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Growth performance and haematological profile of broiler chickens served dietary inclusion of probiotics (*Saccharomyces cereviasae*) and enzyme (bio-enzyme)

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Abstract

This study was conducted to evaluate the growth performance and haematological profiles of broiler chickens served dietary inclusion of probiotics (Saccharomyces cereviasae) and enzyme (Bio-enzyme). One hundred and twenty, one day-old broiler chicks of Agrited strain were used for the study. The birds were randomly allotted to four dietary treatments. Each treatment contained 30 birds replicated three times to contain 10 birds per replicate in a completely randomized design experiment. The four dietary treatments were T1 Control (no probiotics and enzyme), T2 (had both probiotics and enzyme), T3 (probiotics only) and T4 (Enzyme only). The birds were given feed and water ad-libitum and the quantity of feed consumed each day was determined through weigh back techniques while the birds were weighed weekly throughout the experimental period. The experiment lasted eight weeks. The results showed significant ($p<0.05$) differences in the final body weight, total weight gain, average daily weight gain, total feed intake, average daily feed intake and feed conversion ratio. Chickens on treatment 2 had the highest final body weight of 3011.57g and performed better than chickens in other dietary treatments. Similar trend was observed in the haematological profile as treatment two were highest in value across the treatments and parameters measured except in packed cell volume where the highest value (36.33 %) was recorded in treatment 4. It was concluded from the study that treatment two which contained both probiotics and enzyme performed better and thus, recommended to farmers for broiler production.

Keywords: Broilers, growth performance, haematology, probiotics and enzyme.

Introduction

Poultry production plays an important role in animal protein supply most effectively within the shortest possible time (Hossinzadeh and Jahanian, 2010), this is because of their short generation intervals, high prolificacy and fast growth rate. According to Nworgu (2004), high cost of feed is the major problem of poultry farmers in Nigeria. Adene (2004) reported that feed accounts for 65-80 % of the total cost of production. Due to the high cost of poultry feed ingredients; farmers have alternatively chosen agro by-products of poor quality and less nutritive value in rearing their birds. Nutritive feed stuffs are either not available or not cost effective, and sometimes, the nutrients are not readily accessible to the birds. Furthermore, some feed additives are not effective; and most yielding growth promotants have great disadvantages, especially on the consumers' health (Ezema, 2007). From series of research results over the past decades, poultry nutritionists have come up with different types and levels of growth promotants aimed at improving efficiency of chicken production by increasing growth rate and feed conversion ability (Miranda *et al*., 2014). Some of these promotants of growth ever in use included hormones (natural and synthetic) that are specific receptors in their target tissues. They also included antimicrobial compounds that change the population of micro-organisms in the gastrointestinal tract of healthy animals, resulting in improved animal performance. Probiotics present a potential alternative to the

prophylactic use of antibiotics in feed animals (Mahima *et al*. 2013; Angelakis *et al*. 2013; Dhama *et al*. 2013). Also known as direct-fed microbials, probiotics are classified as live nonpathogenic microorganisms that are capable of maintaining a normal gastrointestinal microbiota (Patterson and Burkholder, 2003; Ohimain and Ofongo, 2012). Probiotics, meaning "for life" in Greek, has been defined as "a live microbial feed supplement, which beneficially affects the host animal by improving intestinal balance" (Fuller, 1989). Probiotics can be composed of one or many strains of microbial species, with the more common ones belonging to the genera *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, *Bacillus*, and *Pediococcus* (Gaggia *et al*., 2010). Enzymes are now being routinely used in poultry feeds to improve digestibility of feed ingredients. In general, feed enzymes are available which act on carbohydrates, plant bound materials and proteins. Commercial and academic studies have shown that the judicious use of enzymes can ameliorate inconsistency in nutritional value of maize, thereby improving body weight in birds (Cowieson, 2005). Therefore, this study was aimed at evaluating the growth performance and haematological profiles of broiler chickens served dietary inclusion of probiotics (*Saccharomyces cereviasae*) and enzyme (Bio-enzyme).

Materials and methods

Study location

The experiment was conducted at the Poultry Unit, Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka, Enugu State, Nigeria. Nsukka is in Enugu state, Nigeria and lies between latitude 06° 52' 24"N, Longitude 07° 39' 23" E and 550 meter elevation above the sea level. Nsukka covered land Area of 17.52 sq mi (45.38 km^2) with a population of 309,633 people (Federal Republic of Nigeria Official Gazette, 2007). The climate in this area is humid tropical with average annual rainfall of 1680 – 1700mm. the mean ambient temperature is 26.6 °C (Breinholt *et al.*, 1981).

