

## Growth Performance of West African Dwarf (WAD) Bucks Fed Graded Levels of Toasted Jackfruit Seed Meal

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### Abstract

*An experiment was conducted at the Akwa Ibom State University, Department of Animal Science research farm to determine the effect of graded levels of toasted Jackfruit seed (JFS) meal on growth performance, haematology, serum biochemistry and cost analysis of West African Dwarf (WAD) bucks. The experiment lasted 90 days. Sixteen bucks aged 7 – 9 months and averaging  $8.0 \pm 0.01$ kg in weight were divided into 4 groups of 4 with each group randomly assigned to one of the treatments in a completely Randomized Design. The four treatments were formulated to contain 0, 7.5, 10 and 12.5% of jackfruit seed meals respectively. The values for growth parameters were not significantly ( $P > 0.05$ ) different except for feed conversion ratio (FCR). The bucks on treatment 3 (10% JFS meal) have the least FCR (3.82) and the least cost/kg weight gain (₦293.00) though not significantly ( $P > 0.05$ ) different with a corresponding increase in gross margin (₦4113.00) of the same treatment. The haematological and serum biochemical indices studied were significantly ( $P < 0.05$ ) different across all the treatments except for eosinophils. The highest total protein (7.13g/dl) and calcium (5.76 mmol/l) content were recorded in T<sub>3</sub>. This result has indicated safe nutritional regimes of JFS meal and its inclusion up to 10% is ideal for optimum cost/kg weight gain which is suggestive of enhanced buck production.*

**Keywords:** WAD bucks, jackfruit seed meal, performance, haematology, serum indices.

### 1.0 Introduction

Goats have been known to play vital role in the supply of animal protein among other ruminants as they convert forages and other by-products into useful resources. However, these animals are faced with poor nutrition particularly during the dry season (Amadi *et al.*, 2018). This stems from the fact that animals suffer phases of starvation occasioned by scarcity and decrease in the nutrient contents of the forages. When this happens, a “zig zag” growth pattern is observed in the animals as a result of inadequate feed (Dafwang, 2006; Eyoh *et al.*, 2019). This diverts attention to search for unconventional feedstuff which could

be used directly or with the application of appropriate processing methods to render it safe for consumption by animals (Eyoh, 2020).

Jackfruit (*Artocarpus heterophyllus*) is distributed around the world and is also found in the Akwa Ibom State, Nigeria. The seeds which are known to have nourishing qualities like crude protein content of 6.6g, 0.4g fat, 0.4 for carbohydrate, 1.4g for fibre and 1.50g for ash are discarded or eaten as snacks or used in some local dishes (Akinmutimi, 2006). However, Eyoh, (2020) also reported a range of 6.48-15.33% for crude protein, 3.65-11.27% for crude fibre, 3.57-4.23% for ether extract, 3.65-5.14% for ash, 62.09-64.92% for Nitrogen free extract and 2.91-4.10kcal/g for gross energy respectively. The starch content increases the potentiality of seed for livestock feed. Some antinutritional factors such as phytate, oxalate, tannin and hydrogen cyanide as reported by Eyoh, (2020) in the seed have been identified and various processing methods like toasting and soaking eliminate these antinutrients such that the seed is not detrimental. However, (Odukwe *et al.*, 2017 and Akinmutimi, 2006) have also identified antinutrients in the seed. Effective utilization has been reported in toasting methods of processing among others. Research has been carried out with jackfruit seed meal on poultry, but there is dearth of information on its utilization in small ruminants. Thus, this study was conducted to access the performance, haematology and serum biochemical constituents in WAD bucks fed graded levels of toasted jackfruit seed meal.

## 2.0 Materials and methods

### 2.1 Experimental site

The experiment was conducted at the goat unit of the teaching and research farm of the Department of Animal Science, Akwa Ibom State University. Akwa Ibom is located within latitude 50° 17<sup>1</sup>N and longitude 70° 58<sup>1</sup>E. The climate is typically humid tropical and has a relative humidity range of 56 – 90%, annual rainfall (1680 – 1700 mm) and temperature range of 22 - 37°C (Wikipedia, 2017).

### 2.2 Procurement and Processing of Jackfruit Seeds:

The seeds were collected in the wild from remote villages in Uyo L.G.A. the seeds were manually removed from the pods and left to dry. Thereafter, the seeds were toasted for 20mins in a frying pan and coarsely ground.

### 2.3 Experimental Diets:

The experimental diets were formulated using graded levels of toasted JFS meal and other available feed ingredients. The levels were 0, 7.5, 10 and 12.5% (Table 1) respectively. *Panicum maximum* was used as basal diet while fresh clean drinking water was pounded *ad libitum*.

