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INFLUENCE OF AFRICAN LOCUST BEAN (*Parkia biglobosa*) FRUIT PULP DIETS ON THE ECONOMY OF FEED CONVERSION AND SENSORY PROPERTIES OF RABBITS

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ABSTRACT
Forty five (45) mixed sex weaner rabbits of between five to six weeks of age, with an average weight of 700.00 ± 0.05 g, were used for this study. They were randomly allotted to five treatment diets, consisting of 0, 10, 20, 30 and 40 % dietary inclusion levels of Parkia biglobosa fruit pulp (PBFP) in a completely randomized design experiment to determine the influence of feeding PBFP diets on the economy of feed conversion and sensory properties of rabbits. The feeding trial lasted for12 weeks, during which data on feed intake and weight gain were recorded. At the end of the feeding trial, 15 rabbits were randomly selected, one from each replicate, and slaughtered, by severing their throats with a sharp knife at the neck region. Lean meat samples from the lumbar region were used for sensory evaluation: they were boiled in water with salt seasoning for 30 minutes at 100 °C; allowed to cool, cut into small sizes of about 20 g and served to a 20-member semi-trained taste panel who assessed the organoleptic properties of the meat for each treatment using a 9-point Hedonic scale. Results showed that there were significant (P<0.05) differences in the colour and tenderness of the meat of rabbits, whereas juiciness, flavour and general acceptability did not show any significant (P>0.05) difference across the treatment groups. Higher scores were recorded for meat from rabbits fed 20 % dietary inclusion level of PBFP for all the sensory parameters. It is therefore concluded that inclusion of PBFP in the diets of weaner rabbits at 20 % produced the optimum effect on economy of feed conversion and sensory properties of rabbit meat.

Keywords: *Parkia biglobosa*fruit pulp, economy of feed conversion, sensory properties, rabbits.

INTRODUCTION

The world population is said to be increasing at an alarming rate (presently estimated to be over 7 billion) and is not matched by a corresponding increase in food production (UN, 2021). This population increase has resulted in increased demand for protein of both plant and animal sources. This problem is more aggravated in the developing economies of the world. Nigeria, for example, has the highest population in Africa which is estimated to be over 200 million (Statista, 2021); and there is high maternal and child mortality due to under nutrition (Sobayo *et al.*, 2008). The daily intake of animal protein particularly in Nigeria is estimated to be 7 g which falls short of the 35 g recommended per head per day by the Food and Agriculture Organization of the United Nations (FAO, 2005). Acute shortage and high cost of animal feed have been identified as a major hindrance to the expansion of the livestock industry in Nigeria and other developing African countries (Fasuyi, 2005). It is estimated that between 70-80 % of the total cost of livestock production is related to feed cost (Kellems and Church, 2010). Due to this increasing cost, there is urgent need to seek and evaluate alternative feedstuffs to maize in feeding animals, to minimize the current pressure on maize as a staple food for man (Uchegbu and Udedibie, 1998). One alternative feed ingredient that is receiving attention is the African locust bean pulp obtained from the African Locust Bean tree (*Parkia biglobosa)* which belongs to the family *Leguminosae* andsub-family *Mimosoideae*. The seed of the African Locust Bean, when fermented, has been used as an essential condiment in human food recipes (Campbell-Platt, 1980). The pulp is yellowish in colour and rich in carbohydrates. It also contains essential phytonutrients, possibly precursors of retinol (Vitamin A). In rural Africa during emergencies, the fruit pulp is eaten when grains stores are exhausted, which indicates that it is not toxic and is edible (Akoma *et al.*, 2001). Hence, this research study was designed

to evaluate the influence of African Locust Bean fruit pulp diets on the economy of feed conversion and sensory properties of rabbits.

