



Carcass Yield and Cost Benefits of Weaner Rabbits Fed Doum Palm (*Hyphaene thebaica*) as Replacement for Dietary Maize

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Abstract

The utilization of conventional energy sources for livestock feed formulation is being seriously challenged due to hike in prices. Consequently, alternative ingredients that are cheaper and readily available need to be explored. An 8-week study was conducted to evaluate the carcass characteristics and cost benefit of weaner rabbits fed diets containing doum palm pulp (DPP) as replacement for maize. Thirty-two Mongrel weaner rabbits of mixed sex weighing between 737.50 – 787.50 g each were randomly allotted to four diets containing 0, 10, 20 and 30% levels of DPP as replacement for maize, designated as diets 1, 2, 3 and 4, respectively. Each treatment was replicated four times with two rabbits each in a completely randomized design. Feed and water were served ad libitum. Results indicated that carcass weight and dressing percentage were higher ($P < 0.05$) on diets 4 (1.11 kg; 54.80%) and 3 (0.98 kg; 49.34%). However, most of the organ weights were not significantly affected by diet. Cost benefit analysis revealed a reduction in feed cost per kg from ₦95.54 on diet 1 to ₦80.64 on diet 4 while feed cost per kg gain decreased progressively from ₦239.42 on diet 1 to ₦150.53 on diet 4. Accordingly, the highest cost saving of ₦88.89 (37.13%) was made on diet 4. It was therefore concluded that doum palm pulp can replace maize up to 30% level in the diet of weaner rabbits with increase carcass yield and concomitant reduction in feed cost.

Keywords: Doum palm, rabbit, carcass, cost benefit, maize,

Introduction

Per capita protein intake in developing countries including Nigeria is comparatively low (Abdulraheem *et al.*, 2016). According to FAO (2009), the level of animal protein consumption in Nigeria is about 20% less than the recommended 45%. This scenario has been identified as the cause of malnutrition among all groups especially infants and children (Adekunmi *et al.*, 2017). The same report pointed out that, 35.3 and 40.0% of children in Nigeria between the ages of 6 months and 6 years in urban and rural areas, respectively, are malnourished and underweight. This unfortunate outlook has been attributed to high cost of animals occasioned by high cost of production and low level of animal productivity (Herbert, 2017). Inadequate supply of feeds, nutritionally poor rations,

adulterated feeds and feed ingredients or stale feeds have also been advanced as some of the factors responsible for this problem (Akinmutimi and Anakebe, 2008). Cattle, sheep, goats, pigs and poultry are the conventional sources of animal protein. In Nigeria, however, the demand for protein has not matched supply (Akinmutimi and Onwukwe, 2002). In order to bridge this gap, rabbit production was advanced by a number of researchers (Ewuola and Egbunike, 2008; Ajuogu *et al.*, 2015; Haruna and Muhammad, 2018 and Ibitoye *et al.*, 2020).

Rabbits have the advantage of attaining sexual maturity earlier than the conventional livestock species mentioned above. Similarly, rabbits are highly prolific with a short gestation period of 28 – 32 days. Furthermore, their ability to

efficiently utilize forages and fibrous plant materials is amazing. Another advantage that rabbits have is that its meat is low in fat content with a higher percent of minerals than other meats, nearly of the same nutritive value as beef and comparable to that of broiler chickens (Nistor *et al.*, 2013). In this regard, and to get the best out of rabbits, special attention need to be given to adequate rabbit nutrition. This will enhance its production for the provision of rabbit meat. Maize has hitherto remained the principal source of energy in livestock diets and constitutes between 35 – 50% of the animals' ration (Strydom, 2008). However, the ever-increasing competition for grains between man, animals and industries, have put the livestock industry at disadvantage. It is therefore necessary to evaluate alternative energy sources that are relatively cheaper and more readily available. Doum palm (*Hyphaene thebaica*) is one of these feedstuff. Doum palm is a desert tree native to Egypt, Sub-Saharan Africa and West India. According to Waleed *et al.* (2014), Datti *et al.* (2020) and Kawu *et al.* (2021), the proximate composition of doum palm pulp is; crude protein content of 2.17 – 6.09%, crude fibre 11.49 – 20.37%, ether extract 0.49 – 9.17%, ash 5.77 – 7.37% and metabolizable energy of 2254.50 – 2796.33 kcal/kg.

