PAT December, 2011; 7 (2): 37-47 *ISSN: 0794-5213*

Online copy available at

www.patnsukjournal.net/currentissue

Publication of Nasarawa State University, Keffi

Performance and Heamatological Parameters of Grower Rabbits Fed With Some Browse Supplemented With A Mixture of Bambara Nut Waste and Rice Offal

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Abstract

Twelve (12) grower rabbits of mixed breed with an average initial weight of 940g were used for a 42 day feeding trial to evaluate their performance on diet of a mixture of Bambaranut waste and Rice Offal (3:1) as supplement to some Browse plants. Animals in all the treatment groups were fed a mixture of Bambaranut waste and Rice offal (3:1) at 50g/rabbit/day followed by Browed (T1 Bamboo, T2 Senna, T3 Gmelina and T1 Teak) at 100g/rabbit/day three hours later on cut and carry basis. All the animals were also serve water ad libitum. Completely randomized experimental design was used. Data were analyzed using a one way analysis of variance. Treatments means were separated using least significant difference (L.S.D.) performance parameters showed that daily browse intake,(88.36, 63.23, 63.96, 80.78, T_1 T_2 T_3 and T_4 respectively) daily weight gain (12.15g, 7.88g, & 9.80g for T_1 T_2 T_3 and T_4 respectively) and feed conversion ratio (7.274, 8.02, 8.12 & 8.24 T_1 T_2 T_3 and T_4 respectively) were significantly ($P<0.05$) different with T1 having the best performance in terms of growth and feed utilization. Packed cell volume, (36.89, 38.33, 37.57, and 33.36 for T_1 T_2 T_3 and T_4 respectively) Heamoglobin, (38, 43, 40.67 and 37.33 for T_1 T_2 T_3 and T_4 respectively) Red Blood Cell, ($3.0x10^{12}$, $3.06x10^{12}x$, $3.35x10^{12}$, $3.2x10^{12}$ T_1 T_2 T_3 and T_4 respectively) Eosinophils, Basophils and neutrophils values were not significant ($P>0.05$). However there were significant ($P<0.05$) difference among the blood cell (WBC) values ($2.2x10^9$, $3.96x10^9$, $4.9x10^9$, $3.06x10^9$ for T1 T_2 T_3 and T_4 respectively). T2 Generally had the best heamatological values for nearly all the parameters considered. Based on the result of this work, it was concluded that any of the four browse species or their mixture supplemented with a mixture of Bambaranut waste and Rice offal (3:1) can be used for rabbits feeding during the long dry season. Finally further research using higher levels of the browse species as well as other classes of rabbits was suggested.

Key words: Performance, Heamatology, Grower Rabbits, Bambara Nut Waste and Rice Offal

Introduction

Nigerians are constantly faced with the problem of low animal protein intake which has influenced on the general well being and health of the ever-increasing population. (Onyimonyi and Ene, 2003). They further reported that poor Nigerians constitute 70% of the entire population indicating that the majority of Nigerians are

faced with shortage of animal protein since poor production performance of animals has led to high cost of livestock and livestock products in Nigeria.

The situation may not be due to insufficient number of livestock needed to meet the recommended animal protein intake but it may be due to low quality and quantity of feeds especially in the dry season due to seasonal variation.

Chestworth (2002), reported that during the dry season when rainfall and plant growth is limited, there is often real shortage of feeds coupled with poor quality, to case this situation of low protein intake of animal origin, there is a need to increase production of small highly prolific livestock with rapid turn over rate at a very low cost, one of such animals is the rabbit. Rabbits are capable of increasing the animal protein intake of Nigerians because of reputation for fast growth, short gestation period, early maturity and ease of management, also the small size of the animals makes them affordable.

From the above, it would be important to expand and intensify research into rabbits production to increase the productive performance.

