

CHEMICAL COMPOSITION AND QUALITY ATTRIBUTES OF MEAT FROM RABBITS FED SOME BROWSE SPECIES SUPPLEMENTED WITH A CONCENTRATE DIET.

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ABSTRACT

Sixteen (16) male rabbits were used in a study to determine the effects of some browse plants and a supplement diet on the chemical composition and some quality attributes of meat obtained from the rabbits. The experiment lasted for 50 days. the rabbits were served water *ad libitum*. Gmelina (T1), Tamarind (T2), Neem (T3) and Teak (T4) leaves after wilting for 24 hours were fed at 100g/rabbit/day, 2 hours before the concentrate. The supplement was fed at 100g /rabbit/day. At the end of the feeding trial three (3) rabbits from each treatment were slaughtered, bled, eviscerated and dressed and there after 40g of meat were cut from the thigh of each of the slaughtered rabbits and used for the determination of their chemical composition and quality attributes .The experimental design was a completely randomized design , significant means were separated using SPSS version 23.0, 2015 edition, samples of the meat , concentrate diet and the browse plants were analyzed for their proximate composition using the methods outlined by AOAC(2000). There were no significant ($P<0.05$) differences in the values for daily concentrate intake , ash , moisture , pH_i and pH_u. Total daily feed intake ranged from 168.00 – 198.00g, and were significantly ($P<0.05$) different. Fat content values ranged from 4.35 – 5.65%, and were significantly ($P>0.05$) different . protein content values had a range of 19.00 – 23.50% and showed significant ($P<0.05$) differences. values for drip loss, cooking losses , initial and ultimate pH were all significantly ($P>0.05$) different. The drip loss values ranged from 5.60 – 8.40%, while the cooking loss values were 18.00 – 23.30% , values for both parameters were significantly ($P<0.05$) different It was concluded that Gmelina (T1) produced rabbit meat with the best nutrients and quality parameters. Gmelina (T1) at 100g/rabbit/day as well as bambara nut offal and cereal spent grains based supplement diet were therefore recommended for feeding rabbits for improved meat quality.

Key Words: Concentrate , Attributes, Browse, Quality, Meat, Rabbits

INTRODUCTION

The production of meat from rabbits is suitable because their feeding does not compete for feed ingredients with humans and their meat have some important characteristics which makes it a particularly good meat

for human consumption (Ocheja,*et al.*,2014) , the meat is high in protein and low in fat , the fat in rabbit meat is mainly unsaturated fat ,which is believed to be a more healthy type of fat than saturated fat which is common in other meat , the meat is suitable for the elderly and those with weak teeth, and those who have had digestive up set. Rabbit meat is ideal for cooking in dry heat or frying, it can be used in stews but should not be over cooked as it will disintegrate. The meat has lower cholesterol content than most other meat, this is a health promoting characteristic (Fielding, 1991). The health challenges faced by humans today arising from unhealthy food/ meat consumption calls for the production of meat from animals whose meat is believed to be more healthy, as well as assessing the meat from such animal species, the rabbit is a good example of such animal species

Meat plays a major role in human diets as it supplies required nutrients for growth and maintenance of health.(Anjaneyelu *et al.*,2007) According to Oguche *et.al.*(2018), the nutrition of an animal reflects in the meat quality. The ideal carcass can be described as one that has a minimum quantity of bone, a maximum quantity of muscle and an optimum quantity of fat

Given the health challenges faced the world over today , the need to search for feed materials that can help in the dry season feeding of rabbits and at the same time produce high quality and health promoting meat can not be overemphasized(Ocheja *et al* , 2020). A study by Usman *et al* (2020) reported that of the four (4) browse species (bamboo, Senna, Gmelina and Teak leaves)fed to rabbits, Bamboo leaves produced rabbit meat with the best sensory qualities

The present study was therefore designed to evaluate the effects of some browse species on the chemical composition and quality attributes of rabbit meat

MATERIALS AND METHODS

Study Area

The experiments were carried out at the Rabbitry Unit of the Livestock Teaching and Research Farm, Department of Animal Production, Kogi State University, Anyigba , which lies on Latitudes 7° 15' and 7° 29'N of the equator and Longitudes 7° 11' and 7° 32' East of the Greenwich Meridian (Ifatimehin *et al.*, 2009). It is located in the derived Savannah zone of

Nigeria. The annual rainfall ranges between 1400mm – 1500mm with about 6-7 months of rainfall. The ambient temperature ranges from 25 °C to 35 °C with the highest in March and April (Kowal and Knabe, 1972).

