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## **BLOOD CHARACTERISTICS OF ADULT RABBIT BUCKS FED *DIALIUM GUINEENSE* LEAF MEAL.**

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### **ABSTRACT**

Assessment of blood characteristics of livestock species administered non-conventional feed materials is of paramount importance in determining the physiological status of such animals, especially to make sure they are not adversely affected. A total of 36 New Zealand White (NZW) adult rabbit bucks of 6 months old were used in this experiment which lasted for four weeks; to evaluate their hematological and serum biochemical parameters. The experiment was carried out in a Complete Randomized Design (CRD) comprising three treatments; T1, T2 and T3, containing 0.0, 30.0 and 60.0% *Dialium guineense* leaf meal respectively, and replicated thrice to contain 4 rabbits per replicate. Harvested *Dialium guineense* leaves were air-dried, ground into a meal and used in feed formulation for the rabbits. Blood samples were collected from the jugular vein for hematological and serum biochemical analyses using automated hematology analyzer and Semi-automated clinical chemistry analyzer. Data collected were analyzed using Statistical Analysis System, version 9.4. Packed cell volume (T1 = 32.20%; T2 = 35.10%; T3 = 32.40%) was 9.01% (P<0.05) higher in T2 rabbits than in control rabbits, while mean corpuscular volume (T1 = 64.60 fl; T2 = 61.80 fl; T3 = 58.00 fl) decreased by 4.33 and 10.22% (P<0.05) in T2 and T3, respectively. white blood cell count (T1 =  $8.70 \times 10^9/l$ ; T2 =  $12.00 \times 10^9/l$ ; T3 =  $6.70 \times 10^9/l$ ) recorded 37.93% (P<0.05) increase in T2 but decreased by 22.99% (P<0.05) in T3, while lymphocyte count (T1 =  $5.13 \times 10^9/l$ ; T2 =  $6.72 \times 10^9/l$ ; T3 =  $3.02 \times 10^9/l$ ) was 30.99% (P<0.05) higher in T2 and 41.13% (P<0.05) lower in T3. Heterophil count (T1 =  $3.48 \times 10^9/l$ ; T2 =  $5.04 \times 10^9/l$ ; T3 =  $3.62 \times 10^9/l$ ) was higher in T2 by 44.83% (P<0.05). Platelet count (T1 =  $279.00 \times 10^9/l$ ; T2 =  $341.00 \times 10^9/l$ ; T3 =  $131 \times 10^9/l$ ) was 22.22% (P<0.05) higher in T2, but recorded a decrease of 53.05% (P<0.05) in T3. Heterophil-lymphocyte ratio (T1 = 0.68; T2 = 0.75; T3 = 1.20) was higher in T3 by 76.47% (P<0.05). Total serum protein (T1 = 5.50 g/dl; T2 = 6.10 g/dl; T3 = 4.80 g/dl) was 10.91% (P<0.05) higher in T2 but decreased by 12.73% (P<0.05) in T3, while globulin (T1 = 2.60 g/dl; T2 = 3.30 g/dl; T3 = 2.30 g/dl) was only higher in T2 by 26.92% (P<0.05). Urea (T1 = 25.00 mg/dl; T2 = 38.00 mg/dl; T3 = 25.00 mg/dl) was 52% (P<0.05) higher in T2, while urea-creatinine ratio (T1 = 31.24; T2 = 47.49; T3 = 22.72) recorded 52.02% (P<0.05) increase in T2 and 27.27% (P<0.05) decrease in T3. Alkaline phosphatase (T1 = 15.00 IU/L; T2 = 8.00 IU/L; T3 = 9.00 IU/L) was 46.67 and 40% (P<0.05) lower in T2 and T3, respectively, while alanine transaminase (T1 = 37.00 IU/L; T2 = 45.00 IU/L; T3 = 35.00 IU/L) recorded 21.62% (P<0.05) higher value in T2 only. This study demonstrates that 30% *Dialium guineense* leaf meal in diets of adult NZW rabbit bucks do not have adverse effects on the evaluated blood parameters, rather it improved their PCV, cellular immunity and serum globulin.

**Key words:** Blood, *Dialium guineense*, leaf meal, Rabbit.

### **INTRODUCTION**

Studies on the utilization of non-synthetic materials of plant origin have continued to increase since the advocacy for non-synthetic drug use in animal production, occasioned by residual effects of synthetic drugs (Iwuji and Herbert, 2012). Various plant seeds, leaves, roots and other parts are being explored for their possible benefits and replacement of the synthetic materials used in animal production, with a possibility of achieving the same or improved effect as with synthetic materials.

