

JOURNAL OF AGRICULTURE,
FORESTRY AND THE
SOCIAL SCIENCES

VOL 9, NO. 1, 2011

JOAFSS



FOSTERING PROGRESSIVE PARTNERSHIPS FOR SUSTAINABLE AGRICULTURE

www.ajol.info/journals/joafss

ISSN 1597-0906

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All correspondences to:

Prof. M. A. Bamikole (Editor-in-Chief, JOAFSS)
Department of Animal Science,
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E-mails: bankymao@uniben.edu
bankymao@yahoo.co.uk

OR

ESSIEN, Antigha (Coordinating Editor, JOAFSS)
Department of Animal Science,
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EFFECTS OF VARYING LEVELS OF FLAMBOYANT (*Delonix regia*) SEED MEAL ON BODY WEIGHT CHANGES AND LINEAR BODY MEASUREMENTS OF SAVANNA BROWN GOAT

BY

Alemede, I. C. and Ogunbajo, S. A.

Department of Animal Production, Federal University of Technology, Minna

E-mail for correspondence: khalifahshaq@gmail.com

ABSTRACT

A trial was conducted to study the linear body measurements of Savanna brown goats fed diets containing varying levels of roasted *Delonix regia* seed meal using fifteen goats. Five treatment diets designated T₁, T₂, T₃, T₄ and T₅ were formulated to be isocaloric and isonitrogenous with the groundnut cake component of the diets substituted with *Delonix regia* seed meal at 0 %, 25 %, 50 %, 75 % and 100 % respectively. The animals were allotted to five treatment groups of three replicates in a completely randomized design and fed the diets. Data on feed intake, body weight gain and linear body measurements were collected and subjected to analysis of variance (ANOVA) and the difference between means were separated using the Duncan's Multiple Range Test. The results obtained showed that animals fed diets having 50 % replacement level of groundnut cake with roasted *Delonix regia* seed meal performed better with respect to all the parameters evaluated, with a decline in these parameters at dietary levels above 50 %. It was concluded that feeding diets having 50 % replacement level of groundnut cake with roasted *Delonix regia* seed meal is a nutritionally effective means of improving the performance of does in terms of the performance parameters so evaluated.

Key words: *Delonix regia*, Linear body measurements, Savanna brown goats

INTRODUCTION

Growth usually defined as the increase in body weight or size of various parts of the body at a given age is one of the important selection criteria for the improvement of meat animals. Reliable methods of body weight estimation in food animals are of paramount importance in animal production, nutritional studies and veterinary clinical practice (Mamman, *et al* 2000). The relationship existing among linear body measurements traits provide useful information on performance, productivity and carcass characteristics of animals (Akanno and Ibe, 2006). Body weight and linear body measurements of meat animals have relevance in estimating body size and shape. Body measurement in addition to weight measurement describes more completely an individual or population than conventional method of weighing and grading. Studies regarding the linear body measurement of various animals have been carried out in some regions of the world and their possible use for estimating the animals live weight has not been adopted by farmers in the tropics (Touchberry and Lush, 2007). Objective body dimensions and measures of muscular development were shown to serve to supplement body weight as a measure of productivity in sheep (Afolayan, *et al*, 2002) or as predictors of some less visible characteristics (Gilbert, *et al*, 1993). Linear body measurements are very important especially among rural farmers where there are no weighing scales or machines and the market system is informal and poorly developed as the market value of any animal depends on its weight. This study was therefore carried out to evaluate the relationship between body weight and linear body measurements in savanna brown goats fed dietary levels of *Delonix regia* seed meal.

MATERIALS AND METHODS

The experiment was carried out at the ruminant animal production unit of the Teaching and Research farm of the Federal University of Technology, Minna, Niger State. Fifteen (15) healthy Savanna brown goats with mean initial body weight of 13 kg and aged between 6 – 8 months were used for the study. They were randomly assigned to five treatment groups each having three animals in a completely randomized design. Prior to their arrival, the pens were washed, disinfected and allowed to dry. On arrival, the animals were dewormed using albendazole and ivermectin, bathed with diazintol solution and vaccinated against Pest-de-Pestes Ruminantus (PPR) using tissue culture rinderpest vaccine. The animals were allowed a pre-treatment period of two (2) weeks to enable them acclimatize. The feed ingredients used for the study were obtained in Minna. The *Delonix regia* seeds were also harvested from trees around Minna. Harvesting was carried out between mid-November and early February. The pods were manually cracked to get the seeds which were already dried. The empty pods were thrown away while the seeds were further sundried and roasted using open flame for up to fifteen minutes in a large frying pan with little amounts of sandy soil to prevent friction and burning. They were then sieved and crushed to *Delonix regia* seed meal with the aid of a hammer mill for inclusion in the rations. Five different rations were compounded for the five treatments designated T₁, T₂, T₃, T₄ and T₅. The feeds were formulated to be isocaloric and isonitrogenous. The diets T₁, T₂, T₃, T₄ and T₅ had the groundnut cake component substituted with *Delonix regia* seed meal at 0 %, 25 %, 50 %, 75 % and 100 % respectively. The animals were managed semi-intensively. They were allowed to graze in the morning beginning from 10:00 a.m and returned to their pens in the evening at 4:30 p.m during which period they were given the experimental diets. They were also supplied ample amounts of fresh water and salt licks. Feed intake and refusals were recorded daily. Linear body measurements and body weight gains were taken weekly with the aid of a flexible canvass tape and weighing scale respectively. Linear measurements taken include height at withers (which was measured as the distance from the centre of the dorso-thoracic vertebra region and the ground), chest girth (which was measured as the circumference of the chest just behind the fore limbs), body length (which was measured as the distance from the base of the neck just before the shoulder to the point of emergence of the tail), facial length (which was measured as the distance from the center of the head between the ears and the tip of the upper lip), neck length (which was measured as the distance between the base of the head around the first atlas bone to the base of the neck around the last axis bone of the cervical vertebra) and length of the upper limbs (which was measured as the distance between the point of attachment of the femur to the rest of the body and the knee joint).