MATERIALS AND METHODS

This research study was carried out at the Rabbitry Unit of the Niger State Ministry of Livestock and Fisheries Development, Minna, Niger State. Minna lies within the Guinea Savannah zone of Nigeria (latitude 9°37' North and longitude 6°33' East) (FUTMIN, 2012). The locust bean pulp was purchased from Zonkwa Market of Zangon Kataf Local Government Area of Kaduna State. It was obtained as a by- product of the industrial processing of the common African Locust Bean seed which is used in the production of local food seasoning, *dadawa* (Hausa) or *iru* (Yoruba). Foreign particles such as stone debris and plant residues were removed from the pulp and further sun dried for between 3-5 days, before being incorporated into the experimental diets at 0, 10, 20, 30 and 40 % dietary inclusion levels to form Treatments T_1, T_2, T_3, T_4 and T_5 respectively. The composition of the experimental diets is shown in Table 1

Table 1: Gross composition of the experimental diets fed to weaner rabbits

Ingredients (%)	T_1 (0%)	T_2 (10%)	T_3 (20%)	T_4 (30%)	T_5 (40%)
Maize	49.80	39.80	29.80	19.80	09.80
Groundnut cake	25.55	25.55	25.55	25.55	25.55
African Locust Bean pulp	0.00	10.00	20.00	30.00	40.00
Rice husk	19.00	19.00	19.00	19.00	19.00
Palm oil	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.30	0.30	0.30	0.30	0.30
Methionine	0.80	0.80	0.80	0.80	0.80
Salt	0.30	0.30	0.30	0.30	0.30
*Premix	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
ME (Kcal/Kg)	2701	2668	2635	2602	2571
Crude protein	18.01	18.25	18.49	18.72	18.80
Crude fibre	10.36	11.09	11.82	12.55	13.28
Protein: calorie ratio	1:149	1:146	1:143	1:139	1:137
Calcium	1.40	1.45	1.47	1.49	1.51
Phosphorus	1.03	1.03	0.99	0.99	0.79
Lysine	0.87	0.88	.088	0.88	0.89
Methionine	1.01	1.00	0.98	0.97	0.96

*The premix supplied the following nutrients kg^{-1}: Vitamin A, 500 IU; Vitamin D_3,1500 IU; Vitamin E, 3 IU; Vitamin K, 2 mg; Riboflavin, 3 mg; Pantothenic acid, 6 mg; Niacin, 15 mg; Vitamin B_{12},0.8 mg; Chlorine, 3 mg; Folic acid, 4 mg; Manganese, 8 mg; Zinc, 0.5 mg; Iodine, 1.0 mg; Cobalt, 1.2 mg.

T_1 = 0 % dietary inclusion level of *Parkia biglobosa* fruit pulp
T_2 = 10 % dietary inclusion level of *Parkia biglobosa* fruit pulp
T_3 = 20 % dietary inclusion level of *Parkia biglobosa* fruit pulp
T_4 = 30 % dietary inclusion level of *Parkia biglobosa* fruit pulp
T_5 = 40 % dietary inclusion level of *Parkia biglobosa* fruit pulp

ME = Metabolizable energy

The rabbits were housed in individual wooden cages of height 60 cm, length 45 cm and width 40 cm, under an intensive system of management. Prior to the arrival of the rabbits, the cages were washed and disinfected with MORIGAD® disinfectant. On arrival, the animals were acclimatized for one week, during which time they were given preventive treatments for coccidiosis as well as internal and external parasites; and then fed the Control Diet (T_1). At the end of the acclimatization period, the animals were randomly divided into nine animals per treatment; with each treatment made up of three replicates of three animals per replicate. The rabbits were then

fed the experimental diets *ad libitum* for 12 weeks, during which data were collected on growth performance (feed intake and weight gain). At the end of performance study, one rabbit from each replicate was randomly selected and slaughtered by severing the throat with a sharp knife at the neck region and washed with clean water. Hot carcasses were hung in a well-ventilated space for 30 minutes before being eviscerated. Lean meat from the lumbar region from each scarified rabbit was used for sensory evaluation. The meat was boiled in water with salt seasoning for 30 minutes at 100 °C and allowed to cool. The boiled meat was cut into small bite sizes of about 20 g and served to a 20-member taste panel drawn from the University Community. The organoleptic properties of the meat for each treatment were determined using a 9-point Hedonic scale. The meats were evaluated for tenderness colour, juiciness, flavour and general acceptability. Data obtained were analyzed using Statistical Analysis System Package (SAS, 2000). Differences between treatment means were separated using Duncan multiple range tests as contained in the Package.

