

## BODY WEIGHT AND INTERNAL ORGANS CHARACTERISTICS OF RABBIT BUCKS FED DIETS CONTAINING *DIALIUM GUINEENSE* LEAF MEAL.

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### ABSTRACT

The quest for alternative feed resources in livestock production necessitated this experiment, which was carried out at the Rabbitry Unit of the Teaching and Research Farm, Federal University of Technology, Owerri, Imo State. This study evaluated the body weight and organ characteristics of adult New Zealand White (NZW) rabbit bucks fed diets containing *Dialium guineense* leaf meal. It was carried out in a Complete Randomized Design (CRD) and lasted for four weeks. The experiment is made up of three diets (treatments); T1, T2 and T3, containing 0.0, 30.0 and 60.0 % *Dialium guineense* leaf meal, respectively. Body weights of the rabbits were measured weekly, while internal organ weights were measured at the end of the experiment, and histopathological sections of the heart, liver, kidney and testes were evaluated. Body weights and organ weights were subjected to analysis of variance (ANOVA) at  $P < 0.05$  significant level. Weekly body weights and body weight gain were similar ( $P > 0.05$ ) between T1 and T2 which were significantly ( $P < 0.05$ ) higher than weekly body weights and body weight gain of rabbits on T3. Histopathological evaluation recorded distortions in tissue architecture of the liver and kidneys of the rabbit bucks on T3. The results of this experiment show that *Dialium guineense* leaf meal may be of benefit in diets of adult rabbit bucks to improve their body weights when included at 30 % dietary level.

**Keywords: Diets, Growth, Histopathology, Organs, Weight gain**

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### INTRODUCTION

Plant products that are not usually used in livestock feeding are now being explored for their potential benefits in various aspects of animal production due to scarcity or high cost of the conventional feed resources in livestock production. Many plants are not well researched for their use in livestock production. One of such plants is *Dialium guineense* (Velvet Tamarind), which is a well-known plant in Southeastern Nigeria.

*Dialium guineense*, is a tree that can grow up to 30 m in height with densely leafy crown. The plant is known as Velvet tamarind in English, Icheku in Igbo and Awini in Yoruba (Ezeja *et al.*, 2011). It belongs to the family of plants called *Fabaceae* and the leaves have been reported to be rich in proteins with good amino acid profile (Djissou *et al.*, 2016). Phytochemicals, which include alkaloids, flavonoids, tannins, saponins, cardiac glycosides and steroids are the active constituents of *Dialium guineense*.

While the conventional forages used in feeding rabbits may be scarce during the dry season, *Dialium guineense* leaves continue to flourish in the bushes. The exploration of non-conventional feed materials in livestock nutrition has mostly focused on growth performance of the animals; which analyzes feed intake, weight gain and feed conversion ratio, while some focus on blood and reproductive characteristics of the animals receiving the non-conventional feed materials; and very few consider the internal organs of the animals receiving the non-conventional feeds. This study is therefore, designed to evaluate the body weight and internal organ characteristics of adult New Zealand White (NZW) rabbit bucks fed diets containing *Dialium guineense* leaf meal.

### MATERIALS AND METHODS

The experiment was carried out at the Rabbitry section of the Teaching and Research Farm, Federal University of Technology Owerri, Imo State. It is located in Southeast zone of Nigeria and the climatic condition of Imo State has been documented (Ibeawuchi *et al.*, 2005).

A total of 18 adult New Zealand White (NZW) rabbit bucks were used for this experiment. The rabbits were housed separately in a 2 x 2 feet hutch and were allowed two weeks to acclimatize before administering treatment. Standard management procedures were followed, while feed and water were freely offered to the animals throughout the experimental period.

The leaves of *Dialium guineense* were harvested from the bush around Federal University of Technology, Owerri, air-dried and ground into a meal, which was used to formulate the experimental diets.

The experiment was carried out in Complete Randomized Design (CRD). The 18 rabbit bucks were divided into three experimental groups of six rabbits of three replicates each, on weight equalization basis, after which each of the groups was randomly allocated to one of three treatment diets (Table 1); T1, T2 and T3, containing 0, 30 and 60 % *Dialium guineense* leaf meal, respectively. The experiment lasted for 28 days.

