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Growth Performance and Haematological Parameters of Rabbit Bucks Fed Elephant Grass *(Pennisetum purpureum)*, Tridax (*Tridax procumbens)* and Concentrate Feed

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ABSTRACT

This experiment was conducted to evaluate the growth performance and haematological parameters of rabbit bucks fed diets containing elephant grass (*Pennisetum purpureum*), Tridax (*Tridax procumbens*) and concentrate feed. The experiment was carried out at the Rabbitry Unit of the Federal College of Agriculture, Ishiagu, Ebonyi State. Twelve rabbit bucks were divided into three treatments: T1 (control: 100% concentrate), T2 (50% elephant grass and 50% concentrate), and T3 (50% Tridax and 50% concentrate). The rabbits were fed ad libitum for 10 weeks, with weekly data collection on performance parameters, including body weight, feed intake, and feed conversion ratio. There were significant ($P<0.05$) differences in the live weight among the treatments. Rabbit bucks fed Tridax (T_3) diet recorded significantly ($P<0.05$) the highest weight gain compared to other treatments. Rabbit bucks fed 0% (T_1) diet recorded the lowest body weight gain. Also there were significant ($P<0.05$) differences in the haematological parameters among the treatments. Rabbit bucks fed diet T_3 (50% Tridax and 50% concentrate) produced the best ($P < 0.05$) erythrocyte indices, i.e. RBC, PCV, Hb, MCV, MCH and MCHC among all the three treatments followed by rabbit bucks on T_2 diet.

Keywords: Growth Performance, Rabbit Bucks, *Pennisetum purpureum*,*Tridax procumbens* and Haematological Parameters

INTRODUCTION

The animal protein content of a typical Nigerian diet is about 17 percent of total protein requirements, which is lower than 60 percent in the United Kingdom and 71 percent in New Zealand [1]. In Nigeria, consumption of animal protein remains low at about 6.0-8.4g per head per day which is far below the 13.5g per day recommended by the WHO [2]. [3], predicted a decline in protein intake to 5.3g per head per day by the year 2030 which would be the lowest in the world. The myriad attempt aimed at solving low protein intake and poverty alleviation by Nigerian government still remains a mirage [4]. These reasons behind this inadequate intake of animal proteins includes short supply of animal products due to poverty, general economic recession and low level of production of the indigenous breeds of animals [5]. In order to maximize food production and meet protein requirements in Nigeria, viable options need to be explored and evaluated [6]. Among such alternatives is the use of livestock species such as rabbits that have great potentials for improved production [6]. Improved rabbit production can help in boosting the protein supply in Nigeria. Animal protein production from cattle sheep and goat require much capital as compared to rabbit which has small body size and short gestation interval. Fast-growing animals such as rabbits possess a number of features that might be of advantage to the small holder subsistence - type integrated farming especially in developing countries. The potentials and attributes of rabbit which makes it unique among