Animal feeds in terms of quantity and quality posses a major challenge to livestock production, feed cost may rise up to 60% of the total cost of production necessitating an urgent, cheaply and readily available feed source required for fast growth and reproduction. (Osinowo, 1992). Also. Energy and nitrogen utilization in dry season must be highly considered if high productivity in small animals must be achieved; it is then very important to find ways of evaluating agro processing waste due to shorting of some agro by-products in supplementing limiting nutrients such as energy and nitrogen in forages during the dry season. Two of such agro by-products that hold promise in ruminant nutrition are bambaranut waste and rice offal. The proximate composition of bambaranut waste as reported by Ocheja (2006) was 87% (Dry matter), 17.65% (crude protein), 17% (crude fiber) 5.8% (Ether Extracts) 6.14% ash and 53.39% Nitrogen free extracts.

Onyimonyi and Onukwufor, (2003) reported that Bambaranut waste accounts for 20-22% of the total weight of the nut. This waste is virtually free from metabolic inhibitors and toxins. A common phenomenon with most legumes, while rice offal is the by-product obtained from small rice mills that process parboiled rice through a mechanism which combines husk removal and polishing into one operation to produce only one product. (Tegbe et. Al, 1995). Ocheja et. al, (2008) reported the proximate composition of rice offal to be 90.07%, 6.84%, 42%, 20.40%, 25.30% and 5.06% dry matter, crude protein, crude fibre Ash, nitrogen free extracts and Ether Extract respectively.

Also, given the scarcity and low nutritive value of forages during the long dry season there is need to feed rabbits with leaves from browse species that tend to retain

their leaves during the long dry season, four of these browse species that hold promise in the dry season feeding or rabbits are, Teak (Tectona grandis), Gmelina (Gmelina arborea), Senna (Senna siamea), and Bamboo (Oxytenanthera abyssinica).

Bamboos are some of the fasted growing plants in the world. (Chan and Gregory, 2002). They are capable of growing at 60cm or more per day due to a unique rhizome-dependent system.

Teak, is a yellowish brown timber with good grains and texture. It is used in the manufacturing of outdoor furniture, boat decks, and other articles where weather resistance is desired.

Gmelina (Gmelina arborea) leaves is pale yellow to cream coloured, turning yellowish brown on exposure and is soft to moderately hard.

Senna (Senna siamea) are compatible with food crops and adds nitrogen to the soil. The leaves are edible to livestock and good for shelter belt. (Adegbehin, *et al*, 1992). Therefore the objective of this work was to evaluate the performance and haematological responses of rabbits fed browse. Supplemented with a mixture of Bambaranit waste and Rice offal. The sustifications for this research work were:-

- Forages: are scarce and of low nutritive value during long dry season in the tropics, there is need therefore to feed rabbits with leaves from browse species that tend to retain their leaves during the long dry season.
- Since the prices of conventional feed stuff has sky rocked, there is need to turn to agro processing waste that are readily available, cheap, nutritionally adequate and at the same time not in direct use by humans with a view to lowering feed cost.
- Data on the utilization of these Agro by products as well as these browse species by livestock is scanty even though they are readily available in Anyigba and its environs.

Materials and Methods

EXPERIMENTAL SITE AND HOUSING FACILITIES

The study was carried out at the Rabbittary unit of Kogi State University, Livestock Teaching and Research Farm Anyigba (Latitude 7o6'N and longitude 6o43' E) the area is characterized by about 6-7 months of rainfall ranging from 1400-1500mm annually. The ambient temperature ranges from 25oc to 35oc with the highest in March and April (Kowa and Knabe, 1972). The housing facilities were houses with concrete floor, 2 windows and 1 door. The animals were kept separately in hutch made of wood and net. The hutches were properly cleaned and disinfected and the feeders and the drinkers were also washed and cleaned properly.

THE EXPERIMENTAL FEED MATERIALS:-

a. Bambaranut waste
b. Rice offal
c. Bamboo Leaves (Oxythenantera abyssinaca)
d. Gmelina leaves (Gmelina arborea)
e. Teak leaves (Tectona grandis)
f. Senna (Senna siamea)
g. Table salt

The rice offal was purchased from Ankpa while the bambaranut waste was purchased from Anyigba Market.

The bambaranut waste and rice offal were sun-dried and mixed together to compound the experimental diets.

The browse species were harvested from Kogi State University, Anyigba Campus where they grew naturally.

