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Haematological response of starter broiler chickens fed diets containing graded levels of dried watermelon peel meal

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Abstract

The experiment was carried out to assess the hematological parameters of starter broiler chickens fed feed formulated with dried watermelon peel meal (DWPM). Ninety-six 21-day old broiler chickens were randomly assigned into four (4) treatments of twenty-four (24) birds each containing 0, 10, 20 and 30% DWPM and coded as D1, D2, D3 and D4 respectively in a completely randomized design (CRD). Each treatment groups were further sub-divided into four (4) sub-groups of eight (8) birds to serve as replicate. At the end of the experiment, one bird per replicate was selected for blood analysis. Packed cell volume (PCV), haemoglobin (Hb), white blood cells (WBC), red blood cells (RBC), mean corpuscular volume (MCV), platelets concentration (PC), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC), granulocyte and lymphocyte were measured. Results showed that the DWPM diet had no effect ($P>0.05$) on PCV, Hb, WBC, RBC, MCV, MCH, PC and MCHC. All mean values for the haematological parameters are above the normal range except WBC and RBC. In conclusion, the lack of significant effect suggests that, DWPM can be safely incorporated up to 12.5% in to the diets of starter broiler chicks without adverse haematological consequences. Nevertheless, careful consideration should be given to ensuring optimal nutritional balance and health status in broiler flocks.

Keywords: Watermelon; Chickens; Diet; PCV; Haemoglobin; RBC

1. Introduction

Fruits after processing into juice leave large quantity of peels, which is a nuisance to the environment as a solid waste. The peel fruits have been identified as feed resources in poultry that can reduce high cost of production and substitute convectional feedstuffs [1]; [2]. Studies have shown that fruit by-products are excellent source of nutrients (including dietary fiber, vitamins and minerals), phytochemicals, antioxidants and antimicrobial compounds [3]; [4]. These nutrients and compounds are highly dependent by poultry for their growth and health. It is established that the growth, health, carcass, internal organs and gastro-intestinal tract morphometry are affected by the quality of feeds animals are exposed to [5], and the health status of an animal is reflected in the blood characteristics and thus, blood examination is a good way of screening the health status of an animal to investigate the effect of diet on it.

Haematological and serum biochemistry parameters are good indicators of the physiological status of animals also their changes are important in assessing the response of such animals to various physiological situations and diseases. Besides that, haematology is important in monitoring feed toxicity. The commonly used haematological parameters are erythrocyte or red blood cells (RBC), leucocytes or white blood cells (WBC), haemoglobin concentration, packed cell volume (PCV) and mean corpuscular volume (MCV), mean corpuscular hemoglobin, (MCH), mean corpuscular hemoglobin concentration (MCHC). Haematology is influenced by the age, sex, breed/species, climate geographical location, seasonal fluctuation, day length nutritional status, habitat of the species and furthermore the physiological

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factor [6]. The research was designed to study the effect of including levels of dried watermelon peel (DWMP) on haematological indices of broiler starter chickens.

2. Material and methods

2.1. Study Site

This research was conducted at poultry research house of the Department of Agricultural Education, Adamu Augie College of Education, Argungu, Kebbi State, Nigeria. Argungu town is located between latitude 12° 44' 41.35"N and longitude 4° 31' 30.50"E. The city is situated on the Sokoto river. As of 2007 national housing and population census, Argungu town has an estimated population of 47,064 people. The inhabitants domesticate mostly cattle, sheeps, goats and poultry [7].

2.2. Source and Processing of Watermelon Peels

Watermelon peels were sourced from fruits vendors in Argungu Gwari market Along Birnin Kebbi road. The fresh peels obtained were washed with clean water and cut into pieces (2 cm) using scissors and knife which was further spread under the shade with polythene bags and dry for 96 hours (four days). The drying and final grinding of watermelon peels into powder using pestle and mortar prior to formulation of diet. was done in the animal science laboratory of the department of agricultural education of the college.

2.3. Birds, Diets and Design

A total of ninety six (96) Agrotech 21-day old broiler chicks were used for this research. The birds were randomly assigned into four (4) dietary treatments of twenty four (24) birds. Each treatment was replicated three times containing 8 birds per replicate. The birds were fed with the same formulated diets and coded as A, B, C and D. Control diet (A) did not contain dried watermelon peels meal (WPM), whereas diets B, C and D contain WPM at 5, 10 and 15% respectively. Completely randomized design (CRD) was used for the experiment.

Table 1 Basal experimental diet for finisher broiler chickens

Ingredients	A (0%)	B (1.25%)	C (2.5%)	D (3.75%)
Maize	50.71	50.67	50.54	50.95
GNC	35.79	35.83	35.96	35.55
Wheat offal	5.00	3.75	2.50	1.25
WPM	0.00	1.25	2.50	3.75
Blood meal	3.50	3.50	3.50	3.50
Bone meal	1.00	1.00	1.00	1.00
Limestone	2.00	2.00	2.00	2.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated value				
CP (%)	24.25	24.07	23.92	23.48
ME (Kcal/kg)	2808.24	2792.12	2274.92	2763.30
CF (%)	3.47	3.36	3.22	3.10
EE (%)	5.59	5.74	5.46	5.37

Calcium (%)	0.37	0.33	0.33	0.32
Phosphorus (%)	0.47	0.73	0.46	0.45

KEY: CP=crude protein, ME=metabolizable energy, CF=crude fibre, EE=ether extract

2.4. Haematological Characteristics

At the end of the 4th weeks, two birds per replicate were selected randomly. About 2 ml of blood was taken from the wing vein of the birds using needles and syringes (2 ml) at 7:30 am before feeding the animals. The blood samples were placed in EDTA bottles and labeled. Haematological parameters measured include packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), haemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), platelets, granulocytes and lymphocytes. Immediately after collection, the blood sample in EDTA was inserted gently about five times as described by [8].

