

Performance Evaluation of Growing Rabbit Fed Diets Containing Varying Inclusion Levels of *Centrosema pubescence* or *Calapogonium mucunoides* in the Derived Savannah Zone of Nigeria

O. A. Aderinola, O. O. Ojebiyi, T. A. Rafiu, J. A. Akinlade and L. O. Adepoju

Department of Animal Production and Health, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomosho, Oyo State, Nigeria

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Abstract: Twenty-five (25) mixed bred weaner rabbits (averaged $576-602 \pm 36$ g) were used to investigate the nutrient potential and digestibility of *Centrosema pubescence* and *Calapogonium mucunoides*. The forages were cut, air dried and milled. Five experimental pelletized diets were formulated. Diet T₁ contained no forage, diet T₂ and T₃ contained *Centrosema pubescence* at 10% and 20% inclusion level respectively; *Calapogonium mucunoides* was incorporated into diet T₄ and T₅ at 10% and 20% inclusion level respectively, mainly in substitution to maize, palm kernel and ground nut cakes. The animals were randomly distributed to the diets. Average daily feed intake and average daily weight gain were monitored. The experiment lasted for ten weeks. Data obtained were subjected to one way analysis of variance. The highest final weight (1,321 g) was observed in T₁ though similar to T₂ (1,181 g) (10% *Centrosema pubescens*) T₃ (1,247 g) (20% *C. Pubescens*) and T₄ (1,193 g) (10% *Calapogonium mucunoides*) and the lowest final weight (1,017 g) was observed in T₅ (20% *C. mucunoides*). Average daily weight gain also followed the same trend: 11.7, 9.6, 10.4, 9.6 and 8.4 g/d in T₁, T₂, T₃, T₄, and T₅ respectively, the difference between the control or T₃ treatment (20% *C. Pubescens*) on one hand and T₅ (20% *C. mucunoides*) in the other hand being significant ($P < 0.05$). For the feed intake, values were 66.0, 62.4, 55.9, 61.3 and 58.8 g/d for treatment T₁ to T₅ respectively with T₁ and T₂ $>$ T₃ and T₅ ($P < 0.05$). The best feed efficiency were observed for T₃ and T₁ (0.19 and 0.18 g gain/g feed intake) and the worst for T₅ (0.14 g/g) ($P < 0.05$). In conclusion, the incorporation of *Centrosema pubescence* at 20% inclusion level gives results similar to the control and better than incorporation of *Calapogonium mucunoides*.

Key words: Rabbit, growth *Centrosema pubescence*, *Calapogonium mucunoides*.

1. Introduction

In developing countries of the tropics, the conventional energy feed stuff such as cassava, maize, guinea corn and millet are not only scarce but expensive. In addition, they constitute a major regular source of food for humans [1]. Their inclusion in animal diets has made the livestock feeds to be more expensive.

Utilization of leaf meal such as *Giliricidia sepium*

[2], cassava plant [3], wild sun flower [4], mimosa leaf meal [5] *Calapogonium mucunoides* [6] etc. as source of protein and /or energy in livestock nutrition has been investigated and suggested by livestock nutritionist, largely due to the abundant availability of forage crops especially during raining season and high cost of conventional energy and/or protein feed stuffs.

Apart from the fact that rabbit has short production cycle which can assist to close the gap of protein shortage in Africa, it can also depend perfectly on forage such as *Tridax procumbens*, *Giliricidia sepium* and

Corresponding author: O. A. Aderinola, Ph.D., research fields: pasture production and utilization, dry season forage management. E-mail: ade4aderinola@yahoo.com, oaaderinola@gmail.com.

Centrosema pubescence that are used as a concentrate feed ingredient or supplement to the concentrate.

The focus of this study therefore is to assess the effect of feeding pelleted concentrate embedded with varying levels of *Centrosema pubescence* or *Calapogonium mucunoides*. The two are forages of the Fabaceae family.

2. Materials and Methods

The experiment was conducted at the livestock unit of Teaching and Research Farm, Ladoko Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Ogbomoso is in the derived savannah zone of Nigeria. It is located on Latitudes 8°07' N and 8°12' N and Longitudes 4°04' E and 4°15' E. The mean annual rainfall is 1,247 mm with a relative humidity of between 75% and 95%. It is situated at 600 m above sea level with a mean annual temperature of 26.2 °C. The experiment lasted for ten weeks. The forages (*Centrosema pubescence* and *Calapogonium mucunoides*) were harvested around the experimental site, chopped and air dried and were later milled and stored till the time of use.

Five experimental diets were formulated such that diet I contained none of the test ingredients. Diets II and III contained *Centrosema pubescence* at 10% and 20% inclusion level while diets IV and V contained *Calapogonium mucunoides* at 10% and 20% inclusion respectively. Each experimental diet was thoroughly mixed then processed into pellet form. The proximate analysis of the test ingredients and experimental diets were carried out using procedure of Ref. [7].