The plant, *Dalium guineense*, is widely known for its fruit (Icheku), but has not been widely researched for use in animal production. Studies involving the plant have focused more on the various compositions of the plant and its medicinal and pharmacological uses (Besong *et al.*, 2016). *Dalium guineense*, also called velvet taramind is a leguminous plant which usually grows in the wild with its description widely documented (Besong *et al.*, 2016).

The rabbit industry in Nigeria has been described as emergent or rudimentary and rabbits have been adjudged to have the potential to fill the niche in animal protein needs of developing countries like Nigeria (Iwuji *et al.*, 2017). Therefore, more research studies in rabbit production are of paramount importance in elevating the rabbit production industry in Nigeria. This study is therefore designed to evaluate the effect of *Dalium guineense* leaf meal on haematological and serum biochemical characteristics of adult New Zealand White (NZW) rabbit bucks.

## MATERIALS AND METHODS

### Animals and experimental design

The experiment was carried out at the Teaching and Research farm, Federal University of Technology Owerri, Imo State, Nigeria. A total of 36 adult New Zealand White (NZW) rabbit bucks (6 months old) were used for this experiment. Standard management procedures were followed while feed and water were freely offered to the animals throughout the experiment. Harvested leaves of *Dalium guineense* were air-dried for seven days and ground into a meal, which was used in feed formulation for the experimental rabbits. The experiment was carried out in a Complete Randomized Design (CRD). The 36 rabbit bucks were divided into three experimental groups of twelve rabbits each, on weight equalization basis, after which the groups were randomly allocated to three treatment diets; T1(control), T2 and T3, containing 0, 30 and 60 % *Dalium guineense* leaf meal, respectively.

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

Ingredients	T1	T2	T3
Maize	10.00	10.00	10.00
Soyabean meal	15.00	15.00	15.00
Palm kernel cake	10.50	10.50	10.50
Wheat offal	60.00	30.00	0.00
<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, 2 mg; 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.

### Haematology and serum biochemical analyses

From the jugular vein, 2 ml and 5 ml of blood samples were collected for haematological and serum biochemical analyses, respectively. The Sysmex KX-21N™ Automated Hematology Analyzer (Sysmex Europe GmbH) was used for haematological analysis, while biochemical analysis was carried out using the Semi-automated clinical chemistry analyser, Microlab 300 (Vital Scientific, India).

### Statistical Analysis

Data generated from this study were statistically analyzed for Significant ( $P < 0.05$ ) difference using SAS (2004). Significantly ( $P < 0.05$ ) different means were separated using the same software. The statistical model for this experiment is;  $Y_{ij} = \mu + T_i + e_{ij}$  ( $Y_{ij}$  = individual observation;  $\mu$  = overall mean;  $T_i$  = treatment effect;  $e_{ij}$  = random error).

## RESULTS AND DISCUSSION

Inclusion of *Dialium guineense* leaf meal at 30 % level (T2) in diets of adult rabbit bucks improved their packed cell volume (PCV) by 9.01% ( $P < 0.05$ ), while mean corpuscular volume (MCV) significantly ( $P < 0.05$ ) decreased by 4.33 and 10.22% in T2 and T3, respectively. This may imply that *Dialium guineense* leaf meal played the role of cell hyperplasia than that of cell hypertrophy. The immunity role of *Dialium guineense* (Nnadi *et al.*, 2016) is demonstrated in the 37.93% increase ( $P < 0.05$ ) in white blood cell (WBC) counts, resulting from the significant ( $P < 0.05$ ) increases recorded in their lymphocyte (30.99%) and heterophil (44.83%) counts. The significant ( $P < 0.05$ ) decrease (41.13%) in lymphocyte count of rabbits on T3 (60 % inclusion of *Dialium guineense* leaf meal) could be an indication that the optimum inclusion level of *Dialium guineense* leaf meal was exceeded. Also, *Dialium guineense* leaf meal significantly ( $P < 0.05$ ) increased (22.22%) platelet counts of T2 rabbits, and probably their clotting ability, but not in T3 rabbits with 53.05% ( $P < 0.05$ ) decrease. The heterophil-lymphocyte (H/L) ratio has been adjudged to be an index for stress (Müller *et al.*, 2011). The significant ( $P < 0.05$ ) increase (76.47%) recorded in the H/L ratio of the rabbits on T3 may be an indication that the rabbits were subjected to digestive and or metabolic stress following the inclusion of *Dialium guineense* leaf meal at 60 % dietary level (T3).

