WEANER RABBITS: NUTRITIONAL EFFECTIVENESS OF CONCENTRATE DIETS SUPPLEMENTED WITH DIFFERENT FORAGES

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Abstract

In order to avert the increasing cost of conventional feed, there is a need for other alternatives and cheaper forages. This study investigated the dietary efficiency of *Gliricidia sepium* and *Leucaena leuciocephala* in rabbit nutrition. In 8 weeks, 24 weaner rabbits of both sexes were randomly allotted to three experimental diets (n=8): group A received *Centrosema pubescens* (as the control), group B received *Gliricidia sepium*, and group C received *Leucaena leucocephala*. The rabbits were fed a 1:1 mixture of forages and concentrate diet; they were fed at 5% of their body weight. The chemical composition of the concentrate and experimental forages, the growth performance of rabbits fed based diets, and the digestibility of forages fed to rabbits (total fecal and urine collection) were all investigated. The results show that *Leucaena leucocephala* has the highest crude protein (26.17%), ether extract (34.90%), and organic matter (93.95%). Similarly, *Gliricidia sepium* and *Centrosema pubescens* have the highest crude fiber (14.57%) and ash content (6.69%). Rabbits fed the *Leucaena leucocephala* diet gained the most weight, with a mean gain of 897.92±9.25g/rabbit. The *Leucaena leucocephala* based diet contains the highest fecal crude protein and nitrogen, while the *Centrosema pubescens* diet has the highest dry matter content. It was therefore concluded that *Leucaena leucocephala* had the best dietary efficiency.

Keywords: Rabbits, nutrition, *Gliricidia sepium*, *Leucaena leuciocephala*, diet

Introduction

Low livestock production results in insufficient animal protein, and the demand for animal protein has made it critical for farmers to intensify livestock production (Odeyinka *et al*., 2003). The solutions to this problem of low animal intake by humans are to increase the production of small, highly prolific livestock with a rapid turnover rate, such as rabbits. Their feeding habits offer no significant competition with humans for both cereal and legume grains, as they can survive on a diet primarily composed of grass. They can utilize cellulose effectively, cope with grasses and legumes, and play an important role in the supply of animal protein (Akindele & Adeosun, 2022; Egbo *et al*., 2001). The cost of grains and their by-products, used in concentrated diets, is expensive and scarce, but forage is cheap and abundant. Studies have shown that it is economical to feed a mixed diet of concentrate and forage to raise rabbits (Akindele & Adeosun, 2022).

Forage use in livestock feeding is a common practise (Akindele & Adeosun, 2022). *Leucaena leucocephala*, a miracle tree, is used for a variety of purposes, such as firewood and livestock feed (Odedire and Babayemi, 2007). Farmers prefer *Gliricidia sapium* as a fast-growing tree for living fences, fuel, green manure, shade crop support, and erosion control. *Centrosema pubescens* is a vigorous trailing, twining, and perennial herb that is used as a cover crop (Amaefule *et al*., 2004). However, information on the use of these forages on growth and nitrogen utilization was not fully explored, therefore, the focus of

this study will be on the use of *Leucaena leucocephala*, *Giliricidia sepium*, and *Centrosema pubescens* as rabbit feed and their effects on the growth and nitrogen utilization of weaner rabbits.

Materials and Methods

Experimental site, Collection and preparation of plant material

The study was performed at the Teaching and Research farms, (Rabbit Unit), Obafemi Awolowo University (OAU) Ile-Ife, Osun State Nigeria. The fresh stem of the forages was harvested and tied as bunch and was hung at the hutch of the rabbit cage for easy access by the rabbits.

Experimental design

Twenty-four (24) mixed (both sexes) stocks of weaner rabbits with a weight ranging from 451 to 452g were grouped into three (n=8) randomly. The animals were weighed before the commencement of the research and then weekly for 8 weeks, so as to determine weight changes.

Experimental Diet

The rabbits were purchased from an Ile-Ife market and acclimatize for seven (7) days with feed and water at 12 hours day and night. Three forage diets were fed to the rabbits in replicate at a rate of 5% (2.5% forages and 2.5% basal concentrate) per body weight: group A received *Centrosema pubescens* (as a control), group B received *Gliricidia sepium*, and group C received *Leucaena leucocephala* hung on the rabbit's individual hutch to prevent contamination. Clean, fresh water was given to the animals *ad libitum.*

Analysis and Data collection

The rabbit's weight was measured at the beginning of the experiment and weighted at weekly intervals for eight weeks, and data was collected so as to monitor weight gain and/or loss. The rabbit's feed was weighed before each feeding and after each feeding (leftovers) to determine feed intake. Faeces and urine from the animals were collected using a modified metabolism tray. Forages, feed samples, faeces, and concentrated feed were analysed for proximate contents, and the urine was digested to determine the nitrogen utilization of the rabbit according to the procedure of the AOAC (2005).

Statistical Analysis

Statistical analysis of all the data was conducted using the General linear model procedure of SAS (2008) and to separate the significant from the mean, the Duncan multiple range test was used.

Results and Discussion

Table 1 depicts the chemical composition of the concentrate and selected experimental forages fed to the animals. The percentage crude protein (CP) contents of *Leucaena leucocephala* and *Gliricidia sepium* are comparably better compared to the reports of Adedeji *et al.* (2013), Odedire and Oloidi (2018), and Odedire and Abegunde (2015), respectively, and the CP requirement recommended for rabbits.

Table 1: Chemical composition of the concentrate and selected experimental forages fed to the animals.