Twelve (12) Grower rabbits of mixed breed and with initial body weight ranging from 910g to 940g were used for the study. The animals were randomly assigned to four (4) treatments of three (3) rabbits each. The animals were conditioned to stability by feeding them adequately for 1 week (7 days) with the concentrate and the browse plant used for each treatment. The study lasted for 42 days following an adjustment period of 7 days.

The animals in treatment 1 were fed 50g/head/day of the experimental diet and 100g/head/day of Bamboo leaves and clean drinking water was given to them ad libitum.

The rabbits in treatment 2, were fed 50g/head/day of the experimental diet and 100g/head/day of Senna siamea and clean drinking water was served ad libitum.

The rabbits in treatment 3, were fed 50g/head/day of experimental diet and 100g/head/day of Gmelina arborea leaves and clean drinking water was also given to them ad libitum.

The rabbits in treatment 4 were fed 50g/head/day of the experimental diet and 100g/head/day of Tectona grandis leaves. Water was served to them ad libitum. The animals were dewormed using ivomec to control both internal and external parasites. The concentrate were given to them in the morning following by the browse plants 3 hours later on cut and carry basis.

Dry matter intakes were calculated from difference between absolute feed served and the left over the following day before feeding.

The following data were collected:

a) Performance Data: This include feed intake, total weight gain, feed conversion ratio.

b) Heamatological Data: Blood samples were collected from each animal in the sixth week of the experiment from the ear lobe of the rabbits using syringes and needles into bottles containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant. The uncoagulated blood samples were analyzed for haematological parameters such as packed cell volume (PCV), haemoglobin concentration (HB), Red Blood Cell count (RBC), While Blood Cell count (WBC) and Eosinophils, neutrophils and Basophils percentage.

The initial body weight of the rabbits was determined at the beginning of the experiment. This was done using a weighting scale and ensuring that the average weight of the rabbits per treatment was the same for all the treatment.

The feed conversion ratio was determined by finding the ratio of the total feed consumed throughout the experimental period and the total weight gained per treatment at the end of the experiment.

Samples of experimental diet and the browse were prepared for analysis. The dry matter content of the sample was determined by drying to a constant weight. Crude protein was determined by Kjeldhal procedure, 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 percentages of moisture content, crude fibre, ether extract, crude protein and ash from 100.

The experimental design was a Completely Randomized Design (CRD). The data were analyzed by one way analysis of variance (ANOVA) and treatment means were separated using least significant difference (LSD) using a computer soft ware known as Statistical Package for Social Science (SPSS) 16^{th} version.

Results and Discussion

PROXIMATE CHEMICAL ANALYSIS

The proximate composition of dietary ingredients, experimental diet and the browse plants are summarized in TABLE 2

The crude protein content of 19.71% for Bambaranut waste was slightly higher than 18.2% and 17.65% reported by Ocheja *et al*, (2009) and Ocheja (2006). The nitrogen free extract of 54.32% for Bambaranut waste was slightly lower than 57.12% reported by Ahmaefule and Ironkwe, (2007). The ash content of 5.23% and 5.20%

Ether Extract were within the range reported by Ocheja, (2006) and Onyinmonyi and Ene, (2002). The crude fibre content of 16.96% was slightly lower than 17.67% obtained by Ocheja, (2006).

The crude protein content of 6.01% obtained for Rice offal was slightly lower than 6.84% reported by Ocheja et, al, (2008), but higher than 5.6% reported by Plomu, (1995). These differences could be due to differences in seasons, variety, processing methods and soil condition of Bambaranut and Rice crops.

The dry matter content of 92.60% for Rice offal was the same as 92.6% reported by Olomu, (1995) but lower than 90.07% obtained by Ocheja et.al, (2008). The dry matter content of 94.61% obtained for bambaranut waste was higher than 88.6% reported by Ocheja et.al, (2009).

The nitrogen free extract content of 26.3% for Rice offal was slightly higher than 25.30% reported by Ocheja et.al, (2008). The Ether Extract content of 5.31% was slightly lower than 5.50% obtained by Olomu, (1995). In general, the differences observed in the proximate composition of these by-product was in the line with the views of Oyediji, (2001) who reported that, the protein, fibre and energy of these by-products differ within themselves according to source and variety as well as processing methods.

