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Performance of Weaner Rabbits *(Oryctolagus Cunniculus)* Fed Different Levels of Processed Foetid Cassia (*Cassia tora*) Seed Diets Supplemented with Tridax *(Tridax procumbens)* Forage

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Target audience: Animal nutritionists, Feed millers, Rabbits farmers

Abstract

A ten-week feeding trial was conducted to investigate growth and carcass characteristics of forty-eight mixed breeds weaner rabbits. The rabbits were fed different levels of processed Cassia tora seed based diets supplemented with tridax (Tridax procumbens) forage. The rabbits aged about 5 weeks, had an average weight of 500g. They were randomly allotted to four dietary treatments each with three replicates. The processed Cassia tora seeds were milled and included in the diets at 0, 5, 10 and 15% levels, respectively. Data were collected on growth parameters, digestibility, carcass components, organ proportions and some biochemical parameters, (total blood protein, cholesterol and triglyceride levels). Although all the rabbits showed a positive growth rate, dry matter (DM) intake varied significantly (P<0.05) between animals on control diet and those on Cassia tora diets. Rabbits fed the control diet had significantly (P<0.05) reduced performance of feed conversion ratio (FCR), dry matter digestibility (DMD), protein efficiency ratio (PER) and final body weight. Rabbits fed Cassia tora diets also had higher percentage values of most of the cut-up parts and organs except for neck weight percentage, leg and skin proportions which were not significantly different (P>0.05) for all the treatment. The results of the study showed that Cassia tora inclusion at 5 to 15% levels improved rabbits performance and carcass quality. It was concluded that for optimum performance, Cassia tora could be included in the diets of rabbits at upto 15% levels.

Keywords: Performance, Weaner rabbits, *Cassia tora* seed, Tridax forage

Description of problem

The production of conventional protein and energy giving feedstuffs is grossly inadequate in most developing countries (1). With increasing human population in these countries, there is always a very stiff competition between man and livestock for the available conventional feedstuffs. Hence, the search for alternative cheap protein and energy sources which can be used to produce domestic rabbits at affordable prices (2, 3). The rabbit *(Oryctolagus cunniculus)* is a non- ruminant herbivore which has

the ability to thrive on forages that cannot be consumed by man.

The development of rabbit industry in most temperate countries was stimulated under conditions of adversity such as wars, economic depression, acute animal protein mal-nutrition and imbalance of foreign exchange (4). In Nigeria, the stress caused by poor economic planning, poor policy implementation, high prices of conventional animal protein sources, along with the on-going global economic recession are favourable platforms for the development of rabbit industry (5). Rabbits have a number of advantages over large ruminant animals which include high prolificacy, short generation interval, high ability to convert forage to meat and low requirement for space. As a source of animal protein, rabbit meat furnishes essential amino acids in a most balanced and readily available form than those of plant origin (5). Rabbit can be produced on high forage, low grain diets that are largely non-competitive in human food requirements. (6). Dried seeds of *Cassia tora* contain protein (up to 23%) and it is given as a protein rich feed for livestock and birds. Roasted seeds are substituted for coffee like Tephrosia seeds (7).

Physiologically, *Cassia tora* seeds have been found to help in clearing heat in the liver, brighten the eyes, moisten the intestines and loosen the bowels to relieve constipation due to interior heat and intestinal dryness (8). The dried and fresh leaves are used in northern Nigeria in the treatment of ulcer, ringworm and other parasitic diseases (9). In culture (laboratory), the leaf extracts of the plant showed anti-bacterial and anti-viral activities, particularly against New castle disease virus and viccinia virus (10).

Cassia tora is not used as human food and is therefore considered a suitable ingredient in rabbit feeding. This study was designed to evaluate the growth performance of rabbits fed different levels of processed *Cassia tora* seed based diets supplemented with Tridax forage.

Materials and methods

Experimental site and animals

The experiment was carried out at the Teaching and Research Farm, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna.

Experimental animals and medication

Forty-eight mixed breeds weaner rabbits of about 5 weeks of age, with an initial average body weight of 500g, were used for the experiment.