TREATMENT GROUPS / PARAMETER (%)	Concentrate	*Centrosema pubescens*	*Gliricidia sepium*	*Leucaena leucocephala*
Dry matter	72.00	57.00	36.00	36.00
Crude protein	23.59	21.63	24.58	26.17
Crude fiber	10.39	14.47	14.57	12.33
Ether extract	7.79	5.49	7.50	8.90
Ash	6.49	6.69	5.73	6.05
Organic matter	93.51	93.31	94.28	93.95

Data are expressed as Mean ± SEM. Values with different superscript along the row differs significantly ($p<0.05$).

It was found that *Centrosema pubescences* and *Gliricidia sepium* have high crude fiber (CF) values, which are within the CF range of 12-15% recommended for rabbits, and this corroborates with the reports of Adedeji *et al*. (2013), and Aye (2015). These could be as a result of the season, and the age; the

frequency at which the forages are harvested; and the proportions of cellulose, hemicellulose, and lignin. Ether extract (EE) digestibility indicates better utilization of dietary fat in the diets by providing the rabbits with essential fatty acids and improving their energy utilization (Ikyume *et al*., 2019). High EE contents have been associated with rich sources of carotene and pigments (Odedire and Oloidi, 2018). *Leucaena leucocephala* was observed to contain a relatively higher EE than the concentrates, *Gliriculia sepium,* and *Centrosema pubescens*. This is similar to that recorded by Adedeji *et al*. (2013). Ash is the total mineral content of a forage or diet that ranges from 7.2% to 17.9% and aids in the promotion of balanced animal growth. The decrease in ash contents found in the present study may be due to variation in soil and other habitat features (Kafeel *et al*., 2013).

The growth performance of rabbits fed with *Centrosema pubescens, Gliricidia sepium,* and *Leucaena leucocephala* based diets for eight weeks is shown in Table 2. Rabbits fed the *Leucaena leucocephala* diet recorded the highest mean values for total weight gain and daily weight gain. This is in agreement with Adeyemo *et al.* (2013). The high feed intake of the *Centrosema pubescens* diet and weight gained by rabbits fed *Leucaena leucocephala* may be due to its (1) palatability or taste (Igwebuikwe *et al*., 2007) and (2) high digestibility to release overall nutrients for the animal's growth (Fakolade & Adetomiwa, 2018). Feed conversion ratio (FCR) is the feed requirement per unit of body weight gain. The lower FCR values indicate higher efficiency of the feed, which correlates with body weight gain as revealed in this study. The *Leucaena leucocephala* diet showed the lowest FCR, followed by the other diet and the concentrate.

Table 2: The growth performance of rabbits fed with *Centrosema pubescens, Gliricidia sepium,* and *Leucaena leucocephala* based diets for eight weeks

TREATMENT GROUPS / **PARAMETER (g/rabbit)**	***Centrosema pubescens***	***Gliricidia sepium***	***Leucaena leucocephala***
Total feed intake	863.48±9.18[a]	854.80±9.05[b]	857.89±9.05[c]
Initial weight	488.57±0.56[a]	500.00±0.70[b]	500.29±0.70[b]
Final weight	1320.17±9.55[a]	1344.20±9.65[b]	1398.21±9.80[c]
Total weight gain	831.60±9.00[a]	844.20±9.18[b]	897.92±9.25[c]
Daily weight gain	14.85±0.28[a]	15.08±0.26[b]	16.03 ±0.35[c]
Feed conversion ratio (FCR)	1.03±1.02[a]	1.01±0.98[a]	0.95±0.97[b]

Data are expressed as Mean ± SEM. Values with different superscript along the row differs significantly ($p<0.05$).

Table 3: Digestibility of forages fed to rabbits and determined by total fecal and urine collection

TREATMENT GROUPS / **PARAMETERS (g/100g)**	***Centrosema pubescens***	***Gliricidia sepium***	***Leucaena leucocephala***
Dry Matter (DM)	74.33±0.49[a]	46.40±0.35[b]	55.33±0.42[c]
Fecal crude protein (FCP)	81.24±0.68[a]	85.20±0.66[b]	86.68±0.67[c]
Fecal Nitrogen (FN)	12.99±0.11[a]	13.63±0.10[b]	13.87±0.13[c]
Urine Nitrogen (UN)	1.32±0.01[a]	1.65±0.01[b]	0.20±0.02[c]

Data are expressed as Mean ± SEM. Values with different superscript along the row differs significantly ($p<0.05$).

Represented in Table 3 is the digestibility of forages fed to rabbits and determined by total fecal and urine collection. It was observed that the fecal crude protein and fecal nitrogen of rabbits fed *Leucaena leucocephala* were higher compared to other diets. However, the urine nitrogen of rabbits fed the *Gliricidia sepium* is significantly ($p<0.005$) higher than other diet. As revealed, the dry matter of rabbits fed *Centrosema pubescens* is significantly ($p<0.05$) higher, which indicate the availability of its mineral contents (nitrogen (N)) for uptake. The increased N content of the *Centrosema pubescens* diet increased the UN excretion, both in absolute terms and as a percentage of the total N excreted, and urea N made up for most (90%) of the additional loss of N in the urine (Marini & Van, 2005).

Conclusion and Recommendation

The present study shows that rabbits on the *Leucaena leucocephala* forage diet gave the best values and performances in terms of total and daily weight gain, nutrient digestibility, and nitrogen utilization. Also, both *Leucaena leucocephala* and *Gliricidia sepium* could be included as forage in the diet of rabbits, as they both enhanced the digestibility and nutritional performance of growing rabbits. Likewise, Rabbit fed *Centrosema pubescens* has high dry matter, which increases the availability of nitrogen uptake.

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