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Haematology, Carcass and Relative Organ Weights of Growing Rabbits on Skip-A-Day Concentrate Feeding Regime

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Abstract

The potentials of two common weeds, Aspilia africana (Aa) and Tridax procumbens (Tp), as forages for rabbits were investigated in a study that lasted for 70 days. Thirty five (35) rabbit bucks of mixed breed of between 5 to 7 weeks of age, weighing 519 ±5g, were used for the study. The haematological, carcass and organ characteristics were examined. The rabbits were divided into 5 treatment groups of seven (7) rabbits each, with each rabbit serving as a replicate in a complete randomized design. Group 1 was placed on sole concentrate feeding while concentrate was skipped for 1, 2 and 3 days in groups 2, 3, and 4 respectively with ad-libitum forage (Aspilia africana {Aa} and Tridax procumbens {Tp}) feeding. Group 5 was fed on a sole forage diet of 250 g Aa: 250 g Tp for 56days, after which they were fed concentrate in addition to the forage for two weeks. The red blood cell count values for rabbits on sole concentrate feeding was significantly (P<0.05) higher than the values observed in rabbits on treatments 2, 3 4 and 5, that were similar (P>0.05). The final weights of the rabbits decreased linearly (P<0.05) as the number of days of concentrate feeding decreased. The dressing percentages in treatments 1, 2, 3 and 4 (64.21, 62.97, 64.73 and 62.51 % respectively) were similar (P>0.05) but significantly higher (P<0.05) than the value for rabbits in treatment 5 (56.88 %). Organ characteristics of the rabbits showed that, apart from the relative kidney weights, other organ weights were not significantly (P>0.05) affected by the dietary treatments. It can be concluded that although feeding rabbit with sole concentrate gave the highest weight gain, the use of these forages could reduce cost of production, especially feed cost, drastically, and where it is difficult to get concentrates, these forages can be fed to rabbits for maintenance. Their use would be expected to minimize cost of maintaining a clean environment and the use of non-competitive forages as rabbit feeds could encourage rural rabbit production.

Keywords: Carcass, growing rabbit, forages, relative organs weights, skip-a day,

Introduction

Although rabbit production holds a great potential for meeting the animal protein needs of the people in developing countries, the current urban development and seasonal variations in availability of forages, coupled with high cost of rabbit concentrates, can constitute serious limitations to its expected expanded production. The rabbit is a small herbivore that has evolved a digestive tract uniquely suited to the utilization of herbage; hence its feeding does not pose much problem as poultry and pigs. It can utilize high levels of

roughage and forage materials, thereby releasing the pressure on scarce grains, vegetable protein concentrates and animal protein concentrates (Obioha, 1998).

Agricultural by-products have been recommended for utilization by rabbits. However, the present focus on search for alternative protein and energy from commonly investigated non-conventional feed sources such as oil-seed and cereal by-products for monogastrics like poultry and pigs, has led to astronomical increase in their prices. There is, therefore, the need to seek for further alternative sources of feed to sustain rabbit production so as to raise the level of protein intake by Nigerians. One major advantage of rabbit keeping over poultry and pig is its ability to thrive on forages which cannot be consumed directly by man.

Forage feeding system of rabbits should however make use of plants that will cost almost nothing in their establishment, and the use of which will have the multiple effect reducing environmental pollution/contamination and cost of keeping them at bay through manual weeding. However, such plants should possess the ability of being easily converted into useful animal protein. Two of such plants are *Aspilia africana* and *Tridax procumbens*. The agronomic characteristics of both plants have been extensively discussed by Akobundu and Agyakwa (1987), and they have high potentials in rabbit feeding in the derived savanna zone of Nigeria as they are commonly found in the zone. In practice, feeding a combination of forages to rabbit has some advantage as opposed to single forage offers because what is lacking in one may be supplied by the other (Harris *et al*. 1984; Nweze, 2005). Harris *et al.* (1984) reported a better feed conversion ratio using a mix of alfafa with grass hay for fryer rabbits. Nweze (2005) reported that feed conversion ratio of rabbits fed a mixture of *Panicum maximum* and *Centrosema pubescens* was superior to that of rabbits fed sole forage of *Panicum maximum*. Feeding regimes are at times adopted for convenience and/or control of some physiological phenomena in livestock. This study was designed to investigate some haematological parameters, carcass and relative organ weights of growing rabbit on skip-a-day concentrate feeding regime.

