

GROWTH PERFORMANCE OF RED SOKOTO BUCKS FED DIETS CONTAINING GRADED LEVELS OF *Leucaena leucocephala* LEAF MEAL AS SUPPLEMENT TO CRAB GRASS (*Digitata horizontalis*)

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ABSTRACT

The study was Carried out to Evaluate the Nutritional Potentials of Sun Dried *Leucaena leucocephala* Leaves in the Diets of Growing Red Sokoto Bucks. Sixteen (16) Growing Red Sokoto Bucks averagely 8–9Months of age with an average Weight of 10-11 kg \pm 0.5 were used for the Study. Four Treatment Diets (0%, 5%, 10% and 15% *Leucaena leucocephala*) were Formulated, Designated as T₁, T₂, T₃ and T₄ respectively. The Experimental Bucks were weighted at the Beginning of the Experiment and Weekly Thereafter and Feed Intake Recorded Daily. The Experiment was a Complete Randomized Designed (CRD) Experiment. The experiment lasted for a Period of sixty three (63) days after an adjustment period of fourteen (14) days. The data Collected were subjected to Analysis of Variance. The result revealed a Significant ($p < 0.05$) Total Weight Gain was significantly ($p < 0.05$) Higher in Bucks Fed Treatment 4 (2.26kg). Higher Total Feed Intake (824.50g) (818.23g) in Bucks fed Treatments T₁ and T₂ respectively with the Lowest (803.75g) in Treatment 4. Better Feed Utilization was recorded in experimental bucks fed T₄ with 0.35. The study concludes that *Leucaena leucocephala* leaves can be included in the supplement of Red Sokoto Bucks fed a basal diet of *Digitaria horizontalis* at up to 15% without any detrimental effect on the growth Performance of the Animals. Further Research should be conducted to check the effects of Inclusion of *Leucaena leucocephala* leaves on the Milk Yield and Composition of Red Sokoto Goats.

Keywords: Growth Performance, Red Sokoto Goats, *Leucaena leucocephala*, Crab Grass

1.0 INTRODUCTION

Ruminant animals constitute a very important part of the livestock sub-sector of the Nigerian agricultural economy. The potential of small ruminant production in alleviating the low animal protein intake by man in developing nations such as Nigeria has been reported (Fajemisin *et al.*, 2019). Recently, more attention has been paid to small ruminant production in the tropics as their advantages are becoming more understood than ever before, particularly for their ability to produce meat, milk and skin, even in hostile environments (Konlan *et al.*, 2022). Goats are the most prolific

of all domesticated ruminants under tropical and subtropical conditions (Webb and Mamabolo, 2024) and they play a significant role in livelihoods of the rural populace in most developing countries like Nigeria. Apart from serving as a vital protein source, goats also provide income for meeting household needs (Peacock, *et al.*, 2005). Not with standing, the high cost of formulating livestock feed has been a major constraint militating against the increased production of valuable sources of animal protein (Okoruwa *et al.*, 2013). Inadequate year round supply of quality forages and or feed is a major problem to the productivity of ruminant animals in the tropics (Abubakar *et al.*, 2011). The situation is particularly more devastating for the Sudano-Sahelian belt, the traditional home of most Nigerians ruminant Livestock, which is characterized by a long dry season of about 7-8 months (October – May). Livestock farmers face their greatest challenges during these dry season when a “Staircase” pattern is observed in Animal as a result of inadequate Feed (Adegbola, 2002). During this period, the available Feed is scarce and of low quality, such that animals are not able to meet their protein and energy needs with consequent marked weight losses and productivity (Adegbola, 2002). In Nigeria. Some multipurpose trees have nutritional properties that can be beneficial if incorporated in livestock feed. Utilising some of these properties to their full potential can result to sustainable livestock production (Melesse *et al.*, 2011). Examples of these trees include *Leucaena leucocephala*, *Moringa oleifera*, *Parkia biglobosa*, *Aspalia africana*, *Ficus exasperate* and others. The utilization of the legumes mixture depends on their chemical composition, digestibility and presence of anti-nutritive factors as well as their acceptance. Among the most important shrub in Nigeria is *Leucaena leucocephala*. (Odeyinka 2021). *Leucaena leucocephala* is very rich in protein and several studies have been conducted on its utilization and toxicity. The use of *Leucaena leucocephala* is however reportedly (Vincent *et al.*, 2021) hampered by its susceptibility to psyllid (*Heterospanacubana*) attack, causing considerable reduction in fodder yields, particularly during the dry season. The foliage of leguminous forages improves the utilization of low quality forages, provide for browsing by livestock and game during dry season and also provides critical nutrients lacking in the diets. (Odeyinka 2015). The current study is therefore carried out to determine the growth performance of red sokoto bucks fed diets containing graded levels of *Leucaena leucocephala* leaf as supplement to crab grass (*Digitata horizontalis*).

