EVALUATION OF DIETARY INCLUSION OF DIRECT FED MICROBES ON THE BLOOD CONSTITUENTS AND SERUM CHEMISTRY OF BROILER BIRDS

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Abstract

A 56 days study was carried out using a total of 96-day-old breed of Ross 308 to evaluate the dietary inclusion of Direct Fed Microbes (DFM) on the blood constituents and serum chemistry of broiler chicken. There were twenty-four birds in each treatment and eight birds per replicate. Four experimental diets was formulated which include T1 (0% DFM), T2 (2.5% DFM), T3 (5% DFM) and T4 (7.5% DFM) .Feed and water were given ad libitum throughout the duration of the experiment which lasted 56 days. Blood and serum profile of the experimental broiler birds were evaluated. Data obtained were subjected to statistical analysis. Results showed that no significant differences ($p>0.05$) were observed in haemoglobin (Hb), packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean cell hemoglobin concentration (MCHC). The WBC portrayed a decreasing trend as the level of DFM increased. Significant differences ($p<0.05$) were observed in total serum protein and globulin, whereas, no significant differences ($p>0.05$) were observed in serum albumin, glucose, urea and creatinine. The 2.5% DFM recorded the most significant value in total serum protein. The trial diets (T_2, T_3 and T_4) generally recorded higher serum protein value than the control diet (T_1). It is apparent from this study that T_2 which revealed the highest serum protein, lower urea value compared to the control and highest immune response based on its highest white blood cell count, could be considered for adoption by farmers in the diets of broiler chickens.

Keywords: *Dietary Inclusion, Direct Fed Microbes, Blood Constituents, Serum Chemistry, Broiler Chicken*

Introduction

Probiotics have gained popularity as "functional" supplements for feed (livestock and poultry). The most commonly used probiotics are strains of lactic acid bacteria (stemming from use in dairy products) and bifidobacteria (stemming from higher proportions in breast milk-fed infants vs. bovine milk-fed infants) (Anadón *et al.,* 2006). Micro organisms used as feed additives are designed to produce a quick response, especially at times of need (e.g., postnatal stage, weaning), and are present in a larger quantity of feed; therefore, they must survive the rigors of feed processing and storage. (Patterson and Burkholder, 2003) . The use of antibiotics for growth promotion in poultry species has been banned in Europe and United states (Ahmad, 2006). Therefore, nutritionists and production managers are interested in compounds that may serve as possible replacements. The use of probiotics otherwise known as Direct Fed Microbes (DFM) are one of the approaches that have a potential to replace antibiotics as a result of the direct fed microbes ability to prevent internal colonization of enteropathogenic microorganisms, produce anti-microbial substances (Organic acid and bacteriocins) and enzymes (Liu *et al.*,2007), stimulate intestinal immunity of birds (Fuller, 2000), also reduce stress in animals (Line *et al.*, 1997). Therefore, the objective of this study was to further investigate the effect of adding commercial products of Direct Fed Microbes (DFM) as probiotic sources to broiler diets.

Materials and Method

This study was carried out at the Poultry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture Umudike, Abia State of Nigeria. It is located at Latitude 5° 29^{0}N and Longitude 7^0 33^{0}E in the rain forest zone of South East Nigeria (NRCRI, 2006). A Total of Ninety six (96) Ross 308 broiler birds were used for this study with an average weight of about 50g. The experimental designs used for the experiment were Complete Randomized Design (CRD). The birds were randomly divided into four experimental treatments which include T_1 (0% DFM), T_2 (2.5% DFM), T3 (5% DFM) and T_4 (7.5% DFM). Each treatment had three replicate of 8 birds per replicate. The birds in treatment one serves as control. The experimental animals were bought from a reputable Hatchery in Nigeria, the

feedstuffs were purchased from Jocan Nig. Ltd, Umuahia, Abia State. The Direct Fed Microbes (DFM) were purchased from Eggriculture Inc USA and distributed by Farm Associates Nig. Ltd. Enugu State. Feed and water were provided *ad-libitum*. At end of 56 days, 2 laying birds from each replicate within each treatment was selected and blood samples collected for haematological assessment such as packed cell volume (PVC), red blood cell (erythrocyte) count (RBC), mean cell volume (MCV), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC), haemoglobin (HB), and white blood cell (leukocyte) count. Serum albumen, serum protein, serum globulin, Serum urea, serum glucose and serum creatinine were evaluated. Data obtained in each measured parameter was subjected to Analysis of Variances according to Steel and Torrie (1980) in a Completely Randomized Design and differences between treatments means were separated using the Duncan's Multiple Range Test (Duncan, 1955).

Results and Discussion

Haematological parameters are blood characteristics, which affect both the health and nutritional state of an animal. The nutritional value of a feed stuff could therefore be reflected through parameters such as: white blood cell (WBC), red blood cell (RBC), packed cell volume (PCV), haemoglobin (Hb), mean corpuscular haemoglobin (MCH), lymphocytes, and neutrophilis (Fajohunbo, 2010). Analysis of normal haematological parameters of poultry is equally essential as a diagnostic tool in order to assess the impact of environmental, nutritional and/or pathological stresses (Elagib and Ahmed, 2011). The haematological parameters evaluated in this study provide valuable information about the immune status of animals fed the DFM-based diets (Kral and Suchy, 2000).

