)	5.42 ^b ±0.20	6.21 ^a ±0.13	6.94 ^a ±0.00	6.81 ^a ±0.19
Cholesterol level (mg/dl)	92.57 ^a ±1.61	79.7 ^b ±7.78	73.16 ^b ±1.61	76.43 ^b ±3.03
Triglyceride level (mg/dl)	364.29 ^a ±0.30	235.72 ^b ±10.10	221.43 ^b ±10.10	242.86 ^b ±40.40

a, b: Mean values with different superscripts in the same row are significantly different (P<0.05).

Conclusion and Applications

It was concluded that:

1 Rabbits fed diets supplemented with *Cassia tora* seeds had improved final body weight, body

weight gain and converted their feeds on higher efficiency levels. Feeding of *Cassia tora* seed based diets led to significantly (P<0.05) lower serum blood cholesterol and triglyceride levels compared

- to the levels in the control group of rabbits.
- 3 The processing of *Cassia tora* seeds also led to significant reduction of all the anti-nutrients contained in the seeds by 64-81%. These levels of reduction had rendered the anti-nutrients tolerable and the seeds safe for rabbit consumption.
- 4 Processed *Cassia tora* seeds can be included in the diets of rabbit up to 15% to increase serum total blood protein and conversely reduce cholesterol and triglyceride levels as the inclusion levels increases.

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