2.0 MATERIALS AND METHODS

2.1 Study Area

The experiment was conducted at the Livestock Unit of Teaching and Research Farm, Federal College of Horticulture Dadin-Ko wa, Gombe state, Nigeria. Dadin-kowa, YamaltuDeba Local Government Area is located in the savannah zone of North- Eastern Nigeria, on latitude 11⁰.30N and longitude 100⁰ 20E and on altitude of 240m above sea level (Yarima *et al* 2024). The area is characterized by short rainy season (4-5 months) with annual rainfall of 760mm to 1100mm, and long dry season (6-7 months). The ambient temperature could be as low as 24⁰C during the dry cold season (October-January) and as high as 44⁰C during the dry hot season (February-May). (Ibeje and Okoro 2023).

2.2 Experimental Bucks, Housing and Management

A total of 16 Red Sokoto bucks aged between 8–9 months old with an average weight of 10-11 kg \pm 1 were purchased from the livestock market within Kuri Town. All the animals were treated against internal and external parasites using Levamisole (Kepro B.V. Holland, 1ml per 20 kg body weight), sprayed with Triatix (cooper Ltd) and injected with long acting oxytetracycline 20% LA (Invesa Spain 1ml per 10kg body weight) before the commencement of the experiment (Wadda,

et al., 2014). The animals were housed individually in separate pens. Experimental supplement were supplied at 3% of the animal's body weight and water was given *ad libitum* and the experimental animals were allotted to four treatments supplements containing *Leucaena leucocephala* leaf meal at inclusion levels of 0, 5, 10, and 15% and designated as T₁, T₂, T₃ and T₄ respectively. Daily feed intake and weekly live weight changes was recorded. The trial lasted for 63 days after an adjustment period of two weeks.

2.3 Experimental Diets and Animal Feeding

Leucaena leucocephala leaves were sourced from Orchard Farm, Federal College of Horticulture Dadin Kowa, Gombe State, Nigeria. The leaves were sun-dried on a concrete floors for 48 hours, where it became crispy; it was milled and stored in synthetic bags before incorporation into the diets as described by (Oyewole, *et al.*,2021; Oloche, *et al.*, 2014). Four supplements were formulated containing *Leucaena leucocephala* leaf meal at 0, 5, 10 and 15%.

During the adjustment period which lasted for two weeks, the animal were fed the experimental supplements and the basal diet to enable them adapt to the feeding regimes. The animals were individually fed leucaena leaf meals at varying levels based on treatments levels. Four supplements were formulated in such a way that *leucaena leucocephala* leaf meal was included at different levels as T₁, T₂, T₃ and T₄ comprising of four animals per treatment. During the experiment, feeding was done every morning at about 08:00am. During the feeding trials each animal was offered its respective basal diet of 600g/head/day of *Digitaria horizontalis* (Crab grass) at 08:00am followed by the concentrate at 300g per head per day at 04:00pm. As described by Ocheja, (2020). The animals were weighed at the beginning of the experiment and weekly thereafter. The experiment lasted for a period of sixty-three days after two weeks adaptation period, Ingredients composition and their calculated nutrients analysis are presented below;

