APRW -62

Effects of Replacing Vitamin-Mineral Premix with Leaf Meal Composite on Blood Profile of Starter Broiler Chickens

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Abstract
Effects of replacing dietary vitamin-mineral premix (VMP) with graded inclusions leaf meal composite from selected vegetables on serum and haematological indices of broiler starter chicks were investigated. One day-old Arbor Acre chicks (n = 320) were randomly allotted to four treatment groups with eight replicates of ten chicks each in a completely randomised design. Air-dried leaves of *Telfaria occidentalis*, *Celosia argentea*, *Vernonia amygdalina* and *Moringa oleifera* were milled and constituted in equal proportions to a leaf meal composite (LMC). Four diets formulated were: standard diet (T1) without LMC while other diets contained 1.5 (T2), 3.0 (T3) and 4.5 (T4) % LMC. On day 21, blood (5 mL) was sampled from two birds per replicate for haematological and selected serum biochemical assays. Treatment had no significant effect ($p>0.05$) on determined haematological parameters. Similarly, effects of treatments on aspartate aminotransferase, alkaline phosphatase, blood urea nitrogen, and creatinine were not significantly different ($p>0.05$) however, alanine aminotransferase values (U/L) 23.5, 23.5, 23.75 and 35.75 for chicks on diets T1, T2, T3 and T4, respectively were significantly different ($p<0.05$). The LMC successfully replaced VMP in the diet of broiler starter chickens without any critical implication on chicks' health.

Keywords: Air-dried leaves, haematological indices, serum indices, vitamin-mineral premix,

Introduction

Vitamins and minerals premix use in livestock feeding has become a standard practice because vitamins and minerals are implicated in various metabolic processes in the body (Alahyari-Shahrasb *et al*. 2011) The chicken gut flora can only synthesise very little vitamin resulting in the need to ensure that adequate vitamins are provided in the diet (Islam *et al*., 2004). Most minerals and vitamins deployed for the formulation of vitamin-mineral premixes in the developing countries especially sub-Saharan Africa are imported. The cost of importation usually affects the total cost of production. For the sustainability of broiler chicken industry, the production cost should be as minimum as possible (Duke, 2008).

Several leafy vegetables and plants which are available in the tropics are rich in phytonutrients. (Akoroda, 1990; Achikanu *et al.,* 2013) These plants and leafy vegetables have good potentials to be viable sources of vitamins and minerals. Reports (Makkar and Becker, 1996; Kakengi *et al*., 2003; Mensa *et al*., 2008; Ogbe *et al*., 2011) have shown that leaves of some local vegetables contain appreciable amounts of vitamins, amino acids and minerals. These vegetables may be used as alternatives to imported, very expensive synthetic brands of premixes in the diet of livestock when used either solely or as composite leaf meal (Adegbenro *et al*., 2011). There is limited information on the use of dried vegetable leaf meal composite as a replacement for vitamin-mineral premix in poultry diet.

This study was therefore aimed at assessing the effect of replacing dietary vitamin-mineral premixes with leaf meal composite on blood profile of broiler starter chicks.

Materials and Method

The experiment was carried out at the Teaching and Research Farm, University of Ibadan, Ibadan, Nigeria. Selected vegetables (n=4) were (*Telfairia occidentalis*, *Celosia argentea*, *Vernonia amygdalina*, and *Moringa oleifera*). Vegetable leaves were destalked and air dried. The leaves were then milled and combined in equal proportion to make a leaf meal composite (LMC). Four isocaloric and isonitrogenous diets were formulated. T1 - basal broiler starter diet while the basal VmP was replaced with 1.5 (T2), 3.0 (T3) and 4.5% (T4) LMC. 0ne day-old Arbor Acre broiler chicks (n=320) were randomly allotted to four treatment groups with eight replicates per treatment and ten birds per replicate; birds were subjected to standard medication and vaccination practices with feed and water supplied *ad libitum*. Two birds with the weight closest to group average were selected per replicate and 5 mL blood samples taken from their jugular vein for haematological and serum biochemical parameters according to AOAC (2005) method.

The gross composition of broiler starter diets T1, T2, T3 and T4 is shown in Table 1. Data were subjected to analysis of variance (SAS, 2000) and means were separated using Duncan's option of the same software at $\alpha_{0.05}$.

Table 1: Gross composition (g/kg) of experimental diets fed to broiler chicken at the starter phase

Ingredients (%)	*Diet 1*	*Diet 2*	*Diet 3*	*Diet 4*
Maize	50.0	50.0	50.0	50.0
Soya bean meal	38.0	38.0	38.0	38.0
Soya oil	2.00	2.00	2.00	2.00
Wheat offal	7.24	5.99	4.49	2.99
Oyster shell	0.05	0.05	0.05	0.05
Di-calcium phosphate	1.50	1.50	1.50	1.50
VmP	0.25	-	-	-
Leaf meal composite	-	1.50	3.00	4.50
Table salt	0.25	0.25	0.25	0.25
Methionine	0.15	0.15	0.15	0.15
Lysine	0.05	0.05	0.05	0.05
Coccidiostat	0.06	0.06	0.06	0.06
Total	100.00	100.00	100.00	100.00
Calculated Nutrients				
Crude protein (%)	22.89	22.61	21.93	22.41
Energy ME(Kcal/g)	3038.39	3030.34	3021.69	3030.39
Phosphorus (%)	0.51	0.51	0.51	0.51
Calcium (%)	0.93	0.93	0.93	0.93