All routine management cares were observed throughout the period of the experiment. The rabbits were dewormed with piperizine citrate soluble powder (2.5g per litre of drinking water for one day) and repeated after two weeks. Anti coccidia drug *(Sulphadimidine)* (5ml per 4 litre of drinking water for 5 consecutive days) was also administered on the rabbits. Equally a broad spectrum antibiotic (Tetracin powder) (100g per 200 litre of drinking water for 3 days) was administered via drinking water at the 3rd, 6th and 9th weeks respectively. All treatments were given at the manufacturer's recommended dosage.

Experimental design and feeding

Complete Randomized Design (CRD) was used for the experiment. The forty-eight rabbits were randomly allotted to four treatment groups, each with three replicates of four rabbits per replicate, and balanced for initial weight. The rabbit were housed in well cleaned and disinfected hutches. The test diets were designed as 1, 2, 3 and 4 with *Cassia tora* inclusion at 0, 5, 10 and 15% respectively. Freshly-cut Tridax forage was given to the rabbits each day as supplement. Fresh water was supplied *ad libitum.*

Processing of Cassia tora seeds

The processing method involved soaking *Cassia tora* seeds in water at room temperature for an hour to reduce hardness after which they were thoroughly washed to eliminate sand and other particle and then air dried for 30 minutes to reduce moisture content. The air dried seeds were then subjected to heat treatment (toasting) for 20 minutes at temperatures of 80°C until its beany taste disappeared. This is because low temperatures of dried heat are known to be unable to destroy several anti nutrients. Proximate composition and energy value of *Cassia tora* seeds and Tridax leaves were determined (Table 1) according to (11) methods.

Table 1: Proximate and Energy composition and energy values of *Cassia tora* seeds and Tridax leaves (%)

Parameter	*Cassia tora* seeds	*Tridax* leaves
Dry matter (%)	93.00	14.00
Moisture content (%)	7.00	86.00
Crude protein (%)	22.00	15.30
Crude fibre (%)	14.00	18.45
Ether extract (%)	13.52	4.50
Total ash (%)	2.00	11.00
Nitrogen free extract (%)	41.48	50.75
Gross energy in Kcal/kg	2.95	2.25

Table 2: Composition of concentrate diets fed to the weaned rabbit

Ingredients (%)	*Cassia tora* 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
Soya bean	20.89	22.65	20.25	19.25
Groundnut cake	15.00	13.00	11.55	10.00
Cassia tora	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
Calculated values (%) Protein	18.0	18.0	18.0	18.0
Crude fibre	7.45	8.20	8.15	8.35
Energy(Kcal/kg^{-1}) ME	2.75	2.80	2.82	2.85

Premix supplied per 2.5kg contains: Retinol acetate (10000000 iu), Vit. D_3 (2000000 iu), Vit E (15000 iu), Vit B (3000mg),Niacin (15000mg), Calcium pantothenate (800mg), Vit . B_6 (3000mg), Vit. B_{12} (10mg) Vit. K_3 (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)

Data collection

Weighed quantities of Tridax and *Cassia tora* seed based 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.

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. Feed conversion ratio was calculated. There was no incidence of mortality.

Digestibility trial

A five-day digestibility trial was conducted at the 9th week of the experiment using two rabbits randomly selected from each replicate per treatment. During this period, faecal samples were collected twice daily (morning and evening) and bulked together to represent a day's collection. Each treatment collection was weighed and oven-dried at 80^{0}C until a constant

weight was obtained, stored until required for proximate analysis according to (11) methods (Table 4).

Carcass evaluation

At the end of the trial, three rabbits from each treatment (one rabbit per replicate) were randomly selected, fasted overnight and slaughtered by severing the jugular veins. These were used for carcass and internal organs parameters determination.

Data analysis

Data generated from the various parameters were subjected to statistical analysis using one way analysis of variance (ANOVA), (12). Significant means were separated using the Duncan's Multiple Range Test (13). The computer package used was Statistical Package for Social Sciences (14).

