EFFECT OF FRESH COONTAIL LEAF (*CERATOPHYLLUM DEMERSUM*) WITH GRADED LEVEL BERMUDA GRASS (*CYNODON DACTYLON*) ON GROWTH PERFORMANCE, AND BLOOD INDICES OF WEST AFRICAN DWARF GOATS

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ABSTRACT
The West African Dwarf (WAD) goats play an essential socioeconomic role in the Nigerian economy, hence the effect of 12 weeks of feeding fresh Coontail leaf (FCL) + Bermuda grass (BG) at various dietary levels on WAD goat growth performance and blood indices were explored. A total of 24 WAD goats weighing an average of 6.02kg each were randomly assigned to four treatments of six goats, with two goats per replicate. In a completely randomized form, each treatment was served four experimental diets comprising FCL and BG at Diet 1: Control 100% FCL, Diet 2: 80% FCL + 20% BG, Diet 3: 70% FCL + 30% BG, and Diet 4: 50% FCL + 50% BG, accordingly. Initial weight, final weight, weight gain, feed intake, feed conversion ratio, red blood cell (RBC), white blood cell (WBC), packed cell volume (PCV), and haemoglobin concentration (Hb. The T1 and T4 showed significant ($p<0.05$) changes in final body weights, weight gain, and feed conversion ratio. There was a significant difference ($p<0.05$) in all haematological parameters evaluated, except packed cell volume (PCV) which had no significant ($p>0.05$) difference. All blood biochemical indicators indicated significant ($p<0.05$) differences with total protein, albumin, and urea, except for cholesterol, globulin, and glucose, which were not statistically ($p>0.05$) different. It is possible to conclude that FCL+BG Can be included in WAD goat diets up to 50% without negatively affecting growth performance or blood parameters.
***Keywords*: Bermuda grass, Blood indices, Coontail growth performance, and West Africa Dwarf Goats**

INTRODUCTION

Africa has around 291.1 million goats, accounting for 33.8% of the entire global goat population, with Nigeria accounting for 53.8 million. Goat production systems in Nigeria employ grass-based feed and may coexist with other animals such as sheep or cattle, goats are typically owned and maintained by lower-income members of society. Poor nutrition, ruminant parasites, disease management, and poor genetic makeup are the key obstacles to goat production in tropical regions (Okpara *et al*., 2023). Long dry seasons, which cause seasonal scarcity and uneven distribution of high-quality pasture, limit goat milk and meat production in tropical regions (Irikefe-ekeke *et al*., 2020).

Aquatic plants have an advantage over grasses since they can withstand drought and are available all year. They are also, one of the cheapest sources of feed/supplements for cattle and fish (Irabor *et al*., 2022; Ade *et al*., 2023). Coontail (C. *demersum*) is a cheap, safe, easily accessible, and responsibly sourced carbohydrate supply. *Ceratophyllum demersum* has been shown to have a considerable amount of nutrients and might be used to replace some existing sources of energy without harming experimental animal performance (Ade *et al*., 2023). Macrophytes have been used as either a complete, fresh food or as part of a dry diet. Furthermore, they have replaced protein or energy sources in pelleted meals, either partially or completely (Balkhasher *et al*., 2021). These macrophytes (Coontail) have yet to be studied as feed components for goat diets, despite their potential for usage in other livestock/fish diets.

Bermuda grass (*Cynodon dactylon*) has higher crude protein, and lower effective fiber, which supports the usage of less concentrated protein for livestock feed, lowering production costs (Jose *et al.,* 2017). Bermuda grass became the most significant feed because of its versatility to a variety of soils, aggressive growth, grazing tolerance, and ability to provide high supplies of high-quality forage when soil nutrients are not limited (Redfearn and Rice, 2014). Cattle, goats, and sheep enjoy it because of

its high nourishment value. Thus, the current study aims to assess performance in terms of growth and blood parameters, WAD goats fed fresh Coontail Leaf and Bermuda grass at varied percentages.

MATERIALS AND METHODS

The study was carried out in Dennis Osadebay University's Teaching and Research Farm (small ruminant unit). Anwai, Asaba, is located at longitude 6°45′East and latitude 6°12′ North in the tropical rainforest vegetation zone. The site's climate is hot and humid, with maximum temperatures ranging from 27°C to 30°C. Every year, the locality sees a rainy season that lasts from March to November (Asaba Metrological Outstation 2023).

Experimental animals, procedure, management, and dietary preparation.

Twenty-four WAD goats were selected from the goat population of the Departmental livestock farms with the approval of the Head of the Department. The WAD goats were transferred to their sections and randomly placed in four dietary plans, with six animals per treatment in a completely randomized design (CRD) and two WAD goats for each replicate. The procedure for inclusion level was as follows. Diet 1: control Diet: 100% FCL, Diet 2: 80% FCL, 20% Bermuda grass, Diet 3: 70% FCL, 30% Bermuda grass, Diet 4: 50% FCL, 50% Bermuda grass.

Ten days were allowed for the animal to acclimate to the experimental diet before data collection began. During the trial, clean water was always available, ectoparasites were treated with Ivermectin injections and bacterial infections were prevented with Oxytetracycline, a long-acting, broad-spectrum antibiotic given intramuscularly.

The flesh leaf of Coontail was obtained from the Anwai River, where it is abundant, and fed fresh to the goats, based on their treatment group, while Bermuda grass was mowed from the pasture within the Departmental Research farm, where it is abundant, and served according to their inclusion levels for eighty-four days.