RESULTS AND DISCUSSION

The results of the economy of feed conversion of rabbits fed PBFP diets is presented in Table 2 while the results of the sensory properties of rabbits fed PBFP diets is presented in Table 3. Cost of feed/kg decreased with increase in the level of *Parkia* fruit pulp in the diets. Rabbits fed 30 % and 40 % Parkia fruit pulp had lower feed cost per/kg weight gain than rabbits fed 0, 10 and 20 % Parkia fruit pulp diets, indicating that feed cost per kg weight gain of rabbits fed 10 % and 20 % Parkia fruit pulp diets

Table 2: Economy of feed conversion of rabbits fed *Parkia biglobosa* fruit pulp diets

Parameters	T_1 (0%)	T_2 (10%)	T_3 (20%)	T_4 (30%)	T_5 (40%)	SEM	p-Value
Cost of feed (₦/kg)	111.70	104.70	97.70	90.70	83.70	-	-
Total cost of feed intake (₦)	446.06^{b}	453.60^{b}	550.40^{a}	297.60^{c}	277.65^{c}	28.23	0.0001
Cost of feed/kg weight gain (₦)	700.00^{a}	676.67^{a}	680.00^{a}	606.67^{b}	613.33^{b}	23.76	0.0699

^{abc}Means in the same row with different superscripts were significantly (P<0.05) different. SEM= Standard error of means

Table 3: Sensory properties of rabbits fed varying levels of *Parkia biglobosa fruit* pulp diets

Parameters	T_1 (0%)	T_2 (10%)	T_3 (20%)	T_4 (30%)	T_5 (40%)	SEM	p-Value
Colour	7.35^{b}	7.65^{b}	8.20^{a}	7.00^{c}	7.00^{c}	0.11	0.0018
Tenderness	7.50^{a}	7.35^{b}	7.70^{a}	6.85^{c}	7.30^{b}	0.12	0.0211
Juiciness	6.95	6.85	7.50	6.70	7.05	0.13	0.3584
Flavour	7.00	6.90	7.40	6.50	7.25	0.14	0.2622
General accetability	7.20	7.45	7.55	7.10	7.45	0.11	0.6747

^{ab}Means in the same row with different superscripts were significantly (P<0.05) different.

SEM=Standard error of means

compared favourably with that of the Control diet. This result agreed with the report of Abeke (2005) who reported that the use of unconventional feedstuffs in livestock diets has been known to lower cost of production because they cost less than the conventional ingredients. This result is also similar to what was reported by Obun *et al.* (2010) when he fed four experimental diets that had graded inclusion levels of 0, 5, 10 and15% *Detarium microcarpum* fruit pulp meal (DFPM) which corresponded to 0, 12.5, 25.0 and 37.5% replacement of dietary maize. The authors found that cost of feeding and feed cost per kg body weight gain (BWG) decreased (P <

0.05) with increasing levels of DFPM in the diets. The carcass colour and meat tenderness of rabbits fed 20 % Parkia fruit pulp diets were significantly (P<0.05) better than those of the other treatments; but flavour, juiciness and overall acceptability of the meat were not significantly (P>0.05) affected by the dietary treatments. This result contradicts the report of Madiha *et al.* (2019) who evaluated the effect of feeding Carob pods (obtained from the Carob tree, *Ceratonia siliuqa*) on the carcass and meat quality of growing rabbits reared under Tunisian summer conditions. The authors found that Carob pods at 20 % dietary inclusion level had no effect on the colour, juiciness, tenderness and flavor of rabbit meat.

CONCLUSION AND RECOMMENDATIONS

Based on the data obtained in this research, *Parkia biglobosa* fruit pulp (PBFP) has beneficial effects on the nutrition of rabbits. It is therefore concluded that inclusion of PBFP in the diets of weaner rabbits at 20 % level produced the optimum effect on economy of feed conversion and sensory properties of rabbit meat.

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