**Table 1** Composition of diets fed the experimental rabbit bucks

Ingredients	T1	T2	T3
Maize	45.00	40.00	25.00
Soyabean meal	15.00	10.00	5.00
Palm kernel cake	17.00	7.00	2.00
Wheat offal	18.50	8.50	3.50
<i>Dalium guineense</i>	0.00	30.00	60.00
Fish meal	1.00	1.00	1.00
Bone ash	2.00	2.00	2.00
Oyster shell	1.00	1.00	1.00
Salt	0.25	0.25	0.25
Vit/Min premix*	0.25	0.25	0.25
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

\*To provide the following per kg of diet; Vit A, 10,000 IU; Vit D, 1,500 IU; Vit E, 3 IU; Vit K, 2mg; Riboflavin, 3 mg; Vit B<sub>12</sub>, 0.8 mg; Folic acid, 4 mg; Mn, 8 mg; Zn, 0.5 mg; Iodine, 1.0 mg; Co, 1.2 mg; Cu, 10 mg; Fe, 20 mg.

Body weights of the rabbit bucks were measured and recorded prior to commencement of the treatment, and weekly afterwards. At the end of the experiment, three rabbits per treatment (one per replicate) were sacrificed through stunning and cutting of the neck, following the World Rabbit Science Association (WRSA) recommendations as reported by Iwuji *et al.* (2017). The heart, liver, kidneys and testes were carefully removed and weighed using a digital scale of 0.01 g sensitivity.

The organs removed from the rabbits were put into separate containers containing 10 % formalin so as to preserve them for histological evaluation, which was carried out as described by Iwuji *et al.* (2018). Tissues were cut from the organs preserved in 10 % formalin and transferred to a graded series of ethanol (50, 70, 95 and 100 %) and then cleared in xylene. Once cleared, the tissues were infiltrated in molten paraffin wax in the oven at 58 °C. Serial sections of 5µm in thickness were obtained from a solid block of tissue using a microtome, cleared and fixed in clean slides, which were stained with Haematoxylin and Eosin stains and examined with a light microscope at a magnification of x200. The sections were then photographed to produce the photomicrographs at the Animal Science and Technology Laboratory, Federal University of Technology, Owerri.

The data generated from body weights and organ weights were subjected to analysis of variance (ANOVA) using SAS (2010). Significantly (P<0.05) different means were separated using the same software.

## RESULTS AND DISCUSSION

The average initial body weight, weekly body weights and body weight gain of the rabbit bucks are presented in Table 2. Initial average body weights of the rabbits were similar (P>0.05). Body weight of the rabbits in week 1 was significantly (P<0.05) higher in T2 compared to T3, which was similar (P>0.05) to T1. In weeks 2, 3 and 4, body weights of the rabbits in T1 and T2 were similar (P>0.05), but significantly (P<0.05) higher than body weights of rabbits on T3. Average body weight gain of the rabbits on T1 and T2 were similar (P>0.05) and significantly (P<0.05) higher than average body weight gain of rabbits on T3.

**Table 2** Average Body weight of adult rabbit bucks fed diets containing *Dalium guineense* leaf meal.

Parameters (g)	T1	T2	T3	SEM	p-value
Initial body weight	1825	1835	1825	4.21	0.12
Week 1 body weight	1900 <sup>ab</sup>	1948 <sup>a</sup>	1750 <sup>b</sup>	20.77	0.04
Week 2 body weight	1900 <sup>a</sup>	1960 <sup>a</sup>	1625 <sup>b</sup>	48.25	0.03
Week 3 body weight	1950 <sup>a</sup>	2035 <sup>a</sup>	1650 <sup>b</sup>	31.50	0.02
Week 4 body weight	2000 <sup>a</sup>	2035 <sup>a</sup>	1675 <sup>b</sup>	42.34	0.02
Body weight gain	175 <sup>a</sup>	200 <sup>a</sup>	-150 <sup>b</sup>	12.45	0.001

<sup>ab</sup>: Means on same row with different superscripts are significantly (P<0.05) different.