Results and Discussion

Performance characteristics of experimental rabbits

The performance of the growing rabbits fed different levels of *Cassia tora* seed diets supplemented with Tridax forage shown in (Table 3). The result revealed that rabbits for all treatment showed positive growth response. *Cassia tora* inclusion significantly increased final body weight and body weight gain of rabbit fed diets 2, 3, and 4. However, feed intake varied significantly ($P<0.05$) between those fed control diet and the *Cassia tora* seed based diets. The forage intake was highest in the control group and least in 5% *Cassia tora* based diets. The high (735.18g) consumption of Tridax forage in the control group could have probably been due to the absence of *Cassia tora* seed in their diets. The *Cassia tora* seed fed rabbits also converted their feeds more efficiently than those of the control group.

Final body weight of rabbits improved by *Cassia tora* inclusion in the diets. This result is similar to that obtained by (7), who observed that increasing the *Cassia tora* content of concentrate diets has significant effect on final body weight of rats. Feed conversion ratio values for individual Treatment group showed that *Cassia tora* seed diets were superior and significantly ($P>0.05$) different from those of the control diet. Animals on 5% *Cassia tora* seed based diets converted their feeds better than rabbits fed higher levels of *Cassia tora.*

Table 3: Performance characteristics of rabbits fed different levels of processed *Cassia tora* seed diets supplemented with *Tridax* leaves for 10 weeks

Parameter	Dietary levels of *Cassia tora* levels (%)			
	0.00	5.00	10.00	15.00
Initial body weight/rabbit (g)	496.67	496.67	496.67	496.67
Final body weight (g)	2203.33[b]	2553.33[a]	2493.33[a]	2556.67[a]
Weekly body weight gain (g)	170.66	205.66	199.66	207.00
Final body weight gain (g)	1706.66[b]	2056.66[a]	1996.66[a]	2070.00[a]
Average weekly forage intake (g)	735.18[a]	630.21[d]	665.33[c]	690.13[b]
Average weekly concentrates intake (g)	498.50[a]	444.50[d]	479.83[b]	463.50[c]
Total feed intake (g)	12336.80[a]	10741.00[d]	11451.60[c]	11536.30[b]
Feed to gain ratio	2.77[a]	2.12[c]	2.47[b]	2.48[b]
Protein efficiency ratio	0.79[b]	1.13[a]	1.06[a]	1.11[a]
Feed efficiency	0.40[c]	0.56[a]	0.50[b]	0.48[b]
Total protein in feed	20.50	18.55	17.50	16.75
Mortality	0	0	0	0

a, b, c, d: Mean values with different superscripts along the same row are significantly different ($P<0.05$)

Digestibility coefficient

Animals fed *Cassia tora* seed based diets had significantly ($P<0.05$) better nutrient digestibilities compared to those on the control diets (Table 4). This is in agreement with the work of (15, 16). This was probably because *Cassia tora* increased the utilization of mineral nutrients, particularly phosphorus, due to increase in phytase activity, which in turn increased the bioavailability of minerals and nutrients, including protein (10).

These digestibility values were however higher when compared with the values of (DM 68; CP 65; CF 58; EE 60; Ash 70 and NFE 65%) obtained by (17). This may probably be due to breed differences and different *Cassia tora* inclusion levels in rabbit diets. However, the dry matter and crude protein digestibility values showed no significant ($P>0.05$) differences between the control and *Cassia tora* fed groups.

Carcass characteristics of rabbits fed Cassia tora seed diets.

The carcass characteristics of rabbits fed the experimental diet are presented in Tables 5 and 6.

Rabbits fed the control diet had lower final live body weight than the rabbits in the other experimental groups. This result is similar to that obtained by (8), who observed heavier final live body weights and carcass cuts in rats fed *Cassia tora* supplemented diets. The result also indicated that rabbits fed the control diets had significantly ($P<0.05$) lower dressing

percentage, breast, back, fore and hind limbs and head proportions compared to the *Cassia tora* groups.