**Table 2** Haematological parameters of adult rabbit bucks fed diets containing *Dialium guineense* leaf meal

Parameters	T1	T2	T3	SEM
PCV (%)	32.20 <sup>b</sup>	35.10 <sup>a</sup>	32.40 <sup>b</sup>	0.86
RBC (x 10 <sup>12</sup> /l)	4.99	5.68	5.59	0.32
Hb (g/dl)	10.90	11.60	11.10	0.41
MCV (fl)	64.60 <sup>a</sup>	61.80 <sup>b</sup>	58.00 <sup>c</sup>	1.12
MCH (pg)	21.90	20.40	19.90	0.69
MCHC (g/dl)	34.00	33.00	34.20	0.56
WBC (x 10 <sup>9</sup> /l)	8.70 <sup>b</sup>	12.00 <sup>a</sup>	6.70 <sup>c</sup>	0.61
Lymphocytes (x 10 <sup>9</sup> /l)	5.13 <sup>b</sup>	6.72 <sup>a</sup>	3.02 <sup>c</sup>	0.51
Heterophils (x 10 <sup>9</sup> /l)	3.48 <sup>b</sup>	5.04 <sup>a</sup>	3.62 <sup>b</sup>	0.43
Monocyte (x 10 <sup>9</sup> /l)	0.09	0.24	0.07	0.07
Platelet (x 10 <sup>9</sup> /l)	279.00 <sup>b</sup>	341.00 <sup>a</sup>	131.00 <sup>c</sup>	18.44
H/L ratio	0.68 <sup>b</sup>	0.75 <sup>b</sup>	1.20 <sup>a</sup>	0.14

<sup>abc</sup>: Means within a row with different superscripts are significantly ( $P < 0.05$ ) different. SEM = Standard error of means; PCV = Packed cell volume; RBC = Red blood cell; Hb = Haemoglobin; MCV = Mean corpuscular volume; MCH = Mean corpuscular haemoglobin; MCHC = Mean corpuscular haemoglobin concentration; WBC = White blood cell; H/L = Heterophil/Lymphocyte.

Serum total protein (TP) of T2 rabbits increased by 10.91% ( $P < 0.05$ ), which was caused by the significant ( $P < 0.05$ ) increase (26.92%) in the serum globulin of the T2 rabbits. Globulins play immunity role (Frandsen *et al.*, 2009), therefore, the increased serum globulin corroborates the reported immunity role of *Dialium guineense* (Nnadi *et al.*, 2016) at 30% inclusion level in the diet. Urea is a metabolite of protein (Frandsen *et al.*, 2009). The significant ( $P < 0.05$ ) increase (52%) in the serum urea content of T2 rabbits could be probably due to the higher value of serum TP recorded in them. This same reason may

also be implicated in the significantly ( $P < 0.05$ ) higher (52.02%) values obtained for urea-creatinine ratio and alanine transaminase (ALT) (21.62%) in T2 rabbits.

**Table 3** Serum biochemical parameters of adult rabbit bucks fed diets containing *Dialium guineense* leaf meal

Parameters	T1	T2	T3	SEM
Total protein (g/dl)	5.50 <sup>b</sup>	6.10 <sup>a</sup>	4.80 <sup>c</sup>	0.18
Albumin (g/dl)	2.90	2.80	2.50	0.15
Globulin (g/dl)	2.60 <sup>b</sup>	3.30 <sup>a</sup>	2.30 <sup>b</sup>	0.20
Albumin-globulin ratio	0.83	1.07	1.10	0.03
Urea (mg/dl)	25.00 <sup>b</sup>	38.00 <sup>a</sup>	25.00 <sup>b</sup>	3.32
Creatinine (mg/dl)	0.80	0.80	1.10	0.11
Urea-creatinine ratio	31.24 <sup>b</sup>	47.49 <sup>a</sup>	22.72 <sup>c</sup>	2.22
ALP (IU/L)	15.00 <sup>a</sup>	8.00 <sup>b</sup>	9.00 <sup>b</sup>	1.63
ALT (IU/L)	37.00 <sup>b</sup>	45.00 <sup>a</sup>	35.00 <sup>b</sup>	2.12
AST (IU/L)	36.00	33.00	33.00	1.94

<sup>abc</sup>: Means within a row with different superscripts are significantly ( $P < 0.05$ ) different. SEM = Standard error of means; ALT = Alanine transaminase; AST = Aspartate transaminase; ALP = Alkaline phosphatase.

## CONCLUSIONS

The inclusion of *Dialium guineense* leaf meal in the diet of adult New Zealand White (NZW) rabbit bucks was found beneficial at 30 % inclusion level. Increased packed cell volume (PCV), immunity and serum total protein (TP) were benefits recorded.

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