### 2.4 Experimental Animals and Management:

A total of sixteen (16) West African Dwarf (WAD) bucks were used for the study. These animals were purchased from Ikot Ekpene in Akwa Ibom State. On arrival, the bucks were given prophylactic intra-muscular treatment of 1ml/bodyweight of the animal. They were also drenched with albendazole to control endoparasites and treated for mange and other

ectoparasites using Ivomec®. The goat unit, feeding and drinking troughs were properly cleaned. The experimental animals were randomly assigned to each of the diets.

On the last day of the experiment, two sets of blood samples were taken from the bucks using 5ml syringe. One ml blood samples were collected into labelled sterile bottles containing anticoagulant free bottles, allowed to coagulate at room temperature and centrifuged at 3000 rpm for 10 minutes. The serum concentration for cholesterol, alkaline phosphate (ALP) and albumin were determined using commercial laboratory kit (Randox Laboratories Ltd, U.K). The red blood cell (RBC), white blood cell (WBC) and packed cell volume (PCU) were determined using the method of Adedapo *et al.* (2007).

## 2.5 Data Analysis:

Data collected were analysed using ANOVA in a completely randomized design, following procedures of SAS (2014). Separation of significant differences between the means was done using Duncan's New Multiple Range Test of SAS (2014) software.

## 3.0 Results and Discussion

**Table 3.1: Composition of Experimental Diets**

Ingredients	T <sub>1</sub> (0%)	T <sub>2</sub> (7.5%)	T <sub>3</sub> (10%)	T <sub>4</sub> (12.5%)
Brewer's spent grains	20.00	12.50	10.00	7.50
Rice meal	20.00	20.00	20.00	20.00
Palm kernel cake	20.00	20.00	20.00	20.00
TJFSM	0.00	7.50	10.00	12.50
Rice bran	35.50	35.50	35.50	35.50
Oyster shell	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50
Total	100	100	100	100

TJFSM: Toasted Jackfruit Seed Meal

**Table3.2: Proximate Composition and Gross Energy of the Experimental Diet**

Parameters	T <sub>1</sub> (0%)	T <sub>2</sub> (7.5%)	T <sub>3</sub> (10%)	T <sub>4</sub> (12.5%)
Dry matter (%)	89.78	89.86	89.76	89.84
Crude protein	16.08	16.15	16.18	16.19
Ether extract	3.81	3.91	3.92	4.05
Crude fibre	9.57	9.61	9.59	8.76
Ash	7.09	7.35	7.02	7.02
NFE	53.24	52.86	53.06	53.83
Gross energy (kcal/g)	4.01	4.01	4.01	4.01

NFE = Nitrogen Free Extract

The proximate composition and gross energy of the experimental feeds is presented in Table 3.2. The result reveals that the crude protein contents of the diets ranged from 16.08 – 16.19% while the crude fibre values ranged from 8.76 – 9.61%. The levels of crude protein and crude fibre in the diet used in this study suggests that the diet can enhance performance in ruminants as reported by McDonald *et al.* (1995), Ikyume *et al.* (2018), Eyoh and Ayuk (2019).

**Table 3.3: Growth Performance of WAD Bucks Fed Graded Levels of Toasted JFS Meal**

Parameters	T <sub>1</sub> (0%)	T <sub>2</sub> (7.5%)	T <sub>3</sub> (10%)	T <sub>4</sub> (12.5%)	SEM
Initial weight (kg)	6.00	6.00	6.00	6.00	0.41
Final weight (kg)	9.50	9.60	10.20	9.00	0.68
Weight gain (kg)	3.50	3.60	4.20	3.00	1.08
Daily weight gain/buck/day (g)	38.88	40.00	46.66	33.33	11.98
Feed intake (kg)	16.75	16.80	14.30	16.80	2.59
Feed intake/buck/day (g)	186.10	186.70	158.90	186.70	28.70
Feed conversion ratio	4.79 <sup>ab</sup>	4.65 <sup>ab</sup>	3.82 <sup>b</sup>	5.70 <sup>a</sup>	0.67
Cost/kg of feed (₦)	66.80	65.30	64.80	64.30	0.00
Cost/kg weight gain (₦)	320.10	304.10	293.00	366.80	33.70
Gross margin (₦)	3081.00	3223.00	4113.00	2520.00	1162.30

<sup>a, ab</sup> means in a row with superscripts are significantly ( $P < 0.05$ ) different

Table 3.3 presents growth performance of WAD bucks fed graded levels of toasted jackfruit seed meal.