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farm animals include, high growth rate, high efficiency of conversion, short gestation period, and high prolificacy, low cost of production, high quality (meat which includes low fat, sodium, and cholesterol levels). Rabbit meat has a high protein level (about 20.8%) and it's consumption is bereft of cultural and religious biases [7], it also has excellent quality attributes [8]. Increasing demand and subsequent high cost of conventional animal feed ingredients coupled with increase in human population has created the need for sustainable alternatives particularly natural feed resources [9]. The use of forages and other agricultural by-products. Such as *Tridax procumbens*, *Pennisetum purpureum* [10], Moringa (*Moringa oleifera)* [11] Acacia (*Acasia nilotica*) [12], composite cassava meal [13] and *Commelina benghalensis*, *Lucerna leucocephala*, *Boerhavia diffusa*, *Impoma triloba* [14], have been documented. Rabbits can utilize feed stuffs that are rich in fibre and lignin since they are pseudo-ruminants [15]. Forage feeding system of rabbits should therefore make use of plants that will take almost nothing in their establishment and whose use will have the multiple effects on reducing environmental pollution and cost of keeping them at bay through manual weeding. The physiology and growth performance of farm animals are affected by several factors, one of which is nutrition [16]. Nutritional status of an individual is dependent on dietary intake and effectiveness of metabolic processes. These can be determined by combination of chemical, anthropometric, biochemical or dietary methods [17]. Feed is an important aspect of livestock production. The importance of feed supplementation in animal production has increased in the last few years [18]. Increase in meat production can be achieved through proper nutrition and inclusion of feed ingredients at normal or required levels [19]. According to [20], the nutrition affects blood values of animals. Processing of feed could have effect on growth and haematological parameters of farm animals [21]. Dietary content affect the blood profile of health of animals as reported by [22], [23]. [24], stated that haematological components which consists of red blood cell, white blood cell or leucocytes, Mean corpuscular Haemoglobin and Mean corpuscular Haemoglobin concentration are valuable in monitoring feed toxicity, especially, with feed constituents that affect the blood as well as the health status of farm animals. [25], reported that haematological parameters like haematocrit value, haemoglobin concentration, white blood cell count and red blood cell count are used in routine screening or the health and physiological status of livestock and even humans. [26], reported that haematological traits especially packed cell volume (PCV) and haemoglobin (Hb) are correlated with the nutritional status of the animal. [23] stated that RBC is involved in transport of oxygen and absorbed nutrients. Blood viscosities are however, also affected by nutrition. Livestock blood for instance, may be subjected to hyperviscosity syndrome consequent on the feed they consume which may ultimately affect other blood values including haematocrit and erythrocyte sedimentation rate [27], [25]. Elephant grass (*Pennisetum purpureum*) is a major tropical grass. It is one of the highest yielding tropical grasses. It is a valuable forage and very popular in the tropics, notably in cut-and-carry systems [28]. It is a robust, rhizomatous, tufted perennial grass. It has a vigorous system, developing from the nodes of its creeping stolon. It is an important source of forage for livestock in Africa [29]. Tridax (*Tridax procumbens*) is also a tropical forage of compositae family. It is reported as having great potential for use as livestock feed ingredient [30]. *Tridax procumbens* can be efficiently used in rabbit feeding to supplement nutrient deficiencies found in some feed stuffs.

Location of Experimental Site

The experiment was carried out at the Rabbitry unit of Federal College of Agriculture Ishiagu, Ebonyi State. Ishiagu is located within the derived savannah area of the South-East Nigeria with an annual rainfall of 1600-2000mm which occurs between March and November with a period of dry spell in between. It has an average temperature of 27^0C and is situated at latitude 5.5^0 North and longitude 7.31^0East with a relative humidity of about 88% [31].

Source, processing and preparation of experimental materials

Source of Forages and Concentrates

The forages Elephant grass (Pennisetum *purpureum*) and Tridax (*Tridax procumbens*) which were used for the experiment were obtained within the college environment where the experiment was conducted. Concentrates were purchased from the commercial livestock feed sellers in Eke Ishiagu market, Ishiagu Ebonyi State. Forage feeds were wilted before being fed to the rabbit bucks.

Housing and Management of Experimental Rabbit Bucks

A total number of twelve (12) rabbit bucks sourced from Chiagoziem Farms in Ishiagu were used for this experiment. The rabbit bucks were divided into three batches (Treatments 1, 2 and 3) viz, Four (4) rabbit bucks in each treatment. The rabbit bucks were housed according to their treatments and group feeding was practised. Forages and concentrate feed were fed to the rabbit bucks *ad libitum.* Clean water and feed were provided to each rabbit every day using drinkers and feeders which were mounted in each cage. The feeding trial was conducted for 10 weeks and the first week was used as adaptation period and data on body weight gain were collected every week regularly. The rabbits were weighed and allocated to three treatments (T_1 = Control) was placed on formulated

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diet while treatment two T_2 was placed on the elephant grass and treatment three T_3 was placed on tridax. One week prior to stocking, the cages were disinfected properly. During the one week of adaptation, the rabbits were injected with oxytetraclin and ivomectin intramuscularly and subcutaneously respectively to treat or prevent the common bacteria and parasitic diseases affecting rabbits. The rabbits were maintained in cages with wire screen floors raised to a height of 90cm from the concrete. Row cages of size 76cm x 62 x 42cm were used.

