

EFFECT OF LEVELS OF NIACIN SUPPLEMENTATION ON THE HAEMATOLOGICAL AND SERUM PARAMETERS OF LAYING HENS.

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ABSTRACT

A study was carried out to investigate the effect of niacin supplementation in layers diets on haematological and serum parameters of laying hens. Four dietary treatment with niacin at 0ppm, 30ppm, 40ppm, and 50ppm were fed to the bird for a period of 20 weeks. Each treatment had 18 birds comprising of 3 replicate of six birds each. Data were collected at the end of the experiment on the blood serum and haematological parameters. Levels of niacin supplementation had significant effects ($p < 0.05$) on most of the haematological and blood serum parameters considered except in red blood cell, Triglyceride, Cholesterol, Uric acid and LDL. At 50ppm packed cell volume (PCV), haemoglobin, white blood cell, serum protein, serum albumin and globulin were 33.0%, 12.5g/dl, 19873.3, 60.50g/dl 32.2g/dl and 28.8g/dl respectively, while creatine, and HDL were 0.90 and 22.6 mg/dl. The triglyceride, cholesterol, LDL and uric acid were not significantly affected by the level of niacin supplementation and the PCV, Hb, Serum albumin, Globulin, cholesterol, HDL and Uric acid were significantly higher at 20th weeks of the experiment.

Keywords: Niacin, Layers diet, PCV, Hb, Serum albumin, Globulin

INTRODUCTION

Poultry requirement for vitamin and mineral is a function of series of variations because of the uncertainty of the factors that influence the absolute needs of the animals. Factors such as breed, sex and strain ranked high among the factors that affect the response of birds to exogenous source of vitamins and minerals. Environmental stress is another factor that alters the vitamin and mineral requirement of poultry birds. Nochels (1990) reported an increase in the physiological demand for vitamins during stress and disease condition. A key factor that alter the requirement of poultry birds for vitamin and minerals is their interactions with themselves and other nutrients in the diets.

Vitamins are required by birds in small quantities but they are highly essential as certain deficiency conditions like diarrhoea, loss of appetite, sore red tongue, gastrointestinal disturbance and emotional dementia have been recognized when vitamins are inadequate in poultry diets.

Niacin also known as nicotinic acid or vitamin B3 is a water soluble vitamin which decreases triglycerides level in the body by limiting the ability of liver to produce low density lipoprotein (LDL) cholesterol. Niacin is used to promote healthy cholesterol levels, support circulation problems, and maintain skin health. Niacin has antioxidant properties, and is involved in the energy production, cholesterol and carbohydrate metabolism, regulation of blood sugar, and detoxification. Niacin can reduce LDL cholesterol levels by 10-20%, reduce triglycerides by 20-50% (Sullivan 2006). Oloyo (2002) reported a remarkable improvement in the utilization of nitrogen, metabolizable energy, calcium and phosphorus when higher dietary niacin levels were used in broiler chicken.

Niacin at extremely high doses can have life-threatening acute toxic reaction, and at doses used in lowering cholesterol has been associated with birth defects in laboratory animals (Encyclopedia, 2007). Therefore, the objective of this study is to investigate on the effect of different levels of niacin on the haematological and blood serum parameters in laying hens.

MATERIALS AND METHODS

This study was carried out at the Poultry Unit of Teaching and Research Farm, Federal University of Agriculture, Abeokuta, (7°10'N and 32°E) in Odeda Local Government Area Ogun State. Four Experimental diets were formulated such that the niacin was added to the basal diet at 0, 30, 40, 50mg/kg

of feed respectively.

A total of 72 laying birds were randomly allocated to the four dietary treatments of 18 birds each in a completely randomized design. Each treatment group were further divided into three replicates of 6 birds each. Feed and water were supplied *ad libitum*, the experiment lasted for 20 weeks.

Data collection

At 20th weeks blood samples were drawn from the wing (brachial vein) of birds. About 2ml of blood was collected from 3 birds per replicate group into the tube containing ethylene diamine tetra acetate (EDTA) to obtain plasma and another 2ml was collected into hypodermic syringes for serum. The EDTA anticoagulated whole blood was used to determine haematological parameters (red blood cell, white blood cell, packed cell, haemoglobin while serum was used to determine serum parameters (cholesterol, creatinine, HDL, LDL, blood globulin, serum total protein, uric acid, cholesterol and triglyceride).

Statistical Analysis

Data obtained for blood parameters were subjected to general linear model in analysis of variance (Steel and Torrie, 1980), and significant means were separated using Duncan's Multiple Range Test (Duncan 1955).