There were significant ( $P < 0.05$ ) differences among the treatment means for feed conversion ratio values. However, values for weight gain and daily weight gain/bucks were better numerically for bucks fed T<sub>3</sub> (10%), (4.20 kg and 46.66 g/day) than that obtained for those on control diets (3.50kg and 38.88g/day), T<sub>2</sub> (3.60 kg and 40.00 g/day) and T<sub>4</sub> (3.00 kg and 33.33 g/day) respectively. The significantly higher values numerically obtained for bucks in T<sub>3</sub> may be due to the inactivity effect of antinutritional factor inherent in the seeds by toasting method of processing. Additionally, among the methods of processing, toasting had the highest percentage reduction of the various antinutritional factors (Eyoh, 2020). High weight gain could have been responsible for increased daily feed intake as a result of palatability of

the feed. The result of this study is consistent with the reports of Eyoh *et al.*, (2018) who reported feed intake range of 129.45 – 196.95 g in goats placed on cassava peels, brewer's spent grain and *Panicum maximum* based diets. Feed conversion ratio (FCR) and cost/kg weight gain recorded the least (3.82 and ₦293.00) in T<sub>3</sub> among others. This is an indication that the lower the cost/kg weight gain, the better the diet. This may also imply that feeding WAD bucks at 10% level of toasted JFS meal is more economical and makes the feed more superior than others. Similarly, values for gross margin were numerically higher in T<sub>3</sub> among other treatments. This may have been occasioned by high values of weight gain and lesser feed cost/kg weight gain (Eyoh *et al.*, 2019). However, raising WAD bucks with toasted JFS meal may yield efficient feed utilization with a good return on investment for optimum production.

**Table 3.4: Haematological Indices of WAD Bucks Fed Graded Levels of Toasted JFS Meal**

Parameters	T <sub>1</sub> (0%)	T <sub>2</sub> (7.5%)	T <sub>3</sub> (10%)	T <sub>4</sub> (12.5%)	SEM
Red blood cell (x10 <sup>6</sup> /mm <sup>3</sup> )	6.55 <sup>d</sup>	10.38 <sup>a</sup>	6.80 <sup>c</sup>	7.92 <sup>b</sup>	0.10
Packed cell volume (%)	22.00 <sup>c</sup>	37.50 <sup>a</sup>	23.00 <sup>c</sup>	25.50 <sup>b</sup>	0.96
Haemoglobin (g/dl)	8.25 <sup>c</sup>	13.90 <sup>a</sup>	8.54 <sup>c</sup>	9.33 <sup>b</sup>	0.21
White blood cell (x10 <sup>9</sup> /l)	10.64 <sup>c</sup>	12.43 <sup>b</sup>	15.90 <sup>c</sup>	8.20 <sup>d</sup>	0.05
MCV (fl)	30.78 <sup>d</sup>	36.74 <sup>a</sup>	33.45 <sup>b</sup>	32.55 <sup>c</sup>	0.20
MCH (pg)	12.32 <sup>c</sup>	13.74 <sup>a</sup>	12.76 <sup>b</sup>	11.77 <sup>d</sup>	0.03
MCHC (g/dl)	40.50 <sup>a</sup>	37.83 <sup>b</sup>	38.22 <sup>b</sup>	36.82 <sup>c</sup>	0.22
Lymphocytes (%)	64.50 <sup>a</sup>	63.00 <sup>a</sup>	59.00 <sup>b</sup>	64.33 <sup>a</sup>	1.05
Neutrophils (%)	29.50 <sup>c</sup>	32.00 <sup>b</sup>	34.00 <sup>a</sup>	31.50 <sup>b</sup>	0.87
Eosinophils (%)	3.00	2.00	3.00	3.00	0.00
Monocytes (%)	4.50 <sup>b</sup>	4.00 <sup>c</sup>	5.00 <sup>a</sup>	4.00 <sup>c</sup>	0.20

<sup>a, b, c, d</sup> means in a row with different superscripts are significantly ( $P < 0.05$ ) different

SEM: Standard Error of Mean

MCV: Mean corpuscular volume

MCH: Mean corpuscular haemoglobin

MCHC: Mean corpuscular haemoglobin concentration

The result of haematological indices of WAD bucks fed graded levels of toasted JFS meal is shown in Table 3.4.

There were significant ( $P < 0.05$ ) differences for red blood cell (RBC), packed cell volume (PCV), haemoglobin white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), lymphocytes, neutrophils and monocytes except for eosinophils. Haematological parameters are valuable in monitoring feed toxicity especially with feed constituents that affect the blood as well as the health status of the animals (Okah and Ibeawuchi, 2011).