Twenty-five mixed bred weaner rabbits of average weight ranged from 576 to 602 ± 36 g were allotted to the five experimental treatments T₁ to T₅ in a completely randomized design (CRD) with five replicate per treatment. They were supplied one of the experimental diet I to V and water *ad-libitum* throughout the duration of the feeding trial. The rabbits were housed individually in wood-wire cages measuring 44 mm × 34 mm × 44 cm. They were

designed in such a way that allows easy collection of faeces, urine and left over feeds. The cages were placed in open sided corrugated iron roofed houses.

All data collected were analyzed using one way analysis of variance as expressed in package [8]. The means that were significant were separated using Duncan's Multiple Range Test [9] of the same statistical package.

3. Results and Discussion

Table 1 shows the composition of experimental diets as well as laboratory analysis of the diets and test ingredients. Dry matter (DM), crude protein (CP), ether extract (EE) and gross energy (GE) values of the experimental diets were very close to each other while the crude fibre (CF) increased as the inclusion level of forages increased. The CP, EE and GE of *Calapogonium mucunoides* were greater than that of *Centrosema pubescens* while the CF of the *C. pubescens* is greater than that of *C. mucunoides*. This implies that the two forages were nutritionally different especially when CP, EE, GE and CF were considered. The *C. mucunoides* CP value agreed with the value (22.6-27.6) reported by Asongwed et al. [6] but the CF value (21.73) was relatively lower than 24.19% reported. The CP of *C. pubescens* (19.98%) is similar to 19.83% reported by Ojebiyi et al. [10] but lower than 25% reported by Ugwu et al. [11] but the value of CF, EE and GE obtained agreed with the value reported.

Table 2 shows performance characteristics of weaner rabbits fed varying inclusion level of *Centrosema pubescence* or *Calapogonium mucunoides*. The average final weight of the animals were significantly ($P < 0.05$) influenced by diets. Highest value 1,322 g was obtained from T₁ (control diet) while the least value 1,017g was obtained from T₅ (20% *C. mucunoides*). T₂, T₃ and T₄ were statistically ($P > 0.05$) similar to the control diet implying that the inclusion of *Centrosema pubescens* up to 20% and *Calapogonium mucunoides* up to 10% has no negative effect on the growth performance.

Table 1 Percentage composition of experimental diet.

	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Calapo	Centro
Ingredient							
Maize	24	15	6	15	5.5		
Palm kernel cake	4	4	4	4	4		
Ground nut cake	10.5	7	4	7	6.5		
Soya	4	4	4	4	4		
Starch	1	1	1	1	1		
Wheat offal	21	23.5	25.5	23.5	25.5		
Rice bran	30	30	30	30	30		
<i>Centrosema pubescens</i>	-	10	20	-	-		
<i>Calapogonium mucunoides</i>	-	-	-	10	20		
Oyster shell	3	3	3	3	3		
Bone	2	2	2	2	2		
Salt	0.25	0.25	0.25	0.25	0.25		
Premix*	0.25	0.25	0.25	0.25	0.25		
Total	100	100	100	100	100		
Chemical composition							
Dry matter (%)	91.36	91.27	91.34	91.61	90.55	87.62	87.76
Crude protein (%)	16.67	16.76	16.57	16.87	17.15	22.03	19.98
Crude fibre (%)	7.62	7.98	9.47	8.67	9.84	1.73	2.16
Ether extract (%)	3.76	3.84	3.72	3.91	37.85	3.82	35.67
Gross energy (kcal/kg)	3,976	3,968	3,971	3,983	3,965	3,424	3,389

*Premix supplied per type kg diet: Vit. A, 10,000 IU; Vit. D 2,000,000 IU; Vit. E, 2,300 mg; Vit. K3 2,000 mg; Vit. B, 3,000 mg; Vit. B2, 6,000 mg; Niacin, 5,000 mg; Calcium, 800 mg; Panthotenate, 10,000 mg; Vit. B6, 5,000 mg; Vit B12, 250 mg; Folic acid, 100 mg; Biotin, 50 mg; Choline chloride, 40,000 mg; Selenium, 120 mg and Anti oxidant, 12,000 mg.

Table 2 Performance characteristics of weaner rabbits fed varying inclusion level of *Centrosema pubescence* or *Calapogonium mucunoides*.