Experimental Feed Materials, Preparation, Animal Management and Experimental Procedure

The experimental feed materials were bambara nut offal, Cereal spent grain (from millet) , table salt, bone-meal and Gmelina (*Gmelina arborea*), Tamarind (*Tamarindus indica*), Neem (*Azadirachta indica*) and Teak (*Tectona grandis*) leaves. All the feed components were sourced from Anyigba and its environs. The browse leaves were harvested from Kogi State University, Campus, Anyigba.

Sixteen (16) male rabbits aged about 12 months old, were sourced from Anyigba and its environ. The animals were ear-tagged for identification and were randomly divided into 4 treatments of 4 animals each. The experiment lasted for 50days, Animals in treatments T₁, T₂, T₃, and T₄ were fed Gmelina, Tamarind, Neem and Teak leaves respectively at 100 grabbitt/day on cut and carry basis, after wilting for 24

hours. All the animals were given water *ad libitum*. Daily feed intake was calculated from differences between absolute feed served and leftover. At the end of the feeding trial, three (3) animals were slaughtered from each treatment and 40 g of flesh was cut off from the thigh of each of the slaughtered rabbits, 20g of flesh each were cut off and analyzed for their proximate values , The initial pH (pHi) was taken 30 minutes post mortem and the ultimate pH (PHu) was taken 24 hours postmortem ,these were taken using penetrating electrode of a portable pH meter , the probe was calibrated with 4 and 7 standard buffer solutions before and after every reading the electrode was thoroughly washed with distilled water and cleaned with cotton towels, . The drip loss was determined using 40 g of the meat , the meat samples were placed in a container on the supporting mesh and sealed to prevent air from entering the container , after 24 hours the samples were removed from the containers , bloated dry and weighed again , drip loss was expressed as percentage of initial weight as outlined by Berri *et al.*(2008)

$$\text{Drip Loss} = \frac{\text{Initial Sample Weight} - \text{Weight of Sample after 24 hours chilling}}{\text{Initial Weight}} \times 100$$

The cooking loss was determined by putting 30mm x 30 mm of the meat from each rabbit carcass from each treatment in a plastic bag and cooking it to an internal temperature of 91 C (Kaman, 2016) the samples were left to cool to room temperature , the bags were opened and free juice drained (Choi *et al*, 2016), the cooked

sample (B)was weighed and expressed as a % of the sample before cooking (A) (Yanget *et al* , 2007).

$$\text{Cooking loss (\%)} = \frac{(A - B)}{A} \times 100$$

Table 1: Composition of Concentrate Diet (Dry matter %)

Bambara nut offal	45.00
Cereal Spent Grains	45.00
Rice Offal	6.00
Bone Meal	3.00
Table Salt	1.00
Total	100
Calculated Nutrient Content	18.20
Crude Protein	
Crude Fibre	16.60
Metabolizable Energy	2560.00

Proximate Analysis

Samples of supplement diet, browse leaves and meat were prepared for analysis of their proximate composition. The protein content of the samples were determined by Kjeldahl method. Ether extract, crude fibre and ash content determination were according to standard procedure (AOAC, 2000). The nitrogen free extract (NFE) was calculated by subtracting the sum of the percentages of crude fibre, ether extracts, crude protein and ash from 100.

