

SHORT NOTE

PRELIMINARY STUDY ON THE PERFORMANCE OF RABBIT BUCKS FED SOLE FORAGE, CONCENTRATE AND THEIR MIXTURES

ESTUDIO PRELIMINAR DEL CRECIMIENTO Y PUBERTAD DE CONEJOS ALIMENTADOS CON FORRAJE O CONCENTRADO Y SUS MEZCLAS

Ojebiyi, O.O.^{1*}; Asaolu, V.O.¹; Oladunjoye, I.O.²; Omotola, O.B.¹ and Olaniyi, S.A.¹

¹Department of Animal Nutrition and Biotechnology. LadokeAkintola University of Technology. Ogbomoso. Nigeria. *segunojobiyi@gmail.com

²Department of Animal Production and Health. LadokeAkintola University of Technology. Ogbomoso. Nigeria.

ADDITIONAL KEYWORDS

Aspilia africana. Pellets. Reproductive development. Supplementation. *Tridax procumbens*.

PALABRAS CLAVE ADICIONALES

Aspilia africana. Desarrollo reproductivo. Granulado. Suplementación. *Tridax procumbens*.

SUMMARY

Thirty five rabbit bucks of mixed breed of 7 weeks of age, weighing 519 ± 5.00 g were used to investigate the potentials of two common weeds, *Aspilia africana* (Aa) and *Tridax procumbens* (Tp) as forages. The rabbits were divided into 5 groups in a completely randomised design. Group 1 was placed on sole concentrate feeding; concentrate feeding was skipped for 1, 2 and 3 days in groups 2, 3, and 4 respectively with *ad libitum* mixed-forage Aa and Tp feeding. Group 5 was fed on a mixed-forage diet of 250 g Aa: 250g Tp. The daily pellet intake decreased linearly as the number of days that concentrate feeding was skipped increased. Rabbits in groups 2 and 4 reached puberty at 13.8 and 14.0 weeks respectively, which were longer ($p<0.05$) than 12.8 and 13.1 weeks for groups 1 and 3. None of the rabbits on the sole forage diet reached puberty at the end of the experiment. Supplementation of the test forages with 23-43 g of a balanced concentrate feed per rabbit per day could give satisfactorily performance.

RESUMEN

Treinta y cinco conejos de raza mezclada de 7 semanas de edad con peso de 519 ± 5.00 g, fueron empleados para investigar el potencial de dos adventicias comunes, *Aspilia africana* (Aa) y *Tridax procumbens* (Tp) como forraje para conejos. Los conejos fueron divididos en 5 grupos con

un diseño completamente al azar. El grupo 1 consumió solamente concentrado. El concentrado fue omitido por 1, 2 o 3 días en los grupos 2, 3 y 4 respectivamente con alimentación *ad libitum* de una mezcla de Aa y Tp. El grupo 5 fue alimentado con mezcla de 250 g de Aa y 250 g de Tp. La ingestión diaria de gránulos, disminuyó linealmente al aumentar el número de días en que el pienso era omitido. Los grupos 2 y 4 alcanzaron la pubertad a 13,8 y 14,0 semanas respectivamente, tiempo que fue mayor ($p<0.05$) que las 12,8 y 13,1 semanas que tardaron los grupos 1 y 3. Ningún conejo de la dieta exclusiva de forraje alcanzó la pubertad al final del experimento. La suplementación del forraje con 23-43 g por conejo y día de un concentrado balanceado podría permitir un rendimiento satisfactorio.

INTRODUCTION

In rabbit production replacement or supplementation of concentrate diets by forages especially non-competitive types is very promising. Rabbits can utilise feedstuffs that are rich in fibre and lignin (Finzi, 2008). 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 of reducing environmental

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pollution and cost of keeping them at bay through manual weeding. *Aspilia africana* (Aa) and *Tridax procumbens* (Tp) are two common forages that meet the above criteria, and with high potentials as rabbit feeds in the derived savannah zone of Nigeria. Nutrient compositions of forages are known to differ with a variety of factors including types and species of forage (FPDD, 1989). Hence, feeding a combination of forages to rabbits is a good practice to take advantage of the synergistic effects of such combinations. In poultry, the concept of *skip a day* feeding regime is popular Ojebiyi *et al.* (2002); whereas the phenomenon is not common in rabbit production. This study was designed to assess the growth performance and puberty attainment of rabbit bucks fed sole concentrate and forage Aa and Tp diets and their combinations.