The crude protein content of 15.25% obtained for senna was slightly higher than 14% reported by Allismith and Matthew (2009).

The dry matter of 53.57% and 59.25% Nitrogen free extract obtained for bamboo leaves was slightly higher than 45% dry matter and 42.8% Nitrogen free extract reported by Asaolu et.al, (2010), while 14.5% crude protein, 2.25% Ether Extract and 23.3% crude fibre were slightly higher than 10.69% crude protein, 1.45 Ether extract and 18.45% crude fibre obtained by Asaolu (2010).

The Nitrogen free extact of 63.69% obtained fro Gmelina leaves was higher than 56% reported by Okagbare et.al, (2004). The crude fibre content of 14.02% obtained was higher than 12.6% reported by Okagbare et.al, (2004). These differences may be due to varieties of leaves and differences in the season in which experiment were conducted.

PERFORMANCE CHARACTERISTIC

The performance characteristics of growing rabbits are summarized in table 3. T1 had the best feed conversion ratio (7.27) while T4 (8.24) had worst. The values obtained were significantly ($P<0.05$) different. This could be that T1 best utilized the browse and the supplement. Daily feed intake (dry matter) were significantly ($P<0.05$) affected by treatment. With T1 (88.36g) having the highest and T2 (63.23g) having the least.

Daily browse (DM) intake showed significant (P<0.05) difference with T1 (43.9g) having the highest and T2 (18.77g) having the lowest. The daily weight gain of 12.15g, 7.88g, 7.89g and 9.80g obtained for T1, T2, T3, and T4 were significantly (P<0.05) different, and were lower than 6.57g, 11.91g, 14.05g and 15.49g/day reported by Ocheja et.al, (2008) for growing rabbits fed a mixture of bambaranut waste and sweet potato meal supplemented with Tridax. This difference could be due to source of concentrate feed, species/breed responses as well as variety and processing methods.

HAEMATOLOGICAL PARAMETERS

The haematological values obtained are summarized in Table 4. The packed cell volume (PCV) values (%) obtained were within the normal range for rabbit (33.0-50.0%) reported by Onifade *et al*, (1999) and fanimo *et al*, (2003). The were no significant differences (P>0.05) among treatment groups. T2 had the highest value (38.33%) and T4 had the least (33.36). Normal values observes in the concentration of Packed cell volume (PCV) in the blood suggest absence of a toxic factor (example Haemagglutamin) which could have adverse effect on blood formation (Oyawoye and Ogunkule, 1998).

Haemoglobin (HB) values (S/L) obtained varied with T3 having the highest (40.37S/L) and T4 (37.33S/L) the lowest but were not significantly different (P>0.05). Haemoglobin (H.B.) Values Obtained were very high and statistically the same but did not fall within normal range (9.4-17.4) units for rabbits (Mitruka and Rawnsely, 1997, Rose *et al*, 1979). The high level of Haemoglobin (HB) of the treatment diets may imply that the dietary proteins were of high quality, probably due to the period of wet season. There is however a very low amount of dry matter yield at this period.

The red blood cell count fell within the same range in the treatment groups but T1 ($3.Ox10^{12}$l), had least while T3 ($3.35x10^{12}$L), had the highest, though the treatment had no significant (P>0.05) effect on the red blood cell count. The high value of Red blood cell in all the treatments indicates that animals were well nourished for healthy growth and development of the body tissues cell. (Oyawoye and Ogunkunle, 1998).

The white blood cell count showed significant (P<0.05) differences among the treatment groups. With T2 ($4.9x10^{9}$L) having the highest and T1 ($2.2x10^{9}$L) having the lowest. The white blood cell values obtained were all lower than the normal range of $5.8x10^{9}$L for rabbits reported by Ahamefule et.al, (2008). High white blood cell count is usually associated with microbial infection or the presence of foreign body antigen in the circulating system. Neutrophil values (%) obtained fell within the same range in the treatment groups and were not affected (P>0.05) by the dietary treatment. Eosinophil and Basophil values obtained were nevertheless similar (P>0.05) for all groups. T2 generally had the best haematological values for nearly all the parameters considered,

this could be due to the fact that T2 (fed with senna) being a legume provided the best quality protein amongst the browse used in the study.