Experimental Design and Statistical Analysis

The experimental design was a completely randomized design (CRD). Data were analysed by a one way analysis of variance (ANOVA) and treatment means were compared and separated, (where there were significant differences) using least significant difference (LSD). With the aid of SPSS (2015) Statistical package for social science version 23.0.

RESULTS AND DISCUSSION

Table 2: Proximate Composition of Browse Leaves and Concentrate Diet (% DM)

Nutrients	Treatments				
	T1	T2	T3	T4	Concentrate
Crude protein	10.15	12.55	9.00	9.75	18.75
Crude fibre	12.30	12.80	13.30	14.75	16.20
Nitrogen free extracts	35.15	34.00	31.90	35.00	51.00
Ether extracts	2.55	3.60	2.70	2.95	2.55
Ash	6.90	6.25	5.25	6.40	5.55
Dry matter	63.60	64.20	63.30	66.35	96.00
Moisture	34.40	33.80	37.70	32.60	4.00

Feed Intake Records of Experimental Rabbits

The feed intake of the experimental rabbits is presented in Table 3, the daily concentrate intake of 100g did not show significant ($P < 0.05$) difference, daily browse intake and total daily feed intake values ranged from 90 to 98 g and 168 to 198g and were both significant

($P < 0.05$), the values were . higher than 18.77 to 43.90g and 63.23 to 88,36g reported by Ocheja *et al* (2014) for rabbits fed bamboo ,Senna, Gmelina and teak leaves, this discrepancy may be due to the season in which the experiments were conducted.

Table 3: Feed Intake Records of Experimental Rabbits

Parameter	Treatment				SEM
	T ₁	T ₂	T ₃	T ₄	
Daily Concentrate intake	100.00	100.00	100.00	100.00	0.00
Daily Browse intake	98.00 ^a	75.50 ^d	68.00 ^c	90.00 ^b	18.50
Total Daily feed intake	198.00 ^a	175.50 ^b	168 ^c	190.00 ^c	21.00

a, b, c, = Means on the same row with different superscripts differ significantly ($P < 0.05$).

SEM = Standard Error of the Means

Chemical Composition of Meat from Rabbits fed Some Browse Plants

The proximate composition of meat from rabbits fed some browse plants is presented in Table 4 , the moisture and ash contents were not significantly ($P > 0.05$) different. The fat values ranged from 4.35% – 5.65 % (T1) , the fat content were below 8% optimum fat

reported by Fieding (,1991) and appears to be below the suitable fat content to facilitate flavor, juiciness, tenderness and palatability. .The protein content ranged from 19.00 – 23.55% and showed significant ($P < 0.05$) differences, this range agreed with the report of Fielding ,(1991), that rabbit meat is high in protein and low in fat. T1(Gmelina) had the highest protein content. .

Table 4: Chemical Composition of Meat from Rabbits Fed Some Browse Species (%)

Parameters	Treatments				SEM
	T ₁	T ₂	T ₃	T ₄	
Protein	23.55 ^a	19.40 ^b	19.00 ^b	19.70 ^b	1.25
Fat	4.35 ^a	4.45 ^a	5.50 ^b	5.65 ^b	1.05
Ash	0.88	0.87	0.86	0.80	0.51
Moisture	68.50	67.70	67.60	66.95	0.80

a, b = Means on the same row with different superscripts differ significantly ($P < 0.05$).

SEM = Standard Error of the Means.

Some Quality Attributes of Meat from Rabbits fed Some Browse Species

Some Quality attributes of meat of rabbits fed some browse species is summarized in Table 5. Initial pH and ultimate pH were both not significantly ($P > 0.05$) different, .

The pHu ranged from 5.70 – 6.65 , carcasses with lower pHu tend to be more tender with lower shear force value and better calorimetric values than those with a high pHu . pHu may affect several objective and sensory quality characteristics of meat ie colour , water holding capacity , thus it is accepted and used as the main

indices of meat quality commercially (Simela *et al* , 2004) .