For all the parameters measured the following were within the normal ranges for haemoglobin (7-15g/dl; WBC 6.8 – 20.1 x10<sup>9</sup>µl; MCV 106.3 – 119.9µ and lymphocytes 47 – 82%) as reported by (Daramola *et al.*, 2005 and Opara *et al.*, 2010). Except for T<sub>2</sub> in red blood cell, other treatment i.e. T<sub>1</sub>, T<sub>3</sub> and T<sub>4</sub> were below the normal ranges. However, MCHC and lymphocytes were above the normal range MCHC (32 – 34.6%). The low red blood cell

values obtained in this research might have been instrumental to the anaemic condition of the experimental animals. This is in line with the views of Ibu (2005) who reported that the presence of megaloblastic anaemia where the red blood cells are normally enlarged due to folic acid and vitamin B deficiency. Lymphocytes and neutrophils are more in circulation in goats than in other ruminants (Olusanya *et al.*, 1976).

More so, the values obtained in this research were within normal broad ranges (Tambuwal *et al.*, 2002) for Red Sokoto goats suggesting a well-developed immune system in WAD goats to offer good health.

**Table 3.5: Serum Biochemical Components of WAD Bucks Fed Graded Levels of Toasted JFS Meal**

Parameters	T <sub>1</sub> (0%)	T <sub>2</sub> (7.5%)	T <sub>3</sub> (10%)	T <sub>4</sub> (12.5%)	SEM
Total protein (g/dl)	6.80 <sup>b</sup>	6.88 <sup>b</sup>	7.13 <sup>a</sup>	6.67 <sup>c</sup>	0.04
Cholesterol (mg/dl)	93.61 <sup>a</sup>	89.07 <sup>b</sup>	71.04 <sup>d</sup>	76.69 <sup>c</sup>	0.06
Albumin (g/dl)	3.53 <sup>c</sup>	3.63 <sup>c</sup>	4.20 <sup>a</sup>	4.02 <sup>a</sup>	0.05
Alkaline phosphate (μ/l)	6.35 <sup>b</sup>	7.00 <sup>a</sup>	6.90 <sup>ab</sup>	6.45 <sup>ab</sup>	2.43
Calcium (mmol/l)	4.76 <sup>d</sup>	5.34 <sup>c</sup>	5.76 <sup>a</sup>	5.64 <sup>b</sup>	0.39

<sup>a, b, c, d</sup> means in a row with different superscripts differ ( $P < 0.05$ ) significantly

The result of the serum biochemical values of WAD bucks fed graded levels of toasted JFS is presented in Table 3.5. There were significant ( $P < 0.05$ ) differences in all the serum biochemical parameters measured across the treatment group and did not indicate any particular trend. The total protein, albumin and calcium were higher ( $P < 0.05$ ) for bucks in T<sub>3</sub> respectively.

Total protein, albumin and alkaline phosphate were consistent with the normal ranges (5.2 – 8.5g/dl for total protein; 2.8 – 4.3 g/dl for albumin and 1.4 – 25.7 μ/l for alkaline phosphate) (Opara *et al.*, 2010; Eyoh *et al.*, 2016). Total protein is an indirect index for measuring the nutritional protein adequacy (Nworgu *et al.*, 2007). However, the similarity between the control and other treatments in this study suggests that the nutritional quality may be acceptable. Fasuyi and Noyerem (2007) stated that the most sensitive biochemical indices of mild or impending protein deficiency are a drop in serum albumin into the marginal range. Albumen values were also observed to be similar across the treatments indicating that the bucks did not suffer protein deficiency. Alkaline phosphate values were comparable across the treatments. This implies that bucks across the treatment were healthy as there were no symptoms of liver disease throughout the experimental period. Alkaline phosphate activity can be utilized to assess the health of the liver as it owes its origin to the osteoblasts and some of it are normally excreted in the bile (Daramola *et al.*, 2005). The values obtained for cholesterol and calcium were higher than the normal range in all the treatments (41.30 – 51.20mg/dl and 1.5 – 2.4 mmol/l) as reported by Opara *et al.*, (2010). Cholesterol is an essential structural component of cell membrane and lipo proteins and serve as the prosecutor for steroid hormones and bile acids (Fasuyi and Noverem 2007). It has further been enlightened that increased blood cholesterol values are found in conditions like chronic and



acute nephritis, chronic nephrosis, and high liquid hypothyroidism among others. These conditions were lacking in the present study. High level of serum calcium could probably be as a consequence of the feeding regime, since the animals had access to forage supplementation during the research.

## 4.0 Conclusion

1. The result in this present study has shown that haematological and serum biochemical parameters examined indicated safe nutritional regimes.
2. Inclusion of toasted jackfruit seed meal up to 10% in the diet of WAD bucks gave optimum cost/kg weight gain which is suggestive of improving the profitability in WAD bucks production by smallholder farmers.

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