Previous studies (Ibrahim *et al.*, 2018; Makinde *et al.*, 2018) have shown that up to 20% of doum palm fruit pulp can replace dietary maize in in broiler chicken diets. The pulp has also been used successfully in the diets of African catfish (*Clarias gariepinus*) (Hanan *et al.*, 2020). However, limited literature is available on its use in the diets of rabbits. The aim of this study was therefore to assess the effect of replacing dietary maize with doum palm fruit pulp on carcass yield and cost benefit of weaner rabbits.

Materials and methods

Study Location

The study was conducted at the Livestock unit, Teaching and Research Farm, Department of Animal Production, Abubakar Tafawa Balewa University, Bauchi. Bauchi State.

Procurement and processing of test material

Mature, dry fruits of *Hyphaene thebaica* were purchased from Railway market, Bauchi, Bauchi State. Using a pestle and mortar, the epicarps which are more fibrous were removed from the fruits. Thereafter, the mesocarp (pulp) was removed in a second pestle and mortar milling process. After discarding the kernels, the pulp was further milled using a hammer mill with sieve size of 3mm. other feed ingredients were purchased from Muda lawal market in Bauchi.

Experimental Diets

Four experimental diets in which doum palm pulp replaced maize at 0, 10, 20 and 30% levels, designated as diets 1, 2, 3 and 4 were formulated (Table 1). Samples of doum palm fruit pulp and that of experimental diets were analyzed for proximate composition according to AOAC (2006).

Management of Experimental Animals

A total of thirty-two, Mongrel rabbits with average weight (737.50 and 787.50 g) were randomly allocated to the four dietary treatments at eight per treatment, replicated four times (two rabbits per replication) in a completely randomized design (CRD). Each replicate was housed in a wood-wire cage measuring 50 x 42 x 34cm. Experimental diets and fresh drinking water were provided ad libitum throughout the 8 - weeks study period. For each day, a known quantity of feed was offered to each replicate and left-over collected the following morning.

Data Collection

At the commencement of the study, initial weight of rabbits was determined using a 10 kg scale, thereafter body weight was measured at an interval of 7 days. Daily feed intake was obtained from the difference between feed offered and the left-over collected the following morning. Weight gain was determined by difference between two consecutive weighing. At the end of the feeding trial (8 weeks), four rabbits were randomly selected from each treatment (one per replicate), weighed, slaughtered and eviscerated. Carcass weight and that of selected organs (liver, heart, kidney, spleen and lungs) were also determined. Prices of feed ingredients at purchase were used to compute feed cost per kg. Feed cost per kg gain was obtained by dividing the value of total feed cost (₦) by that of total weight gain while cost saving was a difference between feed cost per kg gain on the control diet and that a treatment diet.

Data Analysis

All data were subjected to one-way analysis of variance using the SPSS v. 25 software. Mean separation was based on DMRT (Duncan, 1955).

Results and Discussion

The proximate composition of doum palm pulp revealed that it has a crude protein value of 4.13%, crude fibre, 13.41%, ether extract 1.17% and metabolizable energy of 2708.24 kcal/kg (Table 1). These values are similar to those reported by Makinde *et al.* (2018) but higher than Datti *et al.* (2020). Live weight of rabbits was significantly ($P<0.05$) higher for those on diets 4 (2.05 kg) and 3 (1.99 kg) than those fed diets 1 (1.67 kg) and 2 (1.69 kg) which also did not differ.

Results for carcass and organ weights is presented in Table 2. Carcass weight also followed the same trend with live weight. Rabbits on diet 4 (1.11 kg) which were similar to those on diets 3 (0.98 kg), had higher ($P<0.05$) weights than those fed diets 3 (1.69 kg) which were similar to those on diet 1 (1.67 kg). Rabbits fed diet 4 (54.30%) dressed higher ($P<0.05$) and were similar to those on diet 3 (49.34%). However, those fed diet 2 (48.20%) which compared favourably with those on diet 3 did not differ from those fed diet 1 (44.37%). These values are comparable to 48.14 – 51.21% reported by Ibitoye *et al.* (2020). No significant influence of diet was obtained for carcass length (15.75 – 17.00 cm), heart weight (0.28 – 0.36%), lungs weight (0.48 – 0.64%) and liver weight (2.62 – 2.93%). These findings are in tandem with Haruna and Muhammad (2018). There was however significant difference among diets for spleen weight. Spleen weight of rabbits on diets 4 (0.58%) which did not differ from those on diet 3 (0.30%) outweighed ($P<0.05$) those on diets 1 (0.16%) and 2 (0.12%) which were the same. Kidney weight was significantly ($P<0.05$) higher on diet 1 (0.91%) which was similar to diets 3 (0.75%) and 4 (0.72%) and lower on diet 2 (0.70%). These values were similar to 0.68 – 0.78% reported by Ibitoye *et al.* (2020) in male rabbits fed different energy sources. However, diets 3 and 4 did not differ from diet 2.