Conclusion and Recommendations

This result shows that supplementation with a mixture of Bambaranut waste and Rice offal (3:1) had a significant ($P<0.05$) effect on growth rate of growing rabbits fed browse plants. Rabbits in T1 (Bamboo) performed Best.
T2 had the best Haematological values for nearly all the parameters considered.
All the four browse plants were safe for rabbit feeding based on the haematological values obtained.
Almost all the haematological values did not show significant ($P<0.05$) differences.
Any of the four browse species or their mixtures supplemented with a mixture of bambaranut waste and Rice offal (3:1) may be recommended for rabbit feeding during the long dry season.

Further research using higher levels of the browse species as well as other classes or rabbits is imperative.

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Table 1: Composition of Experimental Diet

INGREDIENTS	COMPOSITION (%)
Bambaranut Waste	75.6%
Rice Offal	24.2%
Table Salt	0.2%
Total	100

Table 2: Proximate Chemical Composition of Dietary Ingredients and Experimental Diets (On Dry Matter Basis)

Proximate composition (%)	Bambaranut Waste	Rice offal	Concentrate	Bamboo (T1)	Senna (T2)	Gmelina (T3)	Teak Leaves (T4)
Dry Matter	94.61	92.60	88.91	53.57	34.15	25.97	39.45
Crude protein	19.71	6.01	16.30	10.69	15.25	12.38	10.13
Crude Ribre	16.96	40.1	19.41	18.45	16.67	14.02	10.97
Ether Extract	5.20	5.31	5.22	1.45	2.71	2.35	2.10
Ash	5.23	20.4	7.33	10.14	5.26	7.56	19.17
Nitrogen free extract	54.32	26.3	51.66	59.25	60.11	63.69	68.13

TABLE 3: PERFORMANCE CHARACTERISTICS OF EXPERIMENTAL ANIMALS

Parameters	T1	T2	T3	T4	SEM
Number of Rabbits	3	3	3	3	-
Feeding period (days)	42	42	42	42	-
Initial means weight (g)	915	925	930	940	3.30
Final mean weight (g)	1425.33	1256	1261.33	1351.67	23.06
Total weight gain (g)	510.33a	331.9c	331.33c	411.67b	23.49
Daily weight gain (g)	12.15a	7.88c	7.89c	9.80b	0.57
Daily Supplement Intake (g) (DM)•	44.46	44.46	44.46	44.46	-
	44.46	44.46	44.46	44.46	-
Daily browse intake(g)(DM)	43.9a	18.77c	19.5c	36.3b	3.14
Daily feed intake(DM)(g)	88.36a	63.23c	63.96c	80.76b	3.19
Food conversion ratio	7.27b	8.02a	8.12a	8.24a	0.38

A, b, c, d means with different superscript on the same row are significantly different (P<0.05).
SEM: Standard Error of Means

Table 4: HAEMATOLOGICAL VALUES OF GROWING RABBITS

Parameters	T1	T2	T3	T4	SEM
PCV (%)	36.89	38.33	37.57	33.36	1.32ns
HB (S/L)	38	43	40.67	37.33	1.77ns
WBC (1,)	$2.2x10^{9}$c	$3.9x10^{9}$b	$4.9x10^{9}$a	$3.06x10^{9}$b	$1.56x10^{17}$,
RBC(L)	$3.0x10^{12}$	$3.06x10^{12}$	$3.35x10^{12}$	$3.26x10^{12}$	$1.70x10^{23}$ns
Neutrophil(%)	40	43	43.7	36.33	2.37ns
Basophil (%)	0	0.3	0.66	0.66	0.22ns
Eosinophil	3	8	6	5.67	0.73ns

A, b, c, d means with different superscript on the same row are significantly different (P<0.05)
SEM: Standard Error or Means.