Experimental design, animals and management

The study was conducted to evaluate the growth performance and haematological profiles of broiler birds served dietary inclusion of probiotics (*Saccharomyces cereviasae*) and enzyme (Bio-enzyme). One hundred and twenty, one day-old broiler chicks of Agrited strain were used for the study. The birds were randomly divided into four groups and assigned to the four dietary treatments. Each treatment contained 30 birds replicated three times to contain 10 birds per replicate in a completely randomized design. The four dietary treatments were T1 Control (no probiotics and enzyme), T2 (had both probiotics and enzyme), T3 (probiotics only) and T4 (Enzyme only). The birds were given fed and water *ad-libitum* and the quantity of feed consumed each day was determined through weigh back techniques. The birds were weighed weekly throughout the experimental period and the experiment lasted for eight weeks. Vaccination and medications were provided as when due and other routine management practices were provided accordingly. At the end of the experimental period, two birds were randomly chosen from each replicate for haematological profiling. Blood samples were collected into EDTA containers with the aid of sterile syringes and needles and taken to the laboratory for analysis.

Table 1: The percentage composition of the experimental diets of the broiler chickens

Parameters	Treatments			
	T1 (Control)	T2 (Probiotics and Enzyme)	T3 (Enzyme only)	T4 (Probiotics only)
Maize	53.00	53.00	53.00	53.00
Wheat offal	10.00	10.00	10.00	11.00
Palm kernel cake	5.50	5.50	5.50	5.50
Groundnut cake	15.00	15.00	15.00	15.00
Soya bean meal	10.00	10.00	10.00	10.00
Fish meal	1.50	1.50	1.50	1.50
Bone meal	4.00	4.00	4.00	4.00
Salt	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Vit-Premix	0.25	0.25	0.25	0.25
Probiotics	-	0.80	-	0.80
Enzyme	-	0.02	0.02	-
Total	100.00	100.00	100.00	100.00
Calculated composition				
CP%	20.12	20.01	20.11	20.04
Energy (MJME/kg)	3.68	3.81	3.75	3.71

Proximate and statistical analysis

Proximate analysis of feeds was done according to AOAC (1990). Data collected were subjected to analysis of variance (ANOVA) using Statistical Package for Social Sciences (SPSS, 2013) version 19.00. Significant different means were separate using Duncan's new multiple range test (Duncan, 1955).

Results and discussion

Table 2 shows the effect of probiotics and enzyme inclusion on the growth performance of broiler chickens. The results indicated no significant difference ($p>0.05$) in the initial body weight across the treatments and the values ranged from 40.17 to 45.33 g. However, there were significant differences in the final body weight, total weight gain, average daily weight gain, total feed intake and feed conversion ratio across the treatments. Treatment 2 had the highest final body weight value while treatment 1 (Control) had the lowest values of 3011.57g and 2138.87g, respectively.

Table 2: Effect of probiotics and enzyme inclusion on the growth performance of broiler birds

Parameters	Treatments			
	T1 (Control)	T2 (Probiotics and Enzyme)	T3 (Enzyme only)	T4 (Probiotics only)
IBW (g)	40.62±1.24	40.17±0.17	45.33±3.03	42.02±3.33
FBW (g)	2138.87±3.17^{d}	3011.57±2.89^{a}	2923.67±3.59^{b}	2696.58±2.86^{c}
TWG (g)	2098.37±2.20^{d}	2971.41±3.02^{a}	2881.67±37.47^{b}	2654.57±25.71^{c}
ADWG (g)	38.19±0.06^{d}	53.78±0.05^{a}	52.27±0.64^{b}	48.15±0.51^{c}
TFI (g)	4598.73±82.42^{c}	4426.40±12.92^{d}	5025.65±15.09^{a}	4808.78±24.47^{b}
ADFI (g)	82.69±1.02^{c}	79.01±0.21^{d}	89.74±0.27^{a}	85.87±0.44^{b}
FCR	1.16±0.02^{a}	1.47±0.03^{d}	1.72±0.03^{c}	1.78±0.02^{b}

IBW = Initial body weight, FBW = Final body weight, TWG = Total weight gain, ADWG = Average daily weight gain, TFI = Total feed intake, ADFI = Average daily feed intake, FCR = Feed conversion ratio.