Table 1: Ingredients Composition of the Experimental Supplements

Ingredient	Treatments (kg)			
	1	2	3	4
Maize offal (kg)	50.00	50.00	50.00	50.00
Rice bran (kg)	17.00	17.00	17.00	17.00
Groundnut cake (kg)	30.00	25.00	20.00	15.00
Leucaena leaf Meal (kg)	0.00	5.00	10.00	15.00
Bone meal (kg)	2.00	2.00	2.00	2.00
Wood ash (g)	0.50	0.50	0.50	0.50
Table salt (g)	0.50	0.50	0.50	0.50
Total (%)	100.00	100.00	100.00	100.00
Calculated Nutrients Content				
Crude Protein (%)	18.87	18.24	18.56	18.60
Crude Fiber (%)	13.39	13.79	14.18	14.58
M. E (kcal/kg)	2828.20	2824.89	2821.58	2818.27

2.4 Experimental Design

The 16 Red Sokoto Bucks were allotted to four dietary treatments (T₁, T₂, T₃ and T₄) each treatment was replicated 4 times in a Complete Randomized Design (CRD).

2.5 Feed Intake

Feed intake of the experimental animals was obtained by weighing the quantity of supplemental concentrate and that of the Crab grass (*Digitaria horizontalis*) given daily at 08:00am and 02:00pm respectively any leftover were also weighed to obtain the voluntary feed intake by subtracting the left over from the initial feed given.

3.5.1 Body Weight Gain

The experimental animals were weighted before the commencement of the experiment and repeatedly weighed weekly in the early morning before feeding, using Camry spring balance.

2.5.2 Feed Conversion Ratio

This was computed by dividing the daily feed intake by daily weight gain.

$$\text{FCR} = \frac{\text{Feed intake (g)}}{\text{Body weight gain (kg)}}$$

2.6 Data Analysis

Data obtained from the study were subjected to analysis of variance (ANOVA) using SPSS version 23 (2015), and treatment means that are significantly different were separated using least significant difference (LSD).

3.0 RESULTS AND DISCUSSION

3.1 Proximate Composition and Fibre Fractions of Experimental supplements, *Leucaena leucocephala* Leaf meal and Crab Grass (*Digitaria horizontalis*).

The proximate composition and fibre fractions of experimental supplements, *Leucaena leucocephala* Leaf meal and crab grass (*Digitaria horizontalis*), is presented in Table 2.

The crude protein values of the concentrate diets ranged from 11.35% to 12.55 % and can be said to be iso-nitrogenous. While crude protein percentages of *Leucaena leucocephala* leaf was 21.85 %. The crude Fibre of the concentrate diet, forage and *Leucaena leucocephala* leaves were ranged from 13.49 to 15.49 % and 14.85 and 12.50% respectively. Acid detergent Fibre (ADF) and neutral detergent Fibre (NDF) ranges from 5.13 to 15.37% and 19.40 to 43.54 across the treatments.

The high crude protein content of the concentrate diet shows it is high enough to meet the optimum microbial need in the rumen (Yahaya *et al.*, 2020). The values for all the treatment groups were above the 7% minimum protein requirement for optimum microbial growth in the rumen (Baba *et al.*, 2021). The values also fall within the 10 to 12% crude protein requirement for growth performance of goats (Gatemby 2022).

The results follow similar pattern to the report of Puma (2021) that semi-arid browse plants are high generally in Fibre. Rajendran *et al.*, (2021) also reported values for NDF and lignin contents across different ecological zones as follows; 401 and 117g kg DM in the sahelian zone, 457 and 105 g kg DM in sub humid zone and 436 and 93 g kg DM in the humid zone respectively

TABLE 2: Proximate Composition and Fibre Fractions of Experimental supplements, *Leucaena leucocephala* Leaf meal and Crab Grass (*Digitaria horizontalis*).

Parameters	T ₁	T ₂	T ₃	T ₄	Leucaena leaves	Forage (<i>Digitaria horizontalis</i>)
Dry matter	99.17	99.06	99.43	99.55	99.55	98.25
Ash content	3.94	3.55	3.15	2.84	2.30	1.26
Crude fat	0.63	0.24	0.35	0.13	5.05	0.036
Crude Protein	11.36	11.35	11.73	12.55	21.85	3.1
Crude fibre	15.49	15.00	13.65	13.49	12.50	14.85
CHO	67.75	68.89	70.55	70.45	63.51	79
Energy (Kcal/100g)	322.47	321.86	325.51	326.44	295.02	335.58
ADF %	5.13	8.56	12.64	15.37	19.40	32.38
NDF %	9.28	23.62	28.35	34.19	43.54	61.82

CHO means carbohydrates, ADF; Acid Detergent Fibre and NDF; neutral detergent fibre.

