Nutritional Evaluation of Human Used Sugar Cane Bagasse as a Source of Fibre on Growth Performance and Carcass Characteristics of Rabbits

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Abstract
An experiment was conducted to assess the feeding value of human used sugarcane bagasse (HUSB) as a source of fibre on performance of rabbits. 48 mongrel rabbits were randomly allotted to six dietary treatments in which HUSB was included at 0%, 20%, 40%, 60%, 80% and 100%. There are eight rabbits per treatment replicated four times (two rabbits per replicate) in a completely randomized design (CRD). Rabbits were fed experimental diets for 8weeks. Results showed that daily feed intake (69.50-78.21g), daily weight gain (15.28-17.91g) and feed conversion ratio (4.37-4.82) were affected (P<0.05) by the different levels of sugarcane bagasse. The live weight (1150.00-1400.00g) and dressing percentage (48.35-52.67%) were affected by the experimental diets (P<0.05). Gut contents were statistically similar (P>0.05). HUSB can be used as a source of fibre in the diets of growing rabbits and can be used up to 80% to replace wheat offal without deleterious effect with reduction in cost of production.

Keywords: *human used sugarcane bagasse, growth performance, carcass characteristics, rabbits*

Introduction

The acute shortage of animal protein in developing countries like Nigeria is quite alarming. Daily intake of 35g recommended by Food and Agriculture Organization (FAO, 1992) has not been met. The level of consumption of animal protein in Nigeria is estimated at 8g per day which is about 27g less than the minimum requirement by World health organization (Obioha, 1992). The rapid increase in the cost of animal protein source has now put it out of the reach of most Nigerians (Maidala and Istifanus, 2012).There is therefore, an urgent need to increase livestock production in the country especially those that are highly prolific with rapid turnover rate at very low cost. This brings the rabbit (*Oryctolagus cunniculus*) into focus, as it forms a very important aspect of livelihood for socio economic reasons. Rabbit production has been noted to be one of the best means of alleviating the prevailing low animal protein consumption in developing countries due to certain characteristic of rabbits and rabbit meat (Taiwo *et al.*, 2005; Maidala and Istifanus, 2012). The rabbits thrive on wide range of fresh or preserved grasses, shrubs and leaves (Bamgbose *et al.*, 2004). The rabbit is also a very efficient converter of feed to animal protein and the meat is very nutritious, easily digested, extremely low in cholesterol and sodium and contains more protein and less fat, when compared to various other meats. The production

of animals like rabbits, with very short gestation periods and production cycles, can be a solution to the problem of protein shortage. The advantages projected include the high reproductive rate, rapid maturity, high genetic potential, efficient feed utilization, limited competition with humans for food and high quality nutritious meat (Cheeke *et al.,* 1986). Egbo *et al.* (2000) reported that rabbits are efficient converters of feed to meat and utilize up to 30% fibre as against 10% by most poultry species. The subject of dietary fiber has became more important in economic considerations being increasingly involved in production process and cost, where feeding rabbits on high quantity of digestible fiber promoted a best fermentative activity especially at weaning stage (Gidenne *et al*., 2002). it is of a great importance that feeding rabbits diets with higher dietary fiber levels not only provides nutrient substances, but also has the function of maintaining micro-ecological balances of gut, promoting digestive system development and consequently improving the productive performance (Gu, 2002). Higher inclusion levels of fiber reduced both dietary digestible energy content and the overall efficiency of digestible energy used in growing rabbits **(**García *et al.,* 1993**)**. Sugarcane (*Saccarum officinarum*) is large tropical grass which is grown for its juicy stem, from which sugar is extracted. In Nigeria in addition to industrial extraction millions of tonnes of sugarcane were consumed annually, which culminated to large quantities waste called bagasse. Bagasse is the waste that remains after sugar extraction. Millions of tones of bagasse are produced annually which results in blocking water ways and large quantities of heaps both in urban and rural part of the country resulting into land pollution. Incorporating bagasse into livestock feeds can reduce the environmental problems caused by the waste. The research reported here in is on evaluation of sugar cane bagasse as a source of fibre on growth performance and carcass characteristics of rabbits.

Materials and methods

Experimental site

Katagum local government is situated on the northern part of Bauchi state, Nigeria. It is located between latitudes 11^0 42' and 11^0 40^0 and longitude 10^0 31' and 10^0 11' east (Anon, 2009). It shares common boundary with Itas/Gadau local government in north west, Jama'are to the west, Dambam to the east, Misau to the south west, Giade to the south and Shira to the southwest(Azare, 2013). It has a landmass of 1,120 square kilometers (NPC, 2009). The climate of the study area is controlled by the inter tropical convergent zone (ITCZ) which is marked by the rainy and dry season. The major climate elements that influence the climate of the study area and affecting the farming system are temperature and precipitation (rainfall), the annual temperature ranged between 22-33^0 C from April to May (Bashir *et al*.,2001). The mean annual rainfall ranged between 615.6-985mm with peak between July- Augusts. The study area is in the Sudan savanna, the vegetation is greatly determined by the nature of the soil. The soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate

Sources and processing of feed ingredients

Other feed ingredients were procured at Azare main market. The rabbits used in this study were obtained from the rabbit farmers in Azare. The sugar cane bagasse were collected from sugarcane heaps in sugar cane market it was sorted to remove the bagasse and the cover, the bagasse were sundried for seven days and milled. The ingredients were used to formulate six experimental diets. The diets were isonitrogenous and isocaloric. The percentage composition of experimental diets was shown in Table 1. Forty eight rabbits of mixed breeds and sexes were randomly allotted to six experimental diets. There were eight rabbits per treatment replicated

four times (two rabbits per replicate) in a completely randomized design (CRD). Daily feed intake was measured daily by subtracting the difference between feed giving and reminder, rabbits were measured weekly to determine the weekly weight changes. At the end of the experiment, 12 rabbits (2 from each treatment) were randomly selected, starved overnight, weighed and slaughtered in the morning by slitting the throat to evaluate carcass characteristics. They were skinned, eviscerated then the organs and guts parts were separated; liver, lungs, small intestine, large intestine and ceacum and were weighed individually. Data generated for all the parameters were subjected to analysis of variance technique (ANOVA balanced design) as described by Steel and Torrie (1980). Where there was significant difference between treatment means, Duncan multiple range rest (DMRT) was used to separate the means Duncan's (1955).