Materials and Methods

Site of the experiment: The experiment was carried out at the Rabbitry unit of the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, located within the derived savannah zone of Nigeria.

Experimental diets: The experimented diets consisted of a pelletized balanced concentrate (Table 1) that meets the nutrient requirements of growing rabbits and *Aspilia africana* (Aa) and *Tridax procumbens* (Tp) forages (succulent stems and leaves). The forages were harvested fresh daily from the surroundings of the rabbitry unit, where they grow as weeds. They were cleaned of sands and insects before they were fed to the rabbits.

Experimental animals and management: Thirty five (35) mixed breed male weaner rabbits of between 5 - 7 weeks of age, weighing 519 ±5g were used in a feeding trial that lasted for 70 days. The rabbits were randomly distributed into 5 treatments of seven (7) rabbits each in a complete randomised design. Each rabbit served as a replicate. The treatments were as follows:
Treatment 1: sole concentrate feeding;

Treatment 2: feeding concentrate every other day plus *ad-libitum* forage feeding;
Treatment 3: feeding concentrate after every 2 days plus *ad-libitum* forage feeding;
Treatment 4: feeding concentrate after every 3 days with *ad- libitum* forage feeding;
Treatment 5: sole forage feeding for the first 56 days and then concentrate feeding for two weeks thereafter.

The feeding regime is presented in Table 2. Concentrate was offered in earthen pots reinforced with concrete and flattened at the bottom to prevent tipping off. Weighed quantities of the forages were placed in the cages and the rabbits had unrestricted access to the forages. The animals were fed twice daily at 08.00 hrs and at 16.00 hrs while water was supplied *ad-libitum.* At the end of the feeding trial, the animals were slaughtered for carcass analysis.

Table 1: Gross composition of the concentrate feed

Ingredients	Quantity (%)
Maize	30.0
Corn offal	13.0
Groundnut cake	10.0
Palm kernel cake	12.0
Wheat offal	20.5
Brewers dried grain	6.00
Rice bran	5.00
Fish meal	1.00
Bone meal	2.00
Salt	0.25
Premix*	0.20
Total	100

** Premix composition per kg diet:Vitamin A – 3,200,000iu, Vitamin D3 1,200iu, Vitamin E 3,200iu Vitamin K_3 800mg, Vitamin B_1 – 400mcg, Selenium (Se) 40mg, Manganese (Mn) 32,000mg, Pantothenic acid 2000mg, Folic acid 200mg, Choline chloride 60000mg, Iron (Fe) 8,000mg, (Cu) 3,200mg, Zinc (Zn) 2,00mg, Cobalt (Co) 90mg, Iodine (I) 800mg.*

Data collection

Heamatological analysis: At the 7th week blood samples were collected into tube containing Ethylene Diamine Tetra acetic Acid (EDTA) as anticoagulant. Parameters measured include packed cell volume (PCV) which was determined by the microhaematocrit method according to Dacie and Lewis (1991). Haemoglobin (Hb) concentration was determined by Cyanometamoglobin method of Kelley (1979). Red blood cell count (RBC) and white blood cell count (WBC) were determined using improved Neubauer Haemocytometer method as described by Jain (1986).

Carcass and Organ Evaluation: On day 70, the animals were starved overnight and three animals were randomly selected from each treatment group for carcass and organ evaluation. The rabbits were stunned and bled after cutting of the jugular vein with sharp knife, and evisceration was carried out immediately. Bled weight, eviscerated

weight and carcass weight of each animal were recorded. The weight of internal organs like liver, kidney, spleen, heart and the lungs were recorded as well.