Utilization of *Dalium guineense* leaf meal in diets of rabbit bucks did not significantly improve weekly weights of the animals, but decreased it at 60 % (T3) inclusion level, which was evident in the weight loss recorded in the 4<sup>th</sup> week. However, at 30 % (T2) inclusion level, the weekly weights of the rabbits progressively increased, though not significant (P>0.05), leading to a body weight gain of 200 g after 4 weeks. Phytochemicals which are main constituents of *Dalium guineense* have been reported to contain several complex compounds and molecules made up of those that increase appetite and weight gain and those that decrease them (Tucci, 2010). The loss of weight in rabbits on T3 could mean that the appetite and weight decreasing phytochemicals increased to a detrimental level, relative to those promoting appetite and weight gain, while the non-significant progressive weight increase

recorded in T2 could mean that *Dialium guineense* have a potential for increasing body weight of rabbits, especially if the level is reduced.

Table 3 presents the heart, liver, kidneys and testes weights of the experimental rabbits, recorded in percentages of their body weights. Percentage liver weights of rabbits on T1 was significantly ( $P < 0.05$ ) higher than percentage liver weights of rabbits on T2 and T3, which were similar ( $P > 0.05$ ). Percentage heart, kidneys and testes weights of the experimental rabbits were similar ( $P > 0.05$ ) among the treatments.

**Table 3** Percentage organ weights of adult rabbit bucks fed diets containing *Dialium guineense* leaf meal

Parameters (%)	T1	T2	T3	SEM	p-value
<b>Heart</b>	0.23 (4.14g)	0.25 (4.54g)	0.19 (3.35g)	0.02	0.14
<b>Liver</b>	4.31 (77.62g) <sup>a</sup>	1.91 (34.41g) <sup>b</sup>	1.76 (31.73g) <sup>b</sup>	0.5	0.01
<b>Kidneys</b>	0.29 (5.14g)	0.23 (4.05g)	0.19 (3.45g)	0.03	0.06
<b>Testes</b>	0.22 (3.98g)	0.25 (4.46g)	0.24 (4.38g)	0.01	0.09

<sup>ab</sup>: Means on same row with different superscripts are significantly ( $P < 0.05$ ) different.

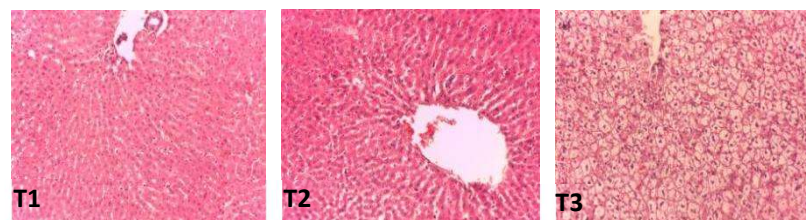
The liver is mainly the organ responsible for metabolism of drugs and other chemical compounds. Moreover, among the organs evaluated (heart, liver, kidney and testis), only the liver has relative function in digestion (Frandsen *et al.*, 2009). The phytochemical contents of *Dialium guineense* were probably subjected to metabolism in the liver, which may have been overloaded, leading to degenerative changes and loss of liver weights recorded in T2 and T3. This suspicion may be corroborated by the distortion in tissue architecture of the liver of rabbit on T3 (Plate 6).

Histopathological sections of the heart, liver, kidneys and testes of the experimental rabbits are presented in plates 1 – 12. Changes in tissue architecture were recorded in liver and kidney of rabbits on T3.



**Figure 1: Histological section of heart of experimental rabbit bucks**

Section with normal tissue disposition observed in T1 and T2, while T3 shows liver tissue with disorganized stromal arrangement and slightly enlarged central vein. The hepatocytes appear to be undergoing ballooning degeneration. The stroma equally appear scanty.



**Figure 2: Histological section of liver of the experimental rabbit bucks.**

Section with normal tissue disposition observed in T1 and T2, while T3 shows kidney tissue with glomeruli closely adherent to the Bowman's capsule and some slightly enlarged tubules. However, some of the tubules appear constricted.