The raw and roasted *Delonix regia* seed meals were analyzed for their proximate composition, energy values and anti-nutritional factors. The treatment diets were also analyzed for their proximate composition and energy values. The anti-nutritional factors were determined using the methods outlined by Onwuka (2005) while all other chemical analyses were carried out according to AOAC methods (AOAC, 1995). Data from experiment were subjected to analysis of variance (ANOVA), and the variations in means were separated using the Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The results of the proximate composition and anti-nutritive factors of the raw and roasted *Delonix regia* seed meal and the experimental diets is presented in tables 1 and 2. The results shows that the anti-nutritive factors of the *Delonix regia* were greatly reduced by roasting.

Table 1: Proximate composition and energy values of raw and roasted flamboyant tree seeds and experimental diets

Nutrients (%)	Raw <i>Delonix regia</i>		Roasted <i>Delonix regia</i>				
	Seeds	Seeds	T ₁	T ₂	T ₃	T ₄	T ₅
Dry matter	87.80	89.40	91.00	92.00	91.00	93.00	90.00
Moisture	12.20	10.60	9.00	7.99	9.00	7.00	10.00
Crude protein	18.10	18.92	12.05	12.03	12.06	12.10	12.12
Crude fiber	7.50	11.00	12.25	18.30	22.82	24.66	29.35
Ether extract	7.50	9.00	13.36	17.37	10.73	18.12	13.96
Ash	3.60	3.40	5.03	7.00	7.00	9.01	11.00
Nitrogen free extract	51.10	47.08	48.31	37.30	38.39	29.11	23.57
Energy (Kcal/kg)	3443.00	3450.00	3616.80	3536.50	2984.50	3279.20	2684.00

T₁ 0 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₂ 25 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₃ 50 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₄ 75 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₅ 100 % replacement level of groundnut cake with *Delonix regia* seed meal

Table 2: Anti-nutritional composition of raw and roasted flamboyant tree seeds

Factors	Raw <i>Delonix regia</i> Seeds	Roasted <i>Delonix regia</i> Seeds
Tannin (mg/100 g)	93.10	11.20
Phytate (mg/100 g)	2.13	0.58
Saponin (%)	12.23	2.22
Trypsin Inhibitors (Tui/mg)	273.00	62.00

The results of the body weight gain and linear body measurements are presented in table 3. The results indicated that with exception to neck length which was higher in animals fed T₅ diets (100 % replacement level of groundnut cake with *Delonix regia* seed meal), all the other parameters measured in this study were higher in animals fed T₃ diets (50 % replacement level of groundnut cake with *Delonix regia* seed meal). The body weight gained and linear body measurements among the animals increased with increase in replacement level of groundnut cake with *Delonix regia* seed meal up to 50 % (T₃ diet), after which it declined markedly. This could be ascribed to the poor nutrient intake occasioned by low feed intake.

Table 3: Body weight gain and linear body measurements of savanna brown goats fed varying levels of roasted *Delonix regia* seed meal