***Proximate analysis*:** The proximate compositions of the concentrate and the forages (Aa and Tp) were determined by the methods of AOAC (2005).

Statistical analysis: All data generated were subjected to analysis of variance using the General Linear Model of SAS (2000).

Table: 2 Chemical compositions of concentrate feed, *Aspilia africana* and *Tridax procumbens*

Nutrient	**Concentrate feed**	***Aspilia africana***	***Tridax procumbens***
Dry matter (%)	90.14	90.77	90.64
Crude fiber (%)	8.00	14.96	15.88
Crude protein (%)	16.93	17.32	16.73
Ether extract (%)	4.05	5.60	5.33
Ash (%)	7.83	13.37	12.66
Gross energy (MJ/kg)	3.38	3.89	3.92
Nitrogen Free Extract (%)	55.21	39.52	40.04

Results and Discussion

The proximate compositions of the concentrate and experimental forages are presented in Table 2. Their crude protein contents fell within the range recommended by NRC (1984) for growing rabbits, and comparable with the levels used in earlier studies (Ojebiyi *et al*., 2006; Amaefule and Ironkwe, 2007). Other proximate components were also similar, suggesting comparable feeding values.

Table 3 contains the haematological parameters of the experimental rabbits. Significant ($P<0.05$) differences were observed in the red blood cell counts. The packed cell volume (PCV), according to Wilson and Brigstoke (1981), is an indicator of blood dilution. In this study, there were no significant differences among treatments in the value of PCV. This may attest to the good physiological state of the rabbits. Haemoglobin, according to Sainsbury (1983), measures the ability of an animal to withstand some levels of respiratory stress. The value obtained in this study ranged between 9.51-10.41 g/dl. All the values fell within the normal values reported by Mitruka and Rawnsley (1977), an implication of the adequacy of the experimental diets in critical nutrients. Levels of haemoglobin lower than normal are indicative of dietary deficiency of iron, copper, vitamin and amino acids (Frandson, 1981). The dietary effects of the forage/concentrate feeding and their combination shows that RBC were not significantly ($P<0.05$) affected. The values, except for the control, were lower than the normal range ($11\text{-}6.51 \times 10^6 mm^3$) recommended by (Mitruka and Rawnsley, 1977), and the values of Taiwo *et al.* (2006), Oduguwa (2006), and Bitto *et al.* (2010). They were however comparable to the value ($3.81\text{-}4.48 \times 10^6 mm^3$) reported by Ojebiyi (2009). According to Farinu (1983), leukocytosis and leucopenia may be due to

certain infections, especially those caused by protozoa, viruses or bacilli or by intoxication from certain chemicals (Mitruka and Rawnsley, 1977). However, no clinical signs of ill health were observed in this study. The red blood cell counts of the rabbits on the sole concentrate feeding (5.60) and rabbits in treatment 2 (4.90) were similar (P>0.05), and significantly (P<0.05) higher than for the rabbits on treatments 3 (4.19), 4 (4.60) and 5 (4.10) that were comparable. The normal physiological functions of erythrocytes are gas exchange, participation in the buffer system of blood and in the clotting mechanism (Oyebola, 2002).

Table 3: Haematological characteristics of rabbits fed skip-a-day concentrate feeding regime

PARAMETERS	TREATMENTS				
	1	**2**	**3**	**4**	**5**
Packed cell volume (%)	29.55±0.13	31.31±0.11	30.00±0.19	28.69±0.39	29.59±0.29
Haemoglobin (g/dm)	9.89±0.49	10.41±0.44	9.99±0.67	9.51±0.13	9.89±0.97
White blood cells (per mm^3)	3.47±0.095	3.10±0.082	3.33±0.067	3.43±0.067	3.63±0.012
Red blood cells (per mm^3)	$5.60±0.13^a$	$4.90±0.39^b$	$4.19±0.42^b$	$4.60±0.31^b$	$4.10±0.41^b$

Table 4: Carcass and organ characteristics of rabbits on skip-a-day concentrate feeding regime

