

## RESPONSE OF HAEMATOLOGICAL INDICES OF BROILER STARTERS TO DIET CONTAINING GRADED LEVELS OF FLASHED-DRIED CASSAVA PULP AS REPLACEMENT FOR MAIZE

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### ABSTRACT

A study was conducted with two hundred and forty (240) day-old unsexed Cobb 500 broiler chickens fed starter diets containing varying levels of flashed dried cassava pulp (FDCP) to evaluate haematological indices. The broilers were allotted on weight equalization to four dietary treatments, and replicated six (6) times, with 10 birds per replicate in a completely randomized design. FDCP replaced maize at 0, 5, 10 and 15% levels. The feeding trial lasted for 28 days. On the 28-day of the study, 3mls of blood was randomly withdrawn by using a disposable needle and syringe from a bird per replicate into a bottle that contained anticoagulant and transferred to the laboratory for assay. Laboratory results were analysed by using SPSS version 27. White blood cells (WBC) showed significant values ( $p < 0.05$ ) from 11.85 to 17.10 ( $\times 10^6/l$ ). Mean corpuscular volume (MCV) significantly ( $p < 0.05$ ) ranged from 119.25 to 118.35 (fl). The mean corpuscular Haemoglobin values ranged from 37.40 to 40.35%. Conclusively, varied FDCP can be used up to 15% level without posing negative effect on haematological indices of broiler starter chickens. Therefore, 15% inclusion level of FDCP is recommended to substitute for maize in broiler nutrition.

**Keywords:** Broiler, Haematological indices, Laboratory, Maize, Analysis

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### INTRODUCTION

The study of the blood cellular components and their quality is known as haematology. It is helpful in determining the extent of blood damage and diagnosing a variety of disease (Togun *et al.*, 2007). Haematological parameters can accurately predict the physiological status of animals. Variations in haematological parameters are often used to assess the body's condition and identify stresses caused by nutritional, pathological, and environmental factors (Afolabi *et al.*, 2010). Haematological components are useful in the monitoring of feed poisoning, especially in the case of feed ingredients affecting the blood and general health of livestock (Oyawoye and Ogunkunle, 2004). White blood cells (leukocytes) and their derivatives are primarily involved in the immune response's synthesis, distribution and transit of antibodies as well as the body's phagocytosis-based defence against foreign invaders.

### MATERIALS AND METHODS

**Experimental area:** The experiment was carried out at the Poultry Unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Ogun-State, Nigeria. The farm is located in the tropical rainforest vegetation zone of South-Western Nigeria.

#### Sourcing of the flashed-dried cassava pulp (FDCP)

The FDCP (test ingredient) was obtained from Psaltry industry, a starch processing industry along Maya Ado-Awaye Road, Iseyin Local government area, Oyo-State, Nigeria.

#### Experimental diets and design

Four iso-proteinous and iso-caloric starter diets were formulated, such that FDCP replaced maize at 0, 5, 10 and 15% levels in diets 1, 2, 3, and 4 respectively. The experiment was arranged in a Completely Randomized Design (CRD). The gross composition of the experimental diet is presented in Table 1.

#### Management of the experimental birds

Two hundred and forty (240) day-old unsexed Cobbs 500 broilers were bought from a reputable hatchery in Oyo state, Nigeria. Birds were assigned into four dietary treatments replicated six times with ten birds per replicate. The experimental diets and water were given *ad libitum* throughout the study which lasted for twenty-eight days. The birds were managed intensively on deep litter with wood shavings as bedding and all necessary vaccinations and medications were strictly carried out.

**Table 1: Gross composition (%) of the experimental diets for broiler starters (0 – 4 weeks)**

Ingredients (kg)	0%	5%	10%	15%
Maize	50.50	45.50	40.50	36.00
FDCP	0.00	5.00	10.00	15.00
Full fat soybean	15.00	16.50	18.00	19.00
Ground nut cake	20.00	20.00	20.00	20.00
Wheat offal	6.00	4.50	3.00	1.50
Fish meal (72%CP)	3.50	3.50	3.50	3.50
Lime stone	1.50	1.50	1.50	1.50
Bone meal	2.50	2.50	2.50	2.50
Lysine	0.20	0.20	0.20	0.20
Methionine	0.30	0.30	0.30	0.30
Vitamin/mineral Premix	0.25	0.25	0.25	0.25
NaCl	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
<b>Calculated values</b>				
ME (MJ/kg)	11.95	11.83	11.75	11.66
Crude protein (%)	23.22	23.17	23.12	23.07
Calcium (%)	1.67	1.67	1.67	1.68
Phosphorous (%)	0.58	0.58	0.57	0.57
Lysine (%)	0.88	0.85	0.82	0.80
Methionine (%)	0.57	0.56	0.54	0.53