Cost benefit analysis (Table 3) showed that feed cost per kg decreased with increased level of DPP in the diet. Diet 1, which contained no DPP had the highest cost (₦95.54) which decreased progressively to ₦80.64 in diet 4. Feed cost per kg gain also decreased with increased level of the test material in the diet from ₦239.42 (diet 1) to ₦150.53 (diet 4). Cost saving was highest on diet 4 (₦88.89) (37.13%), followed by diet 3

(₦82.24) (34.35%) and least on diet 2 (₦18.09) (7.55%). These values, except for diet 2 were higher than 21.52% reported by Chuka and Eze (2015) using probiotics supplementation at 0.08 g/yeast/kg in the diets of weaner rabbits.

Conclusion

Based on the results of this study, it was concluded that doum palm fruit pulp can replace maize up to 30% level in weaner rabbits diets with improved carcass weight and dressing percentage. The substitution of dietary maize with doum palm fruit pulp decreased feed cost and at 30% level gave a cost saving of 37.13%.

Table 1: Ingredients and Percentage Composition of Dietary Levels of Doum Palm Pulp as Replacement for Maize fed to Weaner Rabbits

Ingredient	DIETS				Doum Palm Pulp
	1	2	3	4	
Maize	36.00	32.20	28.4	24.60	
Doum palm pulp	0.00	3.80	7.60	11.4	
Full-fat soya bean	19.20	19.20	19.20	19.20	
Wheat offal	24.00	24.00	24.00	24.00	
Rice husk	14.00	14.00	14.00	14.00	
Palm oil	3.00	3.00	3.00	3.00	
Bone Meal	2.00	2.00	2.00	2.00	
Limestone	1.00	1.00	1.00	1.00	
Salt	0.30	0.30	0.30	0.30	
Premix	0.30	0.30	0.30	0.30	
Methionine	0.10	0.10	0.10	0.10	
Lysine	0.10	0.10	0.10	0.10	
Total	100	100	100	100	
Proximate composition					
Crude Protein (%)	16.36	16.28	16.19	16.10	4.13
Crude Fibre (%)	10.53	10.57	10.62	10.65	13.41
Ether Extract (%)	5.88	5.86	5.84	5.81	1.17
Metabolizable Energy (kcal/kg)	2612.14	2587.62	2551.08	2527.36	2708.24

Table 2: Carcass and Organ Characteristics of Weaner Rabbits Fed Doum Palm Based Diets

Parameters	DIETS				SEM
	1	2	3	4	
Live weight (kg)	1.67 ^b	1.69 ^b	1.99 ^a	2.05 ^a	0.11*
Carcass weight (kg)	0.74 ^c	0.81 ^{bc}	0.98 ^{ab}	1.11 ^a	0.07*
Dressing percentage	44.37 ^b	48.20 ^b	49.34 ^{ab}	54.30 ^a	1.52*
Carcass length (cm)	16.62	15.75	17.00	16.37	0.51 ^{NS}
Organ characteristics expressed as percentage of live weight					
Heart	0.36	0.29	0.28	0.28	0.04 ^{NS}
Lungs	0.58	0.54	0.48	0.64	0.07 ^{NS}
Spleen	0.16 ^b	0.12 ^b	0.30 ^{ab}	0.58 ^a	0.12*
Liver	2.62	2.93	2.89	2.70	0.15 ^{NS}
Kidney	0.91 ^a	0.70 ^b	0.75 ^{ab}	0.72 ^{ab}	0.06*

abc = Means bearing different superscripts within the same row differ. * = (P<0.05), NS = Not Significant, SEM = Standard Error of Means

Table 3: Cost Benefit of Weaner Rabbits Fed Doum Palm Based Diets

Parameters	DIETS			
	1	2	3	4
Total feed intake (kg)	2.08	2.15	2.13	2.24
Feed cost (₦/kg)	95.54	90.59	85.60	80.64
Total feed cost (₦)	198.72	194.77	182.33	180.63
Total weight gain (kg)	0.83	0.88	1.16	1.20
Feed cost/kg gain (₦)	239.42	221.33	157.18	150.53
Cost saving (₦)	-	18.09	82.24	88.89
Percent cost saving	-	7.55	34.35	37.13

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