Parameters	Treatments				
	1	2	3	4	5
Weight at 56days (g)	$1385.00±77.45^a$	$1279.80±50.17^b$	$1219.37±30.73^c$	$948.38±37.85^d$	$589.16±21.03^e$
Weight at 70 days (g)	$1686.29±31.05^a$	$1523.63±12.70^b$	$1346.57±30.73^c$	$1235.00±18.26^d$	$873.834±20.27^e$
Carcass weight (g)	$1082.73±6.17^a$	$959.36±6.52^b$	$871.60±28.30^c$	$772.00±12.24^d$	$497.00±9.77^e$
Dressing (%)	$64.21±0.51^a$	$62.97±0.18^a$	$64.73±0.74^a$	$62.51±0.16^a$	$56.88±0.28^b$
Organ weights (%of live weight)					
Kidney	$0.57±0.00^c$	$0.63±0.0^{0c}$	$0.67±0.01^c$	$0.79±0.01^b$	$0.91±0.00^a$
Spleen	0.21±0.08	0.21±0.01	0.23±0.01	0.24±0.01	0.23±0.01
Liver	3.05±0.00	3.03±0.00	3.03±0.00	3.08±0.02	30.50±0.00
Heart	3.23±0.09	3.27±0.00	3.37±0.09	3.23±0.00	3.52±0.00
Lungs weight	0.25±0.00	0.23±0.00	0.24±0.00	0.23±0.00	0.25±0.02

The carcass and organ characteristic of the experimental rabbits are presented in Table 4. The final weights of the rabbits decreased linearly (P<0.05) as the number of days of concentrate feeding decreased. The highest weight (1686.29 g) was recorded in the rabbits fed sole concentrate while the least weight (873.83 g) was recorded in rabbits fed on sole forage for 8 weeks before being supplemented with concentrate for 2 weeks thereafter. From the results obtained in treatment 5 (sole forage feeding for the first 56 days and then concentrate feeding for two weeks

thereafter), the change in feeding regime positively affected the weights of the rabbits in this group thus suggesting a compensatory growth when an animal is returned to a better quality feed after a period of poor quality feeding and or feeding regime.

The final weights obtained in this study, especially for rabbits on treatments 1, 2, 3 and 4 were comparably higher than the values reported by Fanimo and Oduronbi (2006) and Taiwo *et al.* (2005). The dressing percentage obtained in this study for treatments 1, 2, 3 and 4 (64.21, 62.97, 64.73 and 62.51% respectively) were similar ($P>0.05$) and significantly higher ($P<0.05$) than the value for rabbits in treatment 5 (56.88%). The values were lower than those reported by Bawa *et al.* (2007). The observed similarity observed in the dressing percentages of rabbits in treatments 1, 2, 3 and 4 in spite of the differences in final weights may be an indication of lower viscera weights in rabbits having comparative lower final weights . The lower carcass yield observed in rabbits in treatments 5 may be due to the overdeveloped digestive tract, which according to Lebas *et al.* (1996), lowers carcass yield.

Apart from the relative kidney weights, other organ weights were not significantly ($P<0.05$) affected by the dietary treatments. This may be an indication that there were no incriminating factors that can cause hypertrophy or hypotrophy of these organs in the diets offered. The relative kidney weights increased linearly ($p<0.05$) with an increase in the number of days concentrate feeding was skipped. The lowest weight (0.57) was recorded in treatments 1 (sole concentrate feeding) while the highest (0.91) was observed in treatment 5 (sole forage feeding for the first 56 days and then concentrate feeding for two weeks thereafter) ($P<0.05$). The kidney as well as the liver play important roles in the detoxification and excretion of most toxic materials from body (Ani *et al.*, 2008). Increase in kidney weight of the rabbits can be attributed to proliferations of nephrons of the organ (Lim *et al.*, 1996). Histological confirmations were however not done to verify this. This may be the focus of further studies.

Conclusions

This study further confirms the safety of *Aspilia africana* and *Trdax procumbens* in feeding rabbits. Although their use could help in controlling the weeds and reduce the feeding cost, they cannot be fed solely for fattening purposes.

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