FDCP = Flashed Dried Cassava Pulp.

NaCl = Sodium Chloride

**Data collection****Blood collection and analysis****Haematological parameters analysis**

At 28-day (starting phase) feeding trial, a sterile needle and syringe were used to draw blood from each of the six broiler chickens in each treatment individually through the wing vein. Three milliliters (3mls) blood sample was withdrawn from each bird in vials that containing ethylene diamine tetra-acetic acid (EDTA) as an anticoagulant for determination of haematological parameters. Mean corpuscular volume (MCV) was calculated by dividing hematocrit by the total red blood cell (RBC) i.e  $MCV = \frac{Hct \% \times 10}{RBC \text{ count (millions/mm}^3)}$

Mean corpuscular Haemoglobin (MCH) was calculated by multiplied haemoglobin (Hb g/dl x 10 and divided by

$$RBC \text{ count i.e } MCH = \frac{Hb \left(\frac{g}{dl}\right) \times 10}{RBC \text{ count (millions/mm}^3)}$$

$$\text{Mean corpuscular Haemoglobin concentration (MCHC) i.e } MCHC = \frac{Hb \left(\frac{g}{dl}\right) \times 100}{Hct \%}$$

**Statistical analyses**

Data obtained were subjected to one-way analysis of variance (ANOVA) using SPSS version 27. Significant ( $p < 0.05$ ) means among variables were separated using Duncan's multiple range test (3).

**RESULTS DISCUSSION**

Table 2 shows effect of experimental diets on haematological indices of broiler starters. Significant ( $p < 0.05$ ) differences were found in white blood cells (WBC), mean corpuscular volume (MCV) and mean corpuscular Haemoglobin (MCH), but no significant effect ( $p > 0.05$ ) in packed cell volume (PCV), Haemoglobin (Hb), red blood cells (RBCs), mean corpuscular Haemoglobin concentration (MCHC), heterophils, lymphocyte, basophils and monocytes. The WBC showed significant values ( $p < 0.05$ ) from 11.85 to 17.10 ( $\times 10^6/l$ ). MCV significantly ( $p < 0.05$ ) ranged from 119.25 to 118.35 (fl). The mean corpuscular Haemoglobin values ranged from (37.40 to 40.35%).

The WBC obtained (11.85-17.10  $\times 10^6/l$ ) from this research was within the range value (12.00 – 30.00  $\times 10^6/l$ ) reported by Bounous and Stedman (2000). WBCs are known to fight against foreign body and carotenoid build up immunity (Osman *et al.*, 2004). The result of this study indicates that broiler starter fed with FDCP showed comparable immunity status, which is better than that of broiler starter fed with 0% FDCP (control). The control broiler starters in this study are more susceptible to disease because of their low WBC counts; however, birds with high WBC counts are more resistant to illness and have the ability to produce antibodies during the phagocytosis process (Soetan, *et al.*, 2013). Therefore, birds on varied FDCP diets from this study have higher resistance to

disease. The MCH values obtained (37.40-40.35%) fell within the normal value for broilers, as suggested by Adekunle and Omoh (2014). Therefore, the range of normal values of MCH observed from this research showed the adequacy of the FDCP in starter broiler nutrition. The ability of red blood cells to transport blood is indicated by mean corpuscular haemoglobin, which could suggest that broiler chickens fed FDCP diets at the early stages had improved respiratory function performance as reported by Abdulazeez *et al.* (2016).