Total weight gain and average daily weight gain followed similar trend though total feed intake and average daily feed intake in treatment 3 had the highest value whereas treatment 2 had the least values. Birds in treatment 2 had the best feed conversion ratio (1.47) and the highest final body weight (3011.57g). This is higher than values reported by some authors on final body weights of broiler birds (Babu *et al*. 2016; Owosibo *et al*. 2013). The significant ($p<0.05$) increase in final body weight recorded in treatment 2 may be attributed to the activities of the probiotics which may have elaborated the digestive enzymes such as sucrose and phytase that helped in nutrient digestion thereby promoting growth. This was supported by Cowieson *et al*. (2004) that hydrolysis of phytate by phytase is essential to liberate the bound nutrients in the GIT for absorption. Selle and Ravindran (2007) in agreement with that opinion stated that adding microbial phytase to diets enhances the bird's growth performance and mineral digestibility, and reduces nutrient excretion to the environment. The beneficial effect of probiotic supplementation to broiler chicken diet in terms of increased body weight and body weight gain is well documented in a study by Bandy and Risam (2001).

Table 3: Effect of probiotics and enzymes inclusion on the haematological profile of the broiler chickens

Parameters	Treatments			
	T1 (Control)	T2 (Probiotics and Enzyme)	T3 (Enzyme only)	T4 (Probiotics only)
PCV (%)	29.67 ± 0.33^{d}	32.33 ± 0.32^{c}	34.00 ± 0.58^{b}	36.33 ± 0.33^{a}
Hb (g/dl)	6.90 ± 0.06^{c}	10.70 ± 0.12^{a}	10.07 ± 0.03^{a}	8.70 ± 0.06^{b}
RBC ($x10^{9}/mm^{3}$)	180.00 ± 2.89^{c}	261.67 ± 1.67^{a}	251.67 ± 4.41^{a}	210.00 ± 5.77^{b}
WBC ($x10^{3}mm^{3}$)	1840.00 ± 13.80^{c}	4800.00 ± 0.00^{a}	3513.33 ± 15.11^{b}	4783.33 ± 16.67^{a}

a,b,c,d = Significant means, PCV = Packed cell volume, Hb = Haemoglobin concentration, RBC = Red blo od cell, WBC = White blood cell

The results of the effect of the inclusion of probiotics and enzymes on the haematological profile of the broiler chickens are presented in Table 3. The result showed that there were significant ($p<0.05$) differences in the PCV, Hb, RBC and WBC across the treatments. Birds on treatment 4 had the highest value of PCV (36.33%), followed by bird in treatment 3, but the least value of PCV (29.67 %) was obtained from the birds in the control (T1). Treatment 2 had the highest value of haemoglobin concentration, red blood cell count and white blood cell count (20.70g/dl, $261.67x10^{9}/mm^{3}$ and $4800x10^{3}/mm^{3}$ respectively), whereas the control had the least values s (14.90g/dl, $180.00x10^{9}/mm^{3}$ and $1840x10^{3}/mm^{3}$ respectively). The percentage PCV values in this study were higher than values reported by Owosibo *et al*. (2013) and Ezema (2014) who compared the effects of probiotic and commercial enzyme on growth rate, haematology and serum biochemistry of broiler chickens. However, (32.33 %) obtained in treatment 2, combination of probiotics and enzyme, was the same with the result (32.50%) recorded by Rahman *et al*. (2013) who also included probiotics and enzyme in broiler's diets. On the contrary, Rahman *et al*. (2013) recorded (8.70g/dl) in haemoglobin concentration which was significantly ($p<0.05$) lower than 10.70 and 10.07g/dL obtained in T2 and T3, respectively, but similar to value obtained in T4. Ezema (2014) also recorded lower

values with average of 8.45g/dL. Ogunwole *et al*. (2017) fed broilers with acidified blood meal diets and obtained Hb values ranging from 9.85 to 10.66g/dL which are similar to values obtained in this study. The results in RBC are also in agreement with the results of Ogunwole *et al*. (2017) but differed from results of Owosibo *et al*. (2013) and Ezema (2014). There were significant differences ($p<0.05$) across the treatments in WBC which corroborated with the findings of Abdulazeez *et al*. (2016). The higher values obtained in this study could be attributed to the combined effects of probiotics and enzyme which have been reported to hydrolyse feed materials to release useful nutrients to the animals and also aids in digestion Cowieson *et al*. (2004).

Conclusion and recommendation

It was concluded from the study that broiler chicken fed diets supplemented with both probiotics and enzyme performed better and thus, recommended to farmers for broiler production.

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