Parameters (cm)	Diets					Remark
	T ₁	T ₂	T ₃	T ₄	T ₅	
Body weight gain (kg)	7.94 ± 1.07 ^{ab}	5.94 ± 0.26 ^{ab}	7.97 ± 0.31 ^a	4.73 ± 0.31 ^b	4.00 ± 0.44 ^c	*
Upper fore limb	17.07 ± 0.22 ^b	16.73 ± 0.22 ^b	18.22 ± 0.27 ^b	17.98 ± 0.22 ^{ab}	17.15 ± 0.39 ^b	*
Upper hind limb	21.39 ± 0.21 ^b	20.78 ± 0.21 ^c	22.54 ± 0.26 ^a	22.28 ± 0.26 ^{ab}	21.42 ± 0.36 ^{bc}	*
Height at withers	52.37 ± 0.78 ^b	51.35 ± 0.78 ^c	55.44 ± 0.95 ^a	54.12 ± 0.95 ^{ab}	47.79 ± 1.35 ^d	*
Chest girth	58.48 ± 0.66 ^{ab}	58.02 ± 0.66 ^b	60.40 ± 0.81 ^a	59.87 ± 0.81 ^{ab}	57.77 ± 1.14 ^{ab}	*
Neck length	19.54 ± 0.33 ^b	20.53 ± 0.33 ^a	20.96 ± 0.41 ^a	20.66 ± 0.41 ^a	21.01 ± 0.58 ^a	*
Facial length	17.57 ± 0.17 ^b	18.13 ± 0.17 ^c	19.27 ± 0.21 ^a	18.70 ± 0.21 ^{ab}	18.07 ± 0.29 ^{bc}	*
Body length	74.95 ± 0.60 ^b	77.55 ± 0.66 ^a	78.30 ± 0.80 ^a	78.21 ± 0.80 ^a	75.49 ± 1.14 ^{ab}	*

T₁ 0 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₂ 25 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₃ 50 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₄ 75 % replacement level of groundnut cake with *Delonix regia* seed meal
 T₅ 100 % replacement level of groundnut cake with *Delonix regia* seed meal

The unavailability of good quality grazing land at the time the experiment commenced left the animals with no alternative but to feed majorly on the experimental diets. The higher linear body measurements displayed by animals on T₃ diets (50 % replacement level of groundnut cake with *Delonix regia* seed meal) can be attributed to nutritional adequacy of the diets for growth and the beneficial effects of the anti-nutritional factors consumed. The does fed diets having more than 50 % replacement level of groundnut cake with *Delonix regia* seed meal manifested decreased *in vivo* nutrient utilization and growth rate, thereby leading to increased body fluid loss and reduced rate of nutrient retention and consequently general body weight loss among the animals. At inclusion levels above 50 % (T₃), it could be said that the animals had exceeded the tolerance level for these factors, which resulted in conditions such as gut irritation, associated with tannins as reported by Makkar (2003), decreased rumen motility and bloat associated with saponins as reported by Hu, *et al* (2005), inflammation of the mucosa of the alimentary tract, diarrhea and vomiting associated with saponins as reported by Jamroz and Kubizna (2007).

The correlation between the body weight and linear body measurements is presented in table 4. The correlation results showed that the neck length had the lowest correlation to body weight (0.4467), while the height at withers was the most correlated to body weight (0.6764). The general results indicated that the height at withers, upper hind limb length, chest girth and facial length were most correlated to the body weight of the animal and can be used in predicting the body weight of the animals. This is in line with the findings of Bassano *et.al* (2001) that height at withers and body length can be used to predict body weight, and the findings of Thiruvankadu (2005) that chest girth since it is made up of bones, muscle and viscera can be useful in predicting body weight in animals. The variation in linear body measurements reported in this study is in line with the findings of Adeyinka and Mohammed (2006) that variations in relationship between body weights and linear body measurements can be attributed to seasonal variations in body condition associated with availability of feed, water or physiological status such as pregnancy lactation, diseases and so on.

regia seed meal

	Weight	Height at Withers	Upper fore limb	Upper hind limb	Chest girth	Neck length	Facial length	Body length
Weight	1.0000							
Height at withers	0.6467	1.0000						
Upper fore limb	0.6367	0.5793	1.0000					
Upper hind limb	0.6719	0.5726	0.5741	1.0000				
Chest girth	0.7812	0.6255	0.5785	0.5688	1.0000			
Neck length	0.4467	0.4114	0.5069	0.3956	0.3799	1.0000		
Facial length	0.6537	0.5442	0.6243	0.6071	0.5381	0.5936	1.0000	
Body length	0.6722	0.4873	0.4996	0.5135	0.6483	0.4365	0.5728	1.0000

CONCLUSION AND RECOMMENDATION

This study showed that there were significant ($P < 0.05$) effects of dietary levels of roasted *Delonix regia* seed meal on body weight gain and linear body measurements, with a general increase in the parameters evaluated with increase in replacement level of groundnut cake with *Delonix regia* seed meal up to 50 %, after which there was a decline at inclusion levels above this. It also showed that in all the treatments, the body weight had a correlation with some of the parts measured and hence can serve as basis for the prediction of the live weight of animals. This is particularly important as most farmsteads lack a weighing scale. It can therefore be concluded that diet T₃ (containing 50 % replacement level of groundnut cake with *Delonix regia* seed meal) is the best diet in terms of all the parameters evaluated in this study.

Recommendation

It is recommended that feeding dietary levels of roasted *Delonix regia* seed meal at up to 50 % replacement level of groundnut cake is a nutritionally effective means of fine – tuning the performance of ruminants to get the best in terms of growth performance.

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