**Table 2: Haematological indices of broiler starter fed experimental diets (0-4 weeks)**

Parameters	0%	5%	10%	15%	SEM	P-value
Packed cell volume (%)	32.00	31.00	34.50	35.50	0.76	0.104
Haemoglobin (g/dl)	10.70	10.45	11.75	12.10	0.27	0.053
Red blood cell (10 <sup>2</sup> /l)	2.70	2.60	3.15	3.00	0.08	0.055
Whiteblood cell (x 10 <sup>6</sup> /l)	11.85 <sup>c</sup>	14.00 <sup>b</sup>	15.00 <sup>b</sup>	17.10 <sup>a</sup>	0.67	0.001
MCV (fl)	118.75 <sup>b</sup>	119.25 <sup>a</sup>	109.85 <sup>d</sup>	118.35 <sup>c</sup>	1.17	0.001
MCH (%)	39.75 <sup>b</sup>	40.20 <sup>a</sup>	37.40 <sup>c</sup>	40.35 <sup>a</sup>	0.36	0.001
MCHC (%)	33.45	33.70	34.00	34.05	0.11	0.145
Heterophils	36.50	32.00	29.00	24.00	1.95	0.123
Lymphocyte	63.50	67.50	70.50	76.00	2.00	0.147
Basophil	0.00	0.50	0.00	0.00	0.00	0.095
Monocytes	0.00	0.00	0.50	0.00	0.09	0.095

<sup>a,b,c</sup> Means on the same row with different subscripts are significantly different at (p< 0.05) SEM = Standard error of the mean, MCV = Mean corpuscular volume, MCH = Mean corpuscular haemoglobin MCHC = Mean cell Haemoglobin concentration.

#### CONCLUSION AND RECOMMENDATION

Based on the outcome of this study, flashed-dried cassava pulp (FDCP) can be used up to 15% inclusion level of FDCP. Therefore, 15% level of inclusion of FDCP is recommended to replace maize in the diet of broiler starter chickens.

#### REFERENCES

- Abdulazeez, H. S. B., Adamu, J. U., Igwebuikwe, G., Gwayo J. and Muhammed, A. I. (2016). Haematology and serum biochemistry of broiler chickens fed graded levels of Baobab (*Adansonia digitata L.*) seed meal. *Journal of Animal and Veterinary Science*. Volume 9 issue 10 Version II (October). Pp 48-53 [www.iosjournals.org](http://www.iosjournals.org)
- Adekunle, A. R. and Omoh, O. S. (2014). Haematological traits and serum chemistry of broiler chicken fed bread waste based diets. *Journal of Animal Health Production*, 2 (4): 51 – 54.
- Afolabi, K. D., Akinsoyinu, A. O., Olajide, R. and Akinleye, S. B. (2010). *Haematological parameters of the Nigerian local grower chickens fed varying dietary levels of palm kernel cake (P.247)* Proceedings of 35<sup>th</sup> Annual Conference of Nigerian Society for Animal Production, P.247.
- Bounous, D. and Stedman, N. (2000). Normal avian Haematology: chicken and turkey. In: Feldman BF, Zinkl JG, Jain NC, editors. *Schalm's veterinary Haematology*. New York: Wiley, p.1147-1154.
- Osman, Z. M., Gomaa, A. M., Hussein, H. M., Soliman, F. H. and El-Shobaki, A. F. (2004). Association between retinol metabolism and diabetic retinopathy. *Polish Journal of Food and Nutrition*, 13:15.
- Oyawoye, B. M. and Ogunkunle, H. N. (2004). *Biochemical and haematological reference values in normal experimental animals* New York: Masson. Pp. 212-218.
- Togun, V. A., Oseni, B. S. A., Ogundipe, J. A., Arewa, T. R., Hamed, A. A., Ajonijebu, D. C. and Mustapha, F. (2007). Effects of chronic lead administration on the haematological parameters of rabbits – a preliminary study. Proceedings of the 41<sup>st</sup> Conferences of the Agricultural Society of Nigeria. Pp. 341.
- Soetan, K. O., Akinrinde, A. S. and Ajibade, T. O. (2013). Preliminary studies on the haematological parameters of cockerels fed raw and processed guinea corn (*Sorghum bicolor*) Proceedings of 38<sup>th</sup> Annual Conference of Nigerian Society for Animal Production. Pp. 49-52.