The model used was as follows:

$$X_{ij} = \mu + T_i + E_{ij}$$

Where X_{ij} = observation in the i th treatment

μ = Population mean

T_i = Effect of niacin level

E_{ij} = random error

RESULTS

Table 1 shows effect of level of niacin supplementation on the haematological parameters of laying hens fed niacin based diets. The result showed that the PCV, HB, and white blood cell were significantly ($P < 0.05$) affected. The birds fed 50ppm level of niacin had the highest values for PCV and HB (33.0% and 12.5g/dl) respectively and were significantly different from the values for control group. So also as the level of niacin increased in the diets WBC values also increased and were similar at 30-50ppm levels of niacin inclusion with values from 19893.3 to 22566.7, while the RBC values were not significantly ($P > 0.05$) influenced across the level of inclusion.

Table 1: Effect of levels of niacin supplementation on the haematological parameters of laying hens.
Levels of Niacin supplementation

Parameters	0ppm	30ppm	40ppm	50ppm	SEM
PCV %	24.6 ^c	28.9 ^b	31.2 ^{ab}	33.0 ^a	1.81
Haemoglobin g/dl	9.7 ^b	11.2 ^{ab}	11.7 ^{ab}	12.5 ^a	0.59
White blood cell (N/mm ³)	16915.0 ^b	22566.7 ^a	21110.0 ^a	19873.3 ^{ab}	1200.67
Red blood cell (mm ³)	3.1	3.3	3.4	3.6	0.10

^{abc} means on the same row having different superscripts are significantly different ($p < 0.05$)

Table 2 shows the effect of niacin level on the blood serum parameters of laying hens fed niacin based diets. The result showed that the serum total protein, albumen, globulin, creatinine and HDL were significantly ($P < 0.05$) influenced by the level of niacin supplementation. The triglyceride, cholesterol, LDL and uric acid values were not significantly ($P > 0.05$) influenced by the level of niacin in the diets. The albumin and creatinine had the highest value at 30ppm level of niacin inclusion which was significantly higher than the control group. Birds fed 50ppm level of niacin based diets recorded the highest value of 60.5g/dl and 28.80g/dl for serum total protein and globulin levels respectively. Blood serum HDL had the highest value of 31.8mg/g when the birds were fed 40ppm inclusion level of niacin, while the group on 30ppm and 50ppm niacin respectively had the lowest values that were significantly different from that of the control group.

Table 2 Effect of level of niacin supplementation on the blood serum parameters of laying hens.
Levels of niacin supplementation

Parameters	0ppm	30ppm	40ppm	50ppm	SEM
Serum protein (g/dl)	51.90 ^c	59.00 ^b	54.30 ^{ab}	60.50 ^a	2.00
Serum albumin (g/dl)	30.90 ^b	32.90 ^a	31.50 ^b	32.20 ^{ab}	0.43
Globulin (g/dl)	21.00 ^b	26.10 ^{ab}	22.80 ^b	28.80 ^a	1.51
Creatinine (mg/dl)	0.90 ^b	1.00 ^a	0.90 ^b	0.90 ^b	0.03
Triglyceride (mg/dl)	198.50	192.00	195.80	180.00	4.08
Cholesterol (mg/dl)	231.00	231.00	245.20	222.80	4.65
HDL (mg/dl)	27.30 ^{ab}	26.80 ^b	31.80 ^a	22.60 ^c	1.88
LDL (mg/dl)	79.90	81.00	79.40	82.20	0.62
Uric acid (mg/dl)	11.70	12.00	12.40	13.60	0.42

^{abc} means on the same row having different superscripts are significantly different (p<0.05)

Discussion

The result of the study showed a significant effect of niacin level on the PCV, HB, and RBC while the RBC was not significant. Similar observations were made by Olufisibe (1995) and Eruvbetine and Oguntona (1997). Birds fed 50ppm niacin based diets had high significant values for PCV and HB 33.0% and 12.5g/l. The trend observed was that there was an increase in the values as the level of niacin increased; this trend was similar to RBC though not at a significant level. There was a variation in the value recorded for WBC which might be due to diet effect.

Serum total protein, albumin, globulin, creatinine and HDL were significantly affected by the level of niacin in the diets, this is similar to the report of Mckenney *et al*, (1994). Birds fed 50ppm niacin had high significant values of 60.5g/dl and 28.8g/dl for serum protein and globulin and there was a corresponding increase across the level of niacin whereby albumin and creatinine had higher values with 32.9g/dl and 1.0mg/dl at 30ppm level this point to the fact that protein was better utilized. The triglyceride, cholesterol, LDL and uric acid were not significantly affected by the level of niacin supplementation and the PCV, Hb, Serum albumin, Globulin, cholesterol, HDL and Uric acid were significantly higher at 20th weeks of the experiment.

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