The three treatment groups were labeled T_1, T_2 and T_3 respectively

T_1 = Concentrate feed (control)

T_2 = Elephant grass (*Pennisetum purpereum*) with 50% concentrate feed and T_3 = Tridax (Tridax procumbens) with 50% concentrate feed. 100g concentrate feed was offered to the rabbits in the control group while fresh chopped elephant grass and tridax were offered as described by [32] to treatments 2 and 3 respectively.

Measurement of Rabbit Performance Characteristics

Rabbits were singly weighed at the beginning of the trial and thereafter weekly before serving fresh feed and water in the morning to determine their live body weight. Performance parameters measured were: Average initial weight, total weight gain, weekly weight gain, daily weight gain, dry matter intake and feed conversion ratio. Feed intake was taken as the difference between the feed supplied and left over for each treatment per day. The rabbits were weighed on weekly basis and weight gain for each animal per week was calculated as the difference between the present weight and the weight for the previous week. The daily weight gain was obtained by dividing the total weight gain by the number of days. Feed conversion ratio was determined by dividing the quantity of feed consumed by the weight gained.

Statistical Analysis

The data collected were subjected to analysis of variance (ANOVA) using Completely Randomized Design (CRD) as described by Steel and Torrie (1980). The significant differences between the treatments were determined at 5% confidence level while Duncan's multiple Range test [33] was used to separate significant differences among the means. All analysis were done using statistical for social sciences (SPSS, 2004). The model of CRD used:

$Xij = U + Ti + eji$

Where

Xij = Any observation made in the experiment

U = Observation means

Ti = effect of the dosage

Eij = residual error.

RESULTS AND DISCUSSION

GROWTH PERFORMANCE PARAMETERS

The results of this study are presented in the table below

Table 1. Performance characteristics of rabbit bucks fed the experimental diets

Parameters	T_1(Control) 0%	T_2 50% concentrate and Elephant grass	T_3 50% concentrate and Tridax	SEM
Initial live weight(g)	1431.00^c	1209.80^b	1225.80^a	78.75
Final live weight(g)	1577.50^c	1819.80^b	2046.30^a	96.16
Total weight gain(g)	367.80^c	594.00^b	615.33^a	64.82
Average daily weight gain (g)	5.84^c	9.43^b	9.77^a	1.03
Average weekly weight gain (g)	40.86^c	66.00^b	68.37^a	7.20
Weekly feed intake (g)	554.19^c	629.03^b	639.50^a	50.30
Average daily feed intake (g)	91.35^c	96.21^b	102.54^a	2.04
Feed conversion ratio	9.27^c	9.68^b	15.64^a	1.98

abc: Means within a row having different superscripts differ significantly ($P<0.05$)

SEM = Standard Error of Means.

The effect of the test ingredients on the performance of rabbit bucks is shown in the table above. There were significant ($P<0.05$) differences in the live weight among the treatments. Rabbit bucks fed Tridax (T_3) diet recorded significantly ($P<0.05$) the highest weight gain compared to other treatments. Rabbit bucks fed 0% (T_1) diet recorded the lowest body weight gain. The improved and better weight gain of rabbit bucks fed T_3 showed that the animals made more efficient use of the nutrients in the diet than the other groups. This agrees with the report of [33] and [34], who reported that combination of concentrate feed and *Tridax procubens* significantly improved the growth and weight gain of rabbits. The observed improvement in weight gain of rabbit bucks fed T_3 diet may be due to enough essential amino acids in the diet which were utilized and it supported growth as reported by [35]. This could be due to more balanced nutrient combinations. Adequate amount of all the essential

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amino acids and forage are required for protein synthesis to bring about increase in protein weight gain [36]. The observed depressed growth rate of rabbit bucks fed T_1 compared to the rabbit bucks fed other diet despite the higher feed intake of the rabbit bucks fed this diet indicated that the feed was not adequately translated into increased body weight gain. This may be attributed to low level of crude protein in the diet without forages. This observation is in agreement with the findings of [37] that absence of forage inclusion in rabbit diet depressed body weight gain since they are pseudo-ruminants.

The improved weight gain of rabbit bucks fed Tridax and concentrate (T_3) compared to 0% Tridax and elephant grass agrees with the report of [33], who reported that essential amino acids in the diet combined with forages is relatively high which makes it an excellent supplemental protein source to use with plant derived feed ingredients that are low in amino acids. There were significant ($P< 0.05$) variation in the feed intake of rabbit bucks among the treatments. Forage inclusion in rabbit buck diets significantly ($P<0.05$) increased feed intake of the rabbits since they are pseudo-ruminants which can convert forages into absorbable proteins for body utilization need for growth and development.