3. 2 Growth Performance of Red Sokoto Goats fed Supplement Diets containing Graded Levels of *Leucaena leucocephala* leaf meal to Crab grass basal diet²

The growth performance of Red Sokoto goats fed supplement diets containing graded levels of *Leucaena leucocephala* leaf meal to crab grass basal is presented in Table 3

3.2.1 Initial Weight (IW)

No significant ($p < 0.05$) differences were observed in the Initial Weight of the Experimental Bucks. The Initial Weight Values Ranged from 10.45kg to 10.50kg. The Initial Weight of Red Sokoto Bucks fed Experimental Diet averaged 10.50kg in this Study is Similar to 10.57kg reported by Mafindi *et al.* (2018) for Red Sokoto Goats fed Cowpea Husk Supplemented with Moringa leaves.

3.2.2 Final Weight (FW)

Significant ($p < 0.05$) differences were observed in the final weight of the experimental Bucks. The Final Weight ranged from 11.36kg for Bucks fed on diet 3 (10% LL) to 12.76kg for Bucks fed on Diet 4 (15% LL). The Highest Final Body Weight recorded in this study (12.76kg) was from Experimental Bucks fed on Diet 4 and this was within the Range of 10.83 to 13.33kg reported by Yashim *et al.* (2016). The values were also higher than 9.50kg reported by Vincent *et al.* (2021) for West African Dwarf Goats fed *Moringa oleifera*, *Gliricidia sepium* and *Leucaena leucocephala* Dried leaves as Supplement to Cassava Peels.

3.2.3 Total Weight Gain (TWG)

Significant ($p < 0.05$) differences were observed in the total weight gain of the experimental Bucks. The total weight gains ranged from 0.86kg for Bucks fed on Diet 3 (10% LL) to 2.26kg for Bucks fed on Diet 4 (15% LL). The values observed in this study were within the range of 1.97kg to 2.53kg reported by Muhammad *et al.* (2021).

3.2.4 Average Daily Weight Gain (AWG)

Significant ($p < 0.05$) differences were observed in the Average Daily Weight Gain of the Experimental Bucks. The average Daily Weight Gains Ranged from 0.01kg/day for Bucks fed on Diet 3 (10% LL) to 0.04kg/day for Bucks fed on Diet 4 (15% LL). Yashim *et al.* (2016) reported Average Daily Weight Gain of 0.02 to 0.05kg/day which is similar to values observed in the

present study. Average daily weight gain of 0.02 to 0.04kg/day was also reported by Wadda *et al.* (2014) for Yankasa Sheep fed *Parkia biglobosa*.

3.2.5 Daily Concentrate Intake (DCI)

There were significant ($p < 0.05$) differences in the Concentrate Intake values of the Experimental Bucks. Bucks on Diet 1 (0% LL) recorded the highest value of 273.00g while Bucks on Diet 3 (10%) the lowest 252.00g. The values observed in this study is Lower than 310.1g for Jamunapari Goats fed Graded levels of *Leucaena leucocephala* reported by Haque (2018). Hassan *et al.* (2016) reported a Daily Concentrate Intake of 277.49 to 304.11g for Red Sokoto Bucks fed Graded levels of Lablab (*Lablab purpureus* L. sweet) Hay as a Supplement to Maize (*Zea mays*) stover Basal Diet, which were higher than the values recorded in this study. Millam (2020) also reported a higher value of 458.31g for Red Sokoto Bucks fed Diets containing Soybean Curd Residue.

3.2.6 Daily Forage Intake (DFI)

The results obtained from this research revealed that Forage intake shows significant difference ($P < 0.05$) among the Treatments. The overall Forage Intake showed that Treatments 2 and 3 (5% and 10% LL) had the highest value of 556.23g and 556.85g while Bucks on Treatment 4 the Lowest 539.50g. Olomola *et al.* (2018) reported a Forage intake of 357.9 to 362g for West African Dwarf Goats fed Groundnut cake, Urea and Rumen Epithelial wastes in Cassava Flour and Citrus pulp–base Diets. Zakka *et al.* (2019) also reported a Digitaria Intake of 130.00 to 245g/day for growing Red Sokoto Bucks fed Diets containing two Sorghum Varieties Hay (Bush head and Sweet sorghum). Bello *et al.* (2020) also reported lower value of 328.90g for Red Sokoto Bucks fed Gamba grass and this could be due to age and Season.