Drip loss values (5.60 – 8.40%) were significantly ($P<0.05$) different, , high drip loss tends to lower the dressing percentage. (Ocheja *et al*,2020) The cooking

loss ranged from 18.00% - 23.30% , the values were significantly ($P<0.05$) different . this result also agreed with that obtained by Choi *et al* (2016) who reported that differences in diets affects cooking losses of Korean goats fed different browses.

Table 5: Quality Attributes of Meat from Rabbits fed some Browse Species

Parameters	Treatments				SEM
	T ₁	T ₂	T ₃	T ₄	
Drip loss (%)	5.60 ^a	8.40 ^b	7.30 ^b	7.45 ^b	0.98
Cooking loss (%)	18.00 ^a	23.75 ^b	23.0b ^a	23.30 ^b	2.00
pH (initial)	6.78	6.65	6.55	6.50	0.78
pH(ultimate)	5.70	6.65	6.15	5.80	0.72

a, b = Means on the same row with different superscripts differ significantly ($P<0.05$).

SEM = Standard Error of the Means.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

Gmelina (T1) was most palatable to the rabbits and hence recorded the highest daily browse intake and hence total feed intake.

Meat from rabbits from T1(Gmelina) had the best array of nutrients.

T1 (Gmelina) produced rabbit meat with the best meat Quality

RECOMMENDATIONS

Gmelina leaves at 100g/rabbit/day supplemented with bambara nut and cereal spent grain based concentrate diet is recommended for feeding rabbits especially during the long dry season for improved meat quality.

Further studies should also be carried out using other browse species

REFERENCES

- Anjaneyelu A.S.R , Thomas R and Kondaiah N (2007)Technology for Value added Buffalo meat products :A Review *American J. Food Tech* 2(3):104- 114
- AOAC (2000) Association of Official Analytical Chemists. Official methods of Analysis 17th edition Washington, D.C. Pp. 1 – 20.
- Fielding D (1991) Rabbits . The Tropical Agriculturalist Series CTA/Macmillan pp.88-90..
- Ifatimehin, O. O, Musa, S. D and Adeyemi J. O (2009). An analysis of the changing land use and its impact on the environment of Anyigba town, Nigeria. *Journal of sustainable Development in Africa*, 10 (4):22- 29.
- Kowal J.M and Knabe D.T (1972) An Agro-climatological Atlas of the Northern States of Nigeria University press ABU Zaria
- Ocheja, J.O, Abalaka, E.O, Akinleye,S.B, Usman,G.O, Netala,J, Oyibo,A, Lamido, M and Dauda, A.N.(2020). Quality Attributes of Meat of West African Dwarf Goats fed Cashew Nutshell Based Diets. *Nigerian Journal of Animal Science d and Technology* 3(3):1 - 10
- Ocheja J.O , Lalabe B.C , Ebiloma S O, Atabor J.A, Oyibo A and Eniolorunda S.E (2014) Growth and Nutrient Digestibility of Grower Rabbits fed Bambara nut Waste and Rice Offal based Concentrate with Browse Plamts *J. Agric . Prod and Tech* 3:30-37
- Oguche G.H.E, Ocheja J.O, Omonzokpia O.F, and Jibrin R (2018) Whole Sale cuts amd Organoleptic properties of Meat from West African Dwarf Goats fed Diets Containing Graded levels of Cashew Nut Shell. *Int. J of Agric. and Veterinary Science* 4 (4):47-52.
- Simela L, Webb E.C , Frylinc K, (2004). Effect of ,age and Pre-Slaughter Conditioning, of pH, Temperature, Tenderness, and Colour of Indigenous South African Goats . *South African J.of Animal Sci* 24(1):208 – 211.
- SPSS (2015), Statistical package for Social Science. Version 23.0 SPSS Inc Pp. 5- 17
- Usman, G.O, Netala, J, Omale, Y.Z, Omada, U.J, Lamido, M, Dauda, A.N, Abalaka, E.O (2020) Carcass yield and Sensory Evaluation of Meat from Rabbits fed Some Browse Plants Supplemented with a Concentrate Diet..

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