2.5. Data Analysis

The data generated from this research was analyzed using analysis of variance (ANOVA). Different between treatments means were separated using least significant difference (LSD). The results were presented as mean and standard deviation of the mean.

3. Results and discussion

3.1. Hematological Analysis

Table 2 Haematological analysis of broiler starter chickens fed diets containing levels of DWPM

PARAMETERS	TREATMENTS				
	A (0.0%)	B (1.25%)	C (2.5%)	D (3.75%)	SEM
PCV (%)	46.50	44.83	32.83	41.90	2.41
Hb(g/dl)	15.50	15.10	10.83	13.96	0.79
WBC (x10 ⁶ /L)	12.81	18.43	23.34	12.81	6.60
RBC (x10 ⁶ /L)	2.58	2.76	2.15	2.15	0.21
PLT (x10 ⁶ /L)	24.33	41.00	36.67	44.00	6.98
MCV (fL)	152.50	159.67	152.93	242.27	22.76
MCH (Pg)	50.83	54.17	50.53	80.80	7.57
MCHC (g/dl)	50.83	54.17	50.53	80.80	0.18
GRN (%)	3.03	2.500	6.10	4.20	1.12
LYM (%)	91.00	93.87	88.60	88.97	1.96

KEY: PCV=packed cell volume, RBC=red blood cell, WBC=white blood cell, Hb=haemoglobin, MCV=mean corpuscular volume, MCH=mean corpuscular haemoglobin, MCHC=mean corpuscular haemoglobin concentration, PLT=platelets, GRN=granulocytes, LYM= lymphocytes, SEM =standard error mean error

3.2. Packed Cell Volume (PCV)

PCV signifies the presence of blood volume filled by RBC and thus, a measure of oxygen carrying capacity of the blood. The Hb values (10.83-15.1g/dl) observed were above normal ranges (7 - 13g/dl) of chickens [9]. The birds fed control diet (D1) had a higher PCV than the birds fed DWPM diets. Lower level of PCV in birds fed DWPM diet is similar to earlier findings of [10].

3.3. Haemoglobin (Hb)

Hb is the protein in RBC that transport oxygen to the body's tissues. The Hb values (10.83-15.1g/dl) observed were above normal ranges (7 - 13g/dl) of chickens [9]. The higher concentration of Hb could be due to androgen hormone in broilers. This finding agrees with the report of [8] that, higher amounts of Hb are influenced by reproductive hormone. [9] reported the average normal ranges of 10.57g/dl and 9.47 g/dl.

3.4. White Blood Cell (WBC)

The WBC aids to protect the body from pathogens or disease attack and play an important role in bird's immune system. The DWPM diet increased the WBC of the birds and the values obtained are within the normal range. This is similar to earlier report that supplementation of DWPM increases WBC in rabbit [11]. Study has shown that watermelon peel is rich in carotenoids [12]. Reports indicate that vitamin A and carotenoid increase the immune response in chickens and reduce common avian diseases such as coccidiosis and lesions that cause significant losses to poultry farmer. In the current study, it is evident that the DWPM diet boosted immune response.

3.5. Red Blood Cell (RBC)

The function of RBC is to transports oxygen from the lung to tissue and removes carbon dioxide from the tissue to the lung in the body through haemoglobin. RBC values ($2.1 - 2.7 \times 10^{6/l}$) recorded in this study were within the normal ranges of $2.5 - 3.5 \times 10^{6/l}$) as reported by [9]. RBC is affected by diet of birds. The findings indicated that the RBC effect is more in birds fed control diet than those fed DWPM. This shows that watermelon peel is rich in iron [11].

3.6. Platelets/Thrombocytes

The platelets aid to slow or stop bleeding and to help wound healing. Birds fed levels of DWPM recorded better platelet count than those fed control diet (Table 1). Low platelets count caused internal bleeding of the brain or the intestine or even death. [9]. stated that, platelets are significant in the diagnosis of anaemia.

3.7. Mean Corpuscular Volume (MCV)

MCV is used to measure the amount of RBC in a blood sample. The values of 152.5 - 242.2 fl recorded (Table 2) across the treatments are higher than the normal range (90 - 140fl) of chickens [9]. This indicates that the diets are low or deficient in B12 and folic acid or body cannot absorb B12 and folate properly. The findings are in agreement with the earlier view of [13].

3.8. Mean Corpuscular Haemoglobin (MCH)

MCH refers to the average quantity of haemoglobin present in RBC. As previously discussed, haemoglobin is the protein in RBC that transports oxygen to the tissues. The values of 50.5-80.8 g/dl recorded are higher than the normal range of chickens 33-47 g/dl [9]. Low level of B12 and follic acid in the diets resulted higher MCH [13].

3.9. Mean Corpuscular Haemoglobin Concentration (MCHC)

The MCHC shows the quality of haemoglobin in erythrocyte. [9] reported the 26-35 g/dl as normal range of MCHC in chickens. The observed in this current study is higher than the normal range.

4. Conclusion

It can be concluded from the result of this study that dried watermelon peels can be included up to 12% in the diets of broiler chickens without harmful effect on the haematological parameters at starter phase.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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