Data Collection

Data were collected on the performance characteristics, haematology, and serum biochemistry of the goats and were analyzed using the one-way analysis of variance while Duncan's multiple range test (Steel and Torne 1990) was used to separate the means.

RESULTS AND DISCUSSION

Table 1 shows the chemical composition of the aquatic plants and the grass. Coontail had a better proportion of crude protein (15.08%), while Bermuda grass was lower (12.01%) in that order. However, Bermuda grass had a greater crude fiber content (10.21%) than aquatic Coontail (5.50%), which had the least value (Jose *et al.*, 2017, Ade *et al*., 2023).

Table 1: Chemical composition of the Coontail and Bermuda grass

Components	Fresh coontail leaf	Bermuda grass
Crude protein (%)	15.08	12.01
Either extract (%)	2.40	1.80
Crude fibre (%)	5.50	10.21
Nitrogen-free extract (%)	27.30	70.13
Ash (%)	10.20	7.06
Moisture (%)	40.51	1.00

The performance characteristics of the experimental WAD goats in Table 2 showed no substantial difference ($P > 0.05$) in the initial weight and feed consumption of WAD goats exposed to the various dietary treatments. The rich nutritional profile of FCL and BG could potentially explain the increased weight gain. Previously, Jose *et al.,* (2017) and Ade *et al.,* (2023) reported that FCL and BG are high-nutrient sources.

Table 2: Performance in the growth of WAD goats fed FCL + BG

Parameters	Diet 1	Diet 2	Diet 3	Diet 4	SEM
Initial body wt (kg)	6.03	5.78	6.13	6.13	1.35
Final body wt(kg)	9.15^{c}	10.53^{b}	10.43^{b}	11.90^{a}	2.96
Weight gain(kg)	3.12^{c}	4.75^{b}	4.30^{b}	5.77^{a}	0.67
Feed intake(kg)	19.16	20.27	19.54	19.30	7.82
Feed conversion ratio	4.12^{a}	2.85^{c}	3.05^{b}	2.23^{c}	0.04

^{a,b,c}; means in the same row with different superscripts are significantly different ($p<0.05$)*FCL- fresh Coontail leaf, *BG- Bermuda grass

Haematological parameters

Table 3 shows the outcomes for the haematological parameters of WAD goats fed FCL and BG. The effect of feeding on the physiological responses and pathological well-being of the livestock can be determined through haematological examination. Tsheole (2019). The haematological parameters in this investigation are within normal standards which is consistent with the findings of Jiwuba *et al*., (2020).

Table 3: Haematological characteristics of goats fed FCL+ BG

Parameters	Diet 1	Diet 2	Diet 3	Diet 4	SEM
PCV (%)	30.82	31.71	31.65	31.53	7.44
WBC (x10^{3}/L)	7.35^{c}	7.91^{c}	9.68^{b}	10.72^{a}	1.01
RBC (x10^{6} /L	10.07^{b}	10.19^{b}	11.32^{a}	11.41^{a}	1.49
Hb(g/dL)	9.12^{b}	9.14^{b}	9.32^{a}	10.25^{a}	2.79
MCH (*pg*)	8.01^{a}	8.21^{a}	7.23^{b}	7.11^{c}	1.18
MCV (%)	20.10^{c}	21.35^{b}	22.32^{a}	22.12^{a}	5.86
MCHC (%)	26.36^{c}	27.12^{b}	28.13^{b}	29.01^{a}	3.83

$^{a,b,c;}$ means in the same row with different superscripts are significantly different ($p<0.05$)*FCL- fresh Coontail leaf, *BG- Bermuda grass

Table 4 displays the findings on the serological features of WAD goat-fed FCL and BG. The fact that serum glucose, cholesterol, and globulin indices were not significantly impacted ($p>0.05$) by the experimental diets suggests that nutritional adequacy and diet composition indicate the goats were healthy, and free of any heart-related disease conditions, as high serum cholesterol level is an indication of cardio-vascular disease.

Table 4: Serological Characteristics of goats fed FCL+ BG

Parameters	Diet 1	Diet 2	Diet 3	Diet 4	SEM
Total protein (mg/dL)	7.71^{a}	7.45^{b}	6.51^{c}	6.36^{c}	0.15
Albumin(mg/dL)	3.17^{b}	3.38^{a}	2.91^{c}	2.10^{c}	0.12
Glucose(mmoL/dL)	44.10	44.21	44.09	44.11	11.21
Urea (mmoL/dL)	15.10^{b}	15.78^{b}	17.09^{a}	13.11^{c}	0.35
Cholestero1(mmoL/dL)	75.12	75.19	75.14	75.10	2.20
Globulin (g/L)	4.72	4.62	4.53	4.45	0.30

^{a,b,c}; means in the same row with different superscripts are significantly different ($p<0.05$)*FCL- fresh Coontail leaf, *BG- Bermuda grass

CONCLUSION

This study showed that WAD goats fed Fresh Coontail leaf + Bermuda grass grew well at varied percentage levels. Furthermore, in an evaluation of the biochemical and haematological variables it was discovered that the treatment's dietary level had no adverse impact on the animals. Nonetheless, the animals offered 50% fresh Coontail leaf and 50% Bermuda grass outpaced the other treatments. In conclusion, during the extended dry season, when tropical grasses dry up, WAD goats may feed on fresh Coontail leaf and Bermuda grass.

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