There were significant ($P< 0.05$) differences in the feed conversion ratio of the rabbit bucks. Those fed Tridax and concentrate (T_3) diet recorded superior feed conversion ratio than the control and T_2. This is because forages are rich in crude protein and minerals which may have enhanced the feed utilization of the rabbit bucks [35]. This observation indicates that the nutrients were more efficiently utilized than those fed the control (T_1) diet. This findings support earlier report that the efficiency of feed utilization for monogastric animals and pseudo ruminants is influenced by the levels of protein in the diet [38].

Haematology

Blood samples for haematological studies were collected from the prominent ear veins of the rabbits in each of the treatments. Samples were collected into bottles containing anticoagulant (EDTA). Packed Cell Volume (PCV) was determined with Wintrobe's micro hematocrit method While Red blood cell (RBC) and White blood cell (WBC) were determined with improved Neubauerhaemocytometer. The haemoglobin concentration (Hb) was determined using Cyano-Methaemoglobin method. The erythrocyte indices, Mean cell volume MCV), Mean cell haemoglobin (MCH), and Mean cell haemoglobin concentration (MCHC) were computed as described by [39].

Table 2: Effect of Elephant grass and Tridax on the haematological Parameters of Rabbit Bucks

Parameter	(Control) T_1	Elephant Grass T_2	Tridax T_3	SEM
PCV (%)	31.59^{bc}	32.31^{b}	36.89^{a}	0.14
Hb (g/dl)	8.70^{c}	11.00^{b}	15.64^{a}	0.06
RBC x 10^6/mmm^3	8.50^{c}	10.50^{b}	15.67^{a}	0.09
WBC x 10^6mm^3	19.80^{c}	27.66^{b}	30.10^{a}	0.10
MCV(FC)	23.53^{c}	28.00^{b}	32.50^{a}	0.21
MCH(Pg)	20.02^{c}	22.46^{b}	28.64^{a}	0.51
MCHC (g/dl)	28.32^{c}	32.75^{b}	40.26^{a}	0.71

abc: Means within a row having different superscripts differ significantly ($P < 0.05$)
SEM = standard Error of means

The haematological parameters of rabbit bucks feed elephant grass and tridax are shown in table 2 above. There were significant ($P < 0.05$) differences in the haematological parameters among the treatments. Rabbit bucks fed diet T_3 (tridax and concentrate) produced the best ($P < 0.05$) erythrocyte indices, i.e. RBC, PCV, Hb, MCV, MCH and MCHC among all the three treatments followed by rabbit bucks on T_2 diet. [40], opined that increased red blood cell values are associated with high quality dietary protein and with disease free animals. The values obtained for these parameters compared favourably with the standard erythrocyte values for rabbits reported by [41]. The fact that WBC values of T_3 in this study showed higher figure when compared to other treatments indicates a normal antibody production which helped in maintaining strong disease resistance. This was evident by the fact that no mortality was recorded during this experiment. Pharmacological potentials of forages have been reported by [42]. This is an indication that the rabbits on T_3 were not anaemic because of the normal physiological relationship of haemoglobin with oxygen in the transport of gases to and from the tissues of the body. The values of MCHC, MCH and MCV were in consonance with the normal reported by [43].

CONCLUSION

This study which evaluated the growth performance and haematological effects of rabbit bucks fed diets comprising elephant grass (*Pennisetum purpureum*) and Tridax (*Tridax procumbens*) supplemented with a formulated concentrate feed. The findings revealed significant impacts of the diet fed to rabbit bucks in treatment three (tridax) on growth parameters, feed intake, and overall health of the rabbit bucks.Tridax provided essential nutrients, while the concentrate feed served to balance any deficiency, ensuring optimal growth and development.

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The rabbit bucks fed tridax were found to have enhanced high level of RBC, WBC and Haemoglobin, and physiological well-being of the animals compared to traditional feeding methods. Moreover, the inclusion of locally available forages like Tridax and elephant grass demonstrates the feasibility of reducing feeding costs without compromising the well-being of rabbit bucks.

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