Parameter	T ₁	T ₂	T ₃	T ₄	T ₅	SEM
Initial wt (g)	586.75	576.25	594.25	587.00	603.75	36
Final wt (g)	1,321.65 ^a	1,181.75 ^{ab}	1,247.33 ^{ab}	1,193.00 ^{ab}	1,017.00 ^b	44
Average daily wt gain (g)	11.67 ^a	9.61 ^{ab}	10.36 ^a	9.62 ^{ab}	8.40 ^b	0.76
Average daily feed intake (g)	66.0 ^a	62.4 ^a	55.9 ^b	61.3 ^{ab}	58.8 ^{ab}	1.9
Feed efficiency (g gain/g feed)	0.18 ^a	0.15 ^{ab}	0.19 ^a	0.16 ^{ab}	0.14 ^b	0.01

^{a, b} means with different superscripts along the same rows are significantly ($P < 0.05$) different.

It was also observed that daily weight gain of rabbits fed *Centrosema pubescens* increased as the inclusion level increased, the reverse was the case of rabbit on *Calapogonium mucunoides*.

Animals fed control consumed the highest (66.0 g/d) amount of feed intake though statistically ($P > 0.05$) similar to other treatments except treatment T₃ (20% *C. pubescence*). This observation could be as a result of bulkiness of the diets.

Animal placed on T₃ had a better feed efficiency (0.19) compared to other animals. It could also be

observed that the value increased as the inclusion level of *C. pubescens* increased but decreased as inclusion level of *C. mucunoides* increased. This was in contrary to the report given in Ref. [12] that rabbits placed on fresh *Calapogonium mucunoides* perform better than those placed on fresh *Centrosema pubescence* supplement.

4. Conclusion

Hence it could be concluded from the findings that incorporation of *Centrosema pubescens* up to 20%

inclusion level gives results similar to the control while incorporation of *Calapogonium mucunoides* up till 10% resulted in satisfactory results. Thus utilization of *Centrosema pubescens* should be encouraged in rabbit diet and higher inclusion rate should be investigated into. This will reduce competition for the conventional feed.

References

- [1] G.S. Bawa, E.A. Abu, M.T. Adegbulu, Effect of duration of cooking whole or crushed African locust bean (*Parkia filicoidea*, Welw) seeds on the levels of some anti-nutritional factors and growth performance of young rabbits, Nig. J. Anim. Prod. 34 (2007) 208-219.
- [2] A.O. Ige, A.A. Odunsi, J.A. Akinlade, L.O. Ojedapo, S.A. Ameen, et al., Gliricidia leaf meal in layer's diet: effect on performance, nutrient digestibility and economy of production, J. anim. Vet. Adv. 5 (2006) 483-486.
- [3] D. Erubetina, I.D. Tajudeen, A.T. Adeosun, A.A. Olojede, Cassava (*Manihot esculenta*) leaf and tuber concentrate in diets for broiler chickens, BioResource Tech. 86 (2003) 277-281.
- [4] A.A. Odunsi, G.O. Farinu, J.O. Akinola, Influence of dietary wild sunflower (*Tithonia diversifolia*, Henis A .Gray) leaf meal on layers performance and egg quality, Nig. J. Anim. Prod. 23(1996) 26-32.
- [5] F.C. Nworgu, J.B. Fapohunda, Performance of broiler chicks fed mimosa (*Mimosa invisa*) leaf meal supplements, in: Proc. 28th Ann. Conf. NSAP, 2002, pp. 128-131.
- [6] A.A. Asongwed, O. Abakar, E. Vail, Intake and digestibility of *Calapogonium mucunoides* based diet fed to Draft Donkeys during the dry season, Revue Elev. Med. Vet. Pays Trops. 56 (2003) 205-210.
- [7] AOAC (Association of Official Analytical Chemists), Official Methods of Analysts, 15th ed., Washington D.C., 1990, pp. 69-88.
- [8] SAS (Statistical Analysis System), User's Guide: Statistics, 6th ed., SAS's Institute Inc., Carry, North Carolina, USA, 2000.
- [9] D.B. Duncan, Multiple range and multiple T-test, Biometrics 11 (1955) 1-42.
- [10] O.O. Ojebiyi, G.O. Farinu, V.A. Togun, J.A. Akinlade, O.A. Aderinola, T.A. Rafiu, Effect of quantitative concentrate reduction on the growth of weaned rabbits, in: Proc. 11th Ann. Conf. Anim. Sci. Asso. of Nig. (ASAN), September, 2006, pp. 121-125.
- [11] S.O.C. Ugwu, C.O. Chukwuka, The effects of inclusion or dried *C. pubescence* leave as source of protein in the diet of growing pigs, Proceedings of 6th Annual Conf. Anim. Sci. Ass. Nig., 2001.
- [12] B.O. Nweze, Performance of young rabbits fed two grasses and two legumes species supplemented with compounded diet, Trop. J. Anim. Sci. 8 (2005) 91-95.