3.2.7 Total Feed Intake (TFI)

Significant ($p < 0.05$) differences were observed in the Total Feed Intake of the Experimental Bucks. The values recorded in this study 803.75 to 824.50g, were similar to 895.8g/d as reported by Olomola *et al.* (2018) for West African Dwarf Goats fed Groundnut cake, Urea and Rumen Epithelial wastes in cassava flour and Citrus pulp–based Diets. Odeyinka (2021) reported a higher total feed intake of 1421g/d for West African Dwarf Goats fed varying levels of *Leucaena leucocephala* and *Gliricidia sepium*. Hassan *et al.* (2016) also reported a Total Feed intake of 473.93 to 503.4g Red Sokoto Bucks fed Graded levels of Lablab (*Lablab purpureus* L. Sweet) Hay as a Supplement to Maize (*Zea mays*) Stover Basal Diet which were lower than that observed in the present study. Similar values (806.7g) were also reported by Yahaya *et al.* (2020).

3.2.8 Feed Conversion Ratio (FCR)

Better feed utilization was recorded in experimental Bucks fed Treatment 4 with 0.35. As indicated by Puma (2021), improved Feed Conversion Efficiency may be due to the relatively Higher Nutrient Composition of Diets and the consequent Increase in Body Weight Gain showing that Diets that Promotes a high rate of Gain will usually result in a greater efficiency than Diets that do not allow rapid gain, since the rapidly gaining Animals utilizes less of the total feed intake for maintenances and more of it for Live Weight Gain.

Table 3: Growth Performance and Feed conversion Ratio of Red Sokoto Bucks Fed Supplement containing Graded Levels of *Leucaena leucocephala* Leaf meal

Parameters	T1 (0% LL)	T2 (5% LL)	T3 (10% LL)	T4 (15% LL)	SEM	LOS
Initial Weight(kg)	10.45	10.50	10.50	10.50	0.34	NS
Final Weight Gain(kg)	11.86 ^a	11.53 ^b	11.36 ^b	12.76 ^a	0.25	*
Total weight Gain(kg)	1.41 ^b	1.03 ^c	0.86 ^d	2.26 ^a	0.17	*
Daily weight Gain(kg)	0.02 ^a	0.02 ^b	0.01 ^c	0.04 ^a	0.00	*
Daily conc. Intake(g)	273.00 ^a	262.00 ^b	252.00 ^c	264.25 ^b	4.51	*
Daily forage Intake(g)	551.50 ^b	556.23 ^a	556.85 ^a	539.50 ^c	5.43	*
Total daily Feed Intake(g)	824.50 ^a	818.23 ^b	808.85 ^c	803.75 ^d	7.86	*
Feed conversion Ratio	0.58 ^b	0.79 ^c	0.94 ^d	0.35 ^a	0.22	*

Means in the Same Row with Different Super Scripts differs Significantly (p<0.05), * Means at 95% (p<0.05), LL = *Leucaena leucocephala*, SEM = Standard Error of Mean, LOS = Levels of Significant.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Based on the findings of this study, it can be concluded that, *Leucaena leucocephala* leaves can be included in the supplement of Red Sokoto Bucks fed a basal diet of *Digiteria horizontalis* at up to 15% without any detrimental effect on the growth Performance of the Animals. *Leucaena leucocephala* leaves contain adequate nutrients required by growing Red Sokoto Goats. Inclusion of *Leucaena leucocephala* at 15% gave a Higher Weight of 2.26kg (T₄) and better Feed Conversion Ratio of 0.35.

4.2 Recommendations

- I. *Leucaena leucocephala* Leaf Meal can be included in the Concentrate supplement of Growing Red Sokoto Bucks fed a basal Diet of *Digiteria horizontalis* up to 15% level of inclusion
- II. Further Research should be conducted to check the effects of Inclusion of *Leucaena leucocephala* leaves on the Milk Yield and Composition of Red Sokoto Goats.

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