Results and discussion

The performance characteristic of rabbits fed sugarcane bagasse is shown in Table 2. Result showed that the final body weight was affected by the different levels of sugarcane ($P<0.05$) with higest carcass weight on rabbits fed 80% sugarcane bagasse (14.00g) (Table 2). The weight of carcasses in this study were within the range of values (946.90-1696.00g) reported by Abdel Aziz et al., 2014 on rabbits fed sugarcane bagasse treated with Exogenous Enzymes (*Lactobacillus acidophilus).* The daily feed and daily weight gain were affected by the different level of sugarcane bagasse. The daily feed intake and daily weight gain increase as you increase the levels of sugarcane bagasse up to 80% and decrease hence forth and rabbits eat to meet their nutrient requirements. The daily feed intake values are higher than (52.20-55.20g) and daily weight gain values of (10.20-12.80g) reported by Ayoade *et al*., 2007 on rabbits fed diets with sugarcane scraffing meals. The feed conversion ratio values of experimental diets are better than that of the control values and this can be attributed to efficient utilization of sugarcane bagasse by rabbits (Table 2). The cost of feed decrease as you increases the levels of sugarcane bagasse (Table 2). The cost of gain was highest in the control diet (₦150.11) and lowest in 80% sugarcane bagasse (₦128.07) and this make it a least cost ration. The carcass yield and gut characteristics is shown in Table 3. Results showed that the dressing percentage was significantly better in rabbits fed various levels of sugarcane bagasse and this can be attributed to efficient utilization of the experimental materials, since dressing percentage signifies the carcass superiority (Medugu et al., 2010) . The ceacum weight was affected by the various levels of sugarcane bagasse with higher weight ($P<0.05$) in rabbits fed various levels of sugarcane bagasse (Table 3).the gut characteristics were statistically similar ($P<0.05$).

Conclusion; From the results of this study it can be seen that sugar cane bagasse can be used as a source of fibre in growing rabbits and can be included at up to 80% to replace wheat offal without a deleterious effect in performance with reduced cost of production.

Table 1: Percentage composition of the experimental diets

Ingredients	Levels of human used sugarcane bagasse 0% 1	 20% 2	 40% 3	 60% 4	 80% 5	 100% 6
Maize	43.49	43.49	43.49	43.49	43.49	43.49
Full fat soyabean	19.61	19.61	19.61	19.61	19.61	19.61
Human used sugarcane bagasse	00.00	6.00	12.00	18.00	24.00	30.00
Wheat offal	30.00	24.00	18.00	12.00	6.00	00.00

Fishmeal	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00
Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
NaCl	0.25	0.25	0.25	0.25	0.25	0.25
Premix *	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis						
Crude protein						
Metabolizable energy						
Crude fibre						

Table 2: Growth performance of rabbits fed human used bagasse

Parameters	Levels of human used sugarcane bagasse						
	0%	20%	40%	60%	80%	100%	SEM
	1	2	3	4	5	6	
Initial body weight (g)	350.00	348.00	351.00	350.00	352.00	349.00	NS
Final body weight (g)	1150.00	1300.00	1200.00	12.00.00	14.00.00	1100.00	*
Daily feed intake (g)	69.50	76.00	77.00	78.00	78.21	68.99	*
Daily weight gain (g)	15.28	15.87	16.00	16.28	17.91	15.17	*
Feed conversion ratio	4.55	4.79	4.82	4.80	4.78	4.25	*
Feed efficiency ratio	0.22	0.21	0.21	0.21	0.23	0.22	NS
Total feed cost	480.00	472.21	468.00	457.60	448.00	420.62	NSA
Feed cost N/kg gain	150.11	142.67	140.21	137.61	128.07	130.67	NSA

Table 3: Carcass characteristics of rabbits fed human used bagasse

Parameters	Levels of human used sugarcane bagasse						
	0%	20%	40%	60%	80%	100%	SEM
	1	2	3	4	5	6	
Final body weight (g)	1150.00	1300.00	1200.00	12.00.00	14.00.00	1100.00	*
Slaughter weight (g)	1050.00	1200.00	1100.00	11.00	1200.00	980.00	*
Dressing percentage (%)	48.35	49.21	49.21	49.52	52.67	48.11	*
Head (%)	4.60	5.00	5.21	5.22	5.23	5.00	*
Pelt (%)	3.20	3.35	3.45	3.46	3.51	3.30	NS
Stomach (%)	0.80	0.90	0.90	0.91	0.92	0.81	NS
Liver (%)	0.30	0.40	0.41	0.42	0.42	0.38	NS
Lungs (%)	1.0	0.80	0.90	0.90	0.91	0.90	NS
Heart (%)	0.82	0.80	0.82	0.81	0.82	0.80	NS
Kidney (%)	0.20	0.25	0.25	0.25	0.25	0.25	NS
Small intestine (%)	1.00	1.21	1.22	1.35	1.40	1.60	NS
Large intestine (%)	2.00	2.80	2.90	2.90	2.98	3.00	NS

Ceacum (%)	2.50	3.00	2.80	3.18	3.28	3.37	*

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