Table 4: Apparent nutrient digestibility of diets fed to rabbits at different levels of *Cassia tora* inclusion

Parameter	Dietary levels of *Cassia tora* levels (%)				SEM
	0.00	5.00	10.00	15.00	
Dry matter	71.82	72.73	71.87	70.95	1.25
Crude protein	71.46	71.03	73.07	72.21	1.08
Crude fibre	70.87^{b}	76.17^{a}	77.90^{a}	79.46^{a}	2.41
Ether extract	69.30^{c}	82.01^{a}	79.85^{b}	81.68^{a}	1.61
Ash	61.80^{c}	80.73^{b}	85.15^{a}	86.78^{a}	1.66
NFE	65.82^{c}	74.01^{a}	70.66^{b}	71.43^{b}	1.41

abc: mean values with different superscripts on the same row are significantly different (P<0.05) SEM – standard error of mean NFE Nitrogen free extract

Rabbits on the control diet had no significant effect (P>0.05) on neck, leg and skin proportions. The proportions of breast, back, neck, fore and hind limbs, head, leg, skin and tail for the rabbits fed 5, 10 and 15% *Cassia tora* diets were not significantly (P>0.05) different from each other and agrees with the work of (18) and (19) who reported that different levels of protein supplements had no effect on the proportion of fore and hind limbs, weight proportions of breast, back and dressing percentage of rabbits.

Table 5: Mean carcass cuts of rabbits fed *Cassia tora* based diets expressed as percentage of live body weight (n=3)

Parameter	Dietary levels of *Cassia tora* levels (%)				SEM
	0.00	5.00	10.00	15.00	
Live weight (kg)	2.17[b]	2.50[a]	2.44[a]	2.51[a]	2.45
Dressed weight (kg)	1.08[b]	1.38[a]	1.37[a]	1.34[a]	1.05
Dressing (%)	49.93[b]	55.23[a]	55.80[a]	53.47[a]	1.79
Breast weight (%)	11.43[c]	15.96[a]	14.20[b]	11.97[b]	1.13
Back weight (%)	13.80[b]	13.96[a]	14.37[a]	13.97[a]	1.45
Neck weight (%)	4.60	4.67	5.47	4.27	0.65
Fore limbs (%)	9.37[b]	10.67[a]	10.90[a]	11.97[a]	1.25
Hind limbs (%)	10.00[b]	10.90[a]	10.86[a]	11.30[a]	1.10
Head weight (%)	3.60[b]	4.00[a]	4.10[a]	4.00[a]	1.12
Legs (%)	4.60	4.00	4.10	4.27	0.15
Skin (%)	6.63	6.70	6.43	8.00	1.40
Tail (%)	2.30[a]	2.00[b]	2.03[b]	2.00[b]	0.50

Mean values with different superscripts on the same row are significantly different from each other ($P<0.05$). n: number of replicates

The results from Table 6 indicated that percentage weights of lungs and spleen did not show any significant difference ($P>0.05$) for all the treatment groups. However, the abdominal fat, liver, heart, kidney and intestinal weight percentages of rabbits fed the control diet were significantly lower ($P<0.05$) than those obtained for *Cassia tora* fed rabbits. This is may probably be due to the nutrient value of *Cassia tora* seeds particularly its protein nature. The proportions of the internal organ of the rabbits fed 5, 10 and 15% *Cassia tora* seed diets were similar ($P>0.05$).

Table 6: Mean internal organs of rabbits fed *Cassia tora* based diets expressed as a percentage of live body weight (n=3)

Parameter	Dietary *Cassia tora* levels (%)				SEM
	0.00	5.00	10.00	15.00	
Abdominal fats (%)	3.60[b]	4.15[a]	4.10[a]	4.00[a]	0.50
Liver (%)	3.80[b]	4.00[a]	4.10[a]	4.00[a]	0.30
Lungs (%)	2.17	2.00	2.03	2.00	1.00
Heart (%)	2.43[b]	3.00[a]	3.03[a]	3.09[a]	0.20
Spleen (%)	0.90	0.80	0.97	0.80	0.50
Kidney (%)	2.47[b]	3.53[a]	3.03[a]	3.00[a]	0.23
Full intestinal weight (%)	8.67[b]	10.97[a]	10.82[a]	10.61[a]	0.88

Mean values with different superscripts on the same row are significantly different from each other (P<0.05). n: number of replicates

Conclusion and Application

It was concluded that

1 Rabbits fed diets supplemented with *Cassia tora* seed had improved feed intake, final body weight, body weight gain, feed conversion efficiency and protein efficiency ratio (PER).

2 Processed *Cassia tora* seed could be included in the diets of rabbit up to 15% level without any adverse effect on the performance and carcass characteristics of growing rabbits.

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