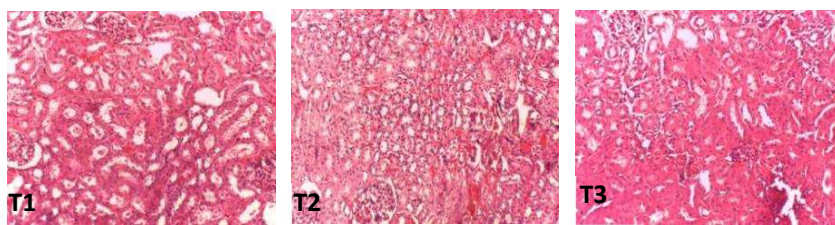


Figure 3: Histological section of kidney of the experimental rabbit bucks.

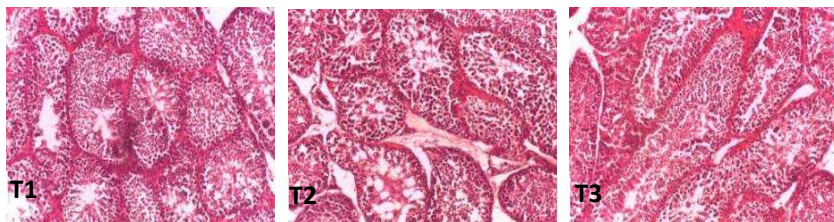


Figure 4: Histological section of testis of adult rabbit buck on T3.

Histological sections of the rabbits showed distortions in tissue architecture of the liver and kidneys of the rabbits on T3. Although percentage weights of the kidneys of *Dialium guineense* treated rabbits (T2 and T3) were similar ( $P>0.05$ ) with control (Table 3); this could be due to non-direct involvement of the kidneys in digestion and metabolism of *Dialium guineense* leaf meal, but due to the effects of the phytochemical metabolites which are constituents of the blood filtered by the kidneys (Frandsen *et al.*, 2009).

#### CONCLUSION

The results of this study elucidate that the utilization of *Dialium guineense* leaf meal in diets of New Zealand White (NZW) rabbits at 30 % inclusion level improves their weekly and total body weight without any deleterious effect on their heart, liver, kidney, and testes.

#### REFERENCES

- Djissou, A. S. M., Tossavi, E. C., Kpogue, S. D., Toguyeni, A. and Fiogbé, E. D. (2016). Comparability of amino acids composition in leaves of *Azolla filiculoides*, *Moringa oleifera* and *Dialium guineense* as sources of proteins in food of fish. *International Journal of Innovation and Applied Studies*, 17(2):718-725.
- Ezeja, M. I., Omeh, Y. S., Ezeigbo, I. I. and Ekechukwu, A. J. (2011). Evaluation of the analgesic activity of the methanolic stem bark extract of *Dialium guineense* (Wild). *Ann Med Health Sci Res*, 1(1):55-62.
- Frandsen, R. D., Wilke, W. L. and Fails, A. D. (2009). *Anatomy and Physiology of Farm animals (7<sup>th</sup> edn)*. Wiley-Blackwell Publishing, USA.
- Iwuji, T. C., Herbert, U., Oguike, M. A. and Etuk, I. F. (2017). Effect of Oral Administration of *Panax Ginseng* Extracts on Organ Weight, Histology and Bone Characteristics of Rabbit Bucks. *FUTO Journal Series*. Vol. 3 (2): 43 – 53.
- Iwuji, T. C., Ibedilo, C. Stella, Ekpo, K.O. and Etuk, I. F. (2018). Internal organ characteristics of broiler birds drinking chilled water under high ambient temperature. *Int'l Journal of Agric. and Rural Dev*. Volume 21(1): 3515 – 3522.
- Tucci, S. A. (2010). *Phytochemicals in the control of human appetite and body weight*. Pharmaceuticals (Basel). 3(3): 748–763.
- SAS (2010) *Statistical Analysis System. SAS User Guide: Release 9.2*. SAS Institute Inc, Cary.
- Ibeawuchi, I. I., Obiefuna, J. C and Ofoh, M. C. (2005). Effects of Row spacing on yield and yield components of Okra (*Abelmoschus esculentus*) and mixture Groundnut (*Arachis hypogea* L.). *Agronomy* 4 (4): 305-307.