1 kg of Premix contains: Vitamin A 10,000,000IU; Vitamin D3-2,000,000IU; Vitamin E-20,000 IU; Vitamin K-2,250 mg; Thiamine B1-1,750 mg; Riboflavin B2-5,000 mg; Pyridoxine B6-2,750 mg; Niacin-27,500 mg; Pantothenic acid- 7,500 mg; Biotin-50 mg; Choline chloride-400 g; Antioxidant- 125 g; Magnesium-80 g; Zinc-50 mg; Iron-20 g; Copper-5 g; Iodine-1.2 g; Selenium-200 mg; Cobalt-200 mg. VmP – Vitamin-mineral premix

Results and Discussion

Table 2 shows the haematological indices of birds fed graded levels of leaf meal composite in replacement of vitamin-mineral premix. Haematology and serum indices are useful in determining the health status of an animal. The selected haematological and serum parameters in this study are important in assessing the response of an animal to various physiological situations (Khan and Zafar, 2005). The findings in this study were corroborated by the work of Onu and Aniebo (2011) on the similarity of RBC in chickens as a result of dietary leaf meal. The higher RBC observed in the chicks on supplemental LMC (T2, T3 and T4) in this study suggests that the diets had potent vitamins and minerals when compared with the standard VmP diet. This finding corroborates the report of Oyewole *et al*. (2013). The haematological parameters of the broiler starter chickens are shown in Table 2. There were no significant variations ($p<0.05$) observed in the parameters measured except for RBC. The PCV ranged from 29.75 to 30.50%; HB from 9.65 to 10.10 g/dL; WBC from 13.90 to 26.43 ($x10^3/\mu l$); lymphocytes from 62.25 to 67.50%; heterophils from 24.50 to 29.50%; monocyte from 3.25 to 4.0%; eosinophil from 2.75 to 4.80%; basophil from <0.01 to 0.50%. The RBC ($x10^3/\mu l$) however, varied significantly ($p<0.05$) among dietary treatments. Birds on T2 had significantly higher ($p<0.05$) RBC (3.54) compared with T1 (3.34), but similar ($p>0.05$) to those on T3 (3.40) and T4 (3.41).

Table 2: Haematological indices of birds fed graded levels of leaf meal composite in replacement of vitamin-mineral premix

Parameters	*Diet 1*	*Diet 2*	*Diet 3*	*Diet 4*	*SEM*
PCV (%)	29.75	30.25	30.50	30.50	0.90
HB (g/dl)	9.65	10.10	9.90	9.98	0.90
RBC ($x10^3/\mu l$)	3.34^{b}	3.54^{a}	3.40^{ab}	3.41^{ab}	0.15
WBC ($x10^3/\mu l$)	16.60	16.28	13.90	26.43	0.50
Lymphocytes (%)	67.50	66.00	66.75	62.25	0.38
Heterophil (%)	24.50	24.50	26.50	29.50	0.36
Monocyte (%)	3.25	3.75	4.00	3.75	0.80
Eosinophil (%)	4.50	4.25	2.75	4.80	0.31
Basophil (%)	0.50	0.50	0.09	0.00	0.25
H/L	0.37	0.37	0.39	0.49	0.40

Means with different superscripts on the same row are significantly different ($P < 0.05$). SEM - Standard error of means PCV-Packed cell volume, RBC- Red blood cell, HB - Haemoglobin, WBC - White blood cell. Diet 1= 0% leaf meal, diet 2= 1.5% leaf meal, diet 3 = 3.0% leaf meal, diet 4 = 4.5% leaf meal, H/L-heterophil/lymphocyte ratio

The serum biochemical parameters of broiler chickens at the starter phase are shown in Table 3. There were no significant differences ($p>0.05$) in the measured serum indices except for Alanine Aminotransferase (ALT) which was significantly higher ($p<0.05$) in T4 (35.75 u/L) compared with 23.75, 23.5 and 23.5 u/L in T1, T2 and T3 respectively. Other parameters monitored ranged from 24.88 (T2) to 27.95 (T1), 19.70 (T4) to 32.70 (T1), 16.13(T4) to 17.33 (T1), 0.55 (T1) to 0.63 (T4) for AST, ALP, BUN and creatinine, respectively. The substitution of VMP with LMC was not harmful to the broiler chickens.

Table 3: Serum biochemical indices of birds fed graded levels of leaf meal composite in replacement of vitamin-mineral premix

Parameters	*Diet 1*	*Diet 2*	*Diet 3*	*Diet 4*	*SEM*
AST (iu/L)	27.95	24.88	25.08	26.90	0.61
ALT (iu/L)	23.50^{b}	23.50^{b}	23.75^{b}	35.75^{a}	0.03
ALP (iu/L)	32.70	21.23	30.05	19.70	0.55
Blood Urea Nitrogen (mg/dL)	17.33	16.85	16.13	16.85	0.77
Creatinine (mg/dL)	0.55	0.60	0.53	0.63	0.45

Means with different superscripts on the same row are significantly different ($p<0.05$). SEM- Standard error of means, AST- Aspartate amino transferase, ALT- Alanine amino transferase, ALP- Alkaline phosphatase, B Diet 1= 0% leaf meal, diet 2= 1.5% leaf meal, diet 3= 3.0% leaf meal, diet 4= 4.5% leaf meal

Conclusion and Recommendations

Dietary LMC from four selected vegetables at 1.5, 3.0 and 4.5% replaced VmP in the diet of broiler starter chickens without adverse effect on the haematological and serum indices. LMC could therefore be used instead of dietary VMP in diets of broiler starter chickens. It is recommended that histology of the chickens' liver be undertaken at the finisher phase to determine the influence of elevated levels of serum alanine aminotransferase

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