MATERIALS AND METHODS

A concentrate diet containing dry matter: 90.1 %, crude fiber: 8.0 % DM, crude protein: 16.9 % DM, ether extract: 4.05 % DM, ash: 7.83 % DM, nitrogen free extract: 55.2 % DM, gross energy: 3.38 MJ/kg of DM was formulated and pelletized by extrusion method using 6 mm die. *Aspilia africana* and *Tridax procumbens* forages (succulent stems and leaves) were harvested fresh daily from the surroundings of the rabbitry unit where they grew as weeds. They were cleaned of sands and other contaminants before use.

Thirty five mixed breed (New Zealand White x Chinchilla) weaned male rabbits of 7 weeks of age with average weight of 519 ± 5.00 g were used for the study. The rabbits were allotted to 5 treatments of 7 rabbits each in a completely randomised design as follows: 1: sole concentrate feeding; 2: concentrate feeding every other day plus *ad libitum* forage feeding; 3: concentrate feeding after every 2 days plus *ad libitum* forage feeding; 4: concentrate feeding after every 3 days with *ad libitum*

forage feeding; 5: sole forage feeding. The animals were fed twice daily at 8.00 h and at 16.00 h while clean drinking water was made available to the animals at all times. Feed intake and weight changes were monitored throughout the experiment which lasted for 56 days. Puberty attainment determination was done using the first attempt at mounting (Lebas *et al.*, 1986), which commenced from the fourth week of the study. Mature receptive does were used to test puberty attainment by the bucks. The receptive does were introduced to the bucks and observations were made on nudging, attempt to mount, and actual riding. The buck that actually mounted and made attempt to mate was assumed to have reached puberty. The age and weight at puberty were recorded.

Concentrate and forages were analyzed for proximate contents according to AOAC (2005). Gross energy determination was done using the Gallenkamp Ballistic Bomb Calorimeter. The performance data were subjected to analysis of variance using the general linear model of SAS (2000). Significant differences were compared using Duncan Multiple Range Test.

RESULTS AND DISCUSSION

The nutrient composition of Aa 90.8, 14.9, 17.3, 5.60, 13.4, 39.5, 3.89 is similar to that of Tp 90.6, 15.9, 16.7, 5.33, 12.7, 40.0, 3.92 for dry matter (%), crude fiber (% DM), crude protein (% DM), ether extract (% DM), ash (% DM), nitrogen free extract (% DM), gross energy (MJ/kg) of DM respectively.

The rabbits on sole concentrate feed had the highest ($p < 0.05$) weight while the rabbit fed solely on forages had the least (**table I**). Even though the crude protein content of the concentrate and the forages were of a similar magnitude, the poorest weight gains of the rabbits on the sole forage diet may be due to generally accepted poorer amino acid profile of forages. High quality protein diets are known to improve growth rates and meat yields (Spreadbury

GROWTH AND PUBERTY ATTAINMENT OF RABBIT BUCKS

Table I. Effect of sole forage, concentrate feeding and their mixture on feed intake, weight changes and mean weights and ages at puberty of rabbit bucks ($n=7$). (Efecto del empleo de forraje únicamente, concentrado o sus mezclas sobre la ingestión de alimentos, cambios de peso y peso y edad medios a la pubertad en conejos ($n=7$)).

Performance	sole concentrate	skip-a-day	skip 2 days	skip 3 days	sole forage	SEM
Initial weight (g)	516	515	515	519	519	36.0
Final weight (g)	1385 ^a	1280 ^b	1219 ^b	948 ^c	589 ^d	49.6
Daily weight gain (g)	14.42 ^a	12.67 ^b	11.44 ^b	6.99 ^c	1.99 ^d	0.45
Daily pellet Intake (g)	68 ^a	34 ^b	23 ^c	16 ^d	0 ^e	0.17
Daily <i>Aspilia</i> intake (g)	0 ^e	146 ^d	160 ^c	176 ^b	210 ^a	0.87
Daily <i>Tridax</i> intake (g)	0 ^e	97 ^d	107 ^c	117 ^b	140 ^a	0.58
Age at puberty (weeks)	12.8 ^b	13.8 ^a	13.1 ^b	14.0 ^a	0.00 ^e	0.49
Weight at puberty (g)	1251 ^a	1247 ^a	1197 ^b	1055 ^b	0.00 ^c	23.7

^{abcde}Means along same row with different superscripts are significantly different ($p<0.05$).

and Davidson, 1978).