The results showed no significant differences ($p>0.05$) in hemoglobin (Hb), packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean cell hemoglobin concentration (MCHC). The WBC portrayed a decreasing trend as the level of DFM increased. The result of MCH and MCHC compared closely to the result obtained by Duwai *et al.* (2013) but higher than that reported by Clement *et al.* (2010) in broilers fed different energy diets. The MCH can be characterized as either macrocytic or microcytic anaemia as discussed for MCV above (Mercks Veterinary Manual, 2012). However, this present finding did not show any significant difference between the control and the trial diets, suggesting no abnormality with the supplementation of the probiotic in broilers diet. The MCHC values are lower than the normal reference ranges 32.41 – 33.37 %and 33 % given by Campbell (2013) and Mercks Veterinary Manual (2012) respectively. The MCHC may be low in iron deficiency, blood loss and anaemia caused by chronic disease. However, the similarity between the control and the trial diets again shows that the MCHC values were not affected by the supplementation of probiotics in broilers diet.

Significant differences ($p<0.05$) were observed in total serum protein and globulin, whereas, no significant differences ($p>0.05$) were observed in serum albumin, glucose, urea and creatinine. The 2.5% DFM recorded the most significant value in total serum protein. The trial diets (T_2, T_3 and T_4) generally recorded higher serum protein value than the control diet (T_1). This shows that inclusion of DFM increases the serum protein in broiler chickens. Again, it was observed that the trial diets portrayed higher values for serum globulin than the control diet. The 5% DFM-based diet recorded the most significant value for serum globulin which however was inconsistent as the level of inclusion of DFM increases. The control diet recorded the least serum globulin. It can therefore be stated that the inclusion of DFM equally increased the serum globulin level of broiler chickens in this study. The albumin levels in this study fall within the range established by Merck Veterinary Manual (2012) which is 1.4 g/dl. Owosibo *et al.* (2013). The increase in serum globulin of the trial diets in this study may suggest increased immunity which would predispose the animals for better performance. Stimulation of immune response by host is among the mechanisms established for improvements in animal performance when fed a DFM (Keeney and Finlay, 2011)

Conclusion

The findings from this study concurred with most of the findings established by previous researchers, observed disparities may be attributed to differences in the strains, concentrations, dosage, storage, potency, specificity of the probiotics used in this study as well as differences in management, breeds, sex effects and environmental conditions, among others. It is apparent from this study that T_2 which revealed the highest serum protein, lower urea value compared to the control and highest immune response based on its highest white blood cell count, could be

considered for adoption by farmers in the diets of broiler chickens.

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Table 1: Percentage composition of Broiler starter diets supplemented with Direct Fed Microbes

Ingredients	T_1 (0%)	T_2 (2.5%)	T_3 (5%)	T_4 (7.5%)
Maize (yellow)	50.00	50.00	50.00	50.00
Soya bean meal	25.00	25.00	25.00	25.00
Wheat offal	8.00	8.00	8.00	8.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	10.00	10.00	10.00	10.00
Bone meal	3.00	3.00	3.00	3.00
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
Vit/mineral premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Crude protein	22.95	22.93	22.91	22.89
ME (Kcal/kg)	2945	2930	2945	2950

Table 2: Percentage composition of Broiler Finisher diet supplemented with Direct Fed Microbes

Ingredients	T_1 (0%DFM)	T_2 (2.5%DFM)	T_3 (5%DFM)	T_4 (7.5%DFM)
Maize (yellow)	52.00	52.00	52.00	52.00
Soya bean meal	20.00	20.00	20.00	20.00
Wheat offal	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	11.00	11.00	11.00	11.00
Bone meal	3.00	3.00	3.00	3.00
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
Vit/mineral premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Crude protein	20.86	20.53	20.34	20.22
ME (Kcal/kg)	3050	3062	3068	3071

Table 3: Hematological characteristics of broiler chickens fed diets containing different levels of direct fed microbes

Parameter	T_1 0%	T_2 2.5%	T_3 5%	T_4 7.5%	SEM
Hb(g/dl)	7.13	7.54	7.81	7.40	0.17
PCV (%)	27.17	28.00	29.00	28.00	0.64
RBC $\times 10^6$/ml	2.90	2.82	2.68	2.86	0.13
WBC $\times 10^3$/ml	9.58	9.85	7.73	6.23	0.79
MCV (Fl)	98.03	100.21	111.26	97.70	4.82
MCH (Pg)	25.64	26.95	30.06	25.83	1.31
MCHC (%)	26.25	26.93	27.16	26.38	0.51

Means did not differ significantly at $p>0.05$; SEM = Standard error of the mea

Table 4: Serum Characteristics of Broiler Chickens fed Diets containing different levels of Direct Fed Microbes

Parameter	T_1 0%	T_2 2.5%	T_3 5%	T_4 7.5%	SEM
Total protein	2.06^{b}	2.66^{a}	2.55^{ab}	2.41^{ab}	0.09
Albumin	0.96	1.15	0.96	1.09	0.04
Globulin	1.10^{b}	1.51^{ab}	1.59^{a}	1.32^{ab}	0.08
Glucose	189.33	201.67	205.33	181.67	6.40
Urea	2.45	1.90	1.01	3.30	0.55
Creatinine	0.28	0.20	0.33	0.23	0.03

a,b Means differed significantly at $p<0.05$; SEM = Standard error of the mea