The daily intake of concentrate feeds decreased linearly ($p<0.05$) with increase in number of days concentrate feeding was skipped. Treatment 1 had the highest while the least was recorded in treatment 4. The daily forage intake for Aa shows that treatment 5 had the highest ($p<0.05$) value while the least was recorded in treatment 2. Similar trend was observed in the intake of Tp.

Rabbits on sole concentrate feeding had the highest ($p<0.05$) daily weight gain. Rabbits in treatments 2 and 3 had similar weight gains while those on treatment 5, that is, fed solely on forage, had the least daily weight gain. The similarity in values of daily weight gains for T2 and T3 shows that feeding rabbits with these forages and supplementation with some concentrates could result in comparable daily weight gains (12-15 g) obtainable in most studies in the tropics (Lorgyer *et al.*, 2008), even where sole concentrate feed were offered. The onset of puberty is more closely related to body weight than age (Hafez, 1987). The practical application of age at puberty is that early onset of sexual maturity provides economic advantage through increased lifetime reproductive rate (Fitzgerald *et al.*, 1992). In this study, there were significant

differences ($p<0.05$) between the weights at puberty. Bucks on T1 and T3 reached puberty at an earlier age than those on T2. Animals on treatment 4 reached puberty later although at a lower weights than those on treatments 1, 2, and 3. They were also more active. The observed activeness and lower consumption of the concentrate here may be responsible for these as they may have low or no fat deposition in the body, although this was not investigated. The ages at puberty obtained here were similar to those reported by Lebas *et al.* (1986). The mean age and weights at puberty is presented in **table I**. Puberty attainment appraisal on weekly basis is presented in **table II**. In rabbits, the onset of puberty varies from breed to breed. Lebas *et al.* (1986) reported that feeding has more influence on puberty attainment than climate. This is corroborated by Osinowo (2006) that under-nutrition delays puberty. It thus appears therefore that rabbits in treatment five (sole forage feeding) were undernourished. It could also be as a result of low dry matter intake because the forages were not offered as hay.

While some rabbits (4, 3, 3, and 2 rabbits for treatments 1, 2, 3, and 4 respectively) attained puberty, although at different ti-

Table II. Puberty attainment of rabbit bucks fed sole sole forage, concentrate and their mixtures. (Llegada a la pubertad de conejos alimentados solo con forraje, concentrado o combinación de ambos).

Treatment (n=7)	weeks of experiment			
	4	6	8	Total
Sole concentrate	0.00	2.00	2.00	4.00
Skip a day	0.00	0.00	3.00	3.00
Skip 2 days	0.00	1.00	2.00	3.00
Skip 3 days	0.00	1.00	1.00	2.00
Sole forage	0.00	0.00	0.00	0.00
Total of attempts	0.00	3.00	9.00	12.0

mes, none of the rabbits on the sole forage diet attained puberty at the end of the experiment. The implication of this finding is that although rabbits can be maintained

on these forages, the growth as well as reproductive performances may be adversely affected. The results obtained in this study were similar to the findings of Onwudike (1995) who reported that rabbits produce better when fed mixtures of forage and concentrate.

CONCLUSIONS

Rabbits offered a balanced supplement concentrate feed at 23.0 and 34.0 g/d adopting *skip-a-day* and *skip 2-days* feeding regimes respectively grew satisfactorily while none of the rabbits on the sole forage diet reached puberty at the end of the 8 weeks of experiment. It was also observed that offering a balanced concentrate feed at 16.0 g/day resulted in puberty attainment by rabbit bucks though at later age than sole concentrate and skip 2-days regime.

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