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EFFECTS OF GRADED LEVELS OF PROBIOTIC (*BIOVET-YC*) SUPPLEMENTATION ON THE PERFORMANCE OF BROILER CHICKENS

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ABSTRACT

The study was carried out to evaluate the effect of probiotic *(Biovet-YC)* supplementation on growth performance in broiler chickens. A total of two hundred day old Agrited broiler chicks were subjected to 56-day study period. Chicks were randomly allotted to five dietary treatments with 10 birds per replicate and 40 birds per treatment in a completely randomize design (CRD). The levels of probiotic inclusion were 0, 0.05, 0.1, 0.15 and 0.2% as represented by T1, T2, T3, T4 and T5 respectively. The birds in all the groups were reared under deep litter system; feed and water were provided *ad-libitum.* Dietary probiotic significantly (P<0.05) improved weight gain and feed intake birds on T1 recorded the lowest feed intake (53.03g) while those on T4 recorded the highest (59.90g) whereas, feed conversion ratio was not significantly altered at the starter phase of the experiment (Birds on T1 recorded 3.77 while birds on T4 recorded the least FCR of 3.29). At the finisher phase weight gain and feed conversion ratio were significant at (P<0.01) and (P<0.05) respectively, while daily feed intake was not affected. Birds on T4 had the highest daily weight gain (18.18g) and (35.24g) while those on control had the lowest (14.06g) and (30.51g) for starter and finisher respectively. The same trend was elicited for feed conversion ratio. The economic analysis showed significant variation in feed cost per kg gain in terms of broiler production across treatment groups T1 (control) was ₦345.11/kg gain while T4 recorded the least ₦288.61/kg gain. Probiotic supplementation in broiler diets could improve growth performance. Moreover, supplementation of probiotic in the level of 0.15% can safely be used in diets of broilers.

Keywords: Probiotics, *biovet-yc*, broilers, growth, performance.

INTRODUCTION

The poultry industry has been one of the most dynamic, ever expanding and an important economic activity in many countries. However, poultry industry has always been confronted with challenges in form of various diseases. These lead to increase used of antimicrobial products in the poultry industry for therapeutic, prophylactic and growth promotion. In view of the above therefore, the demand for higher and safer protein source, free of infections is getting increased due to the increasing demand for quality in animal products, as well as concern about the effects of antimicrobial additives on human health (Alkhalf *et al.,* 2010).

It has been shown by several scientific studies that antibiotics added to animal feeds as therapeutic, prophylactic and growth promoters allow better live performance (Dibner and Richards, 2005). However, the growing concern with the possible relation between in-feed antibiotics and bacterial resistance in livestock and human has driven the adoption of few measures to control these compounds (Ferket, 2003). Edens (2003) mentioned that, with

increasing concerns about antibiotics resistance, and the ban on sub therapeutic antibiotic usage in Europe and potential for a ban in the United States, there is increasing interest in finding alternatives to antibiotics for poultry production. Therefore, probiotics can be listed among such alternatives.

The use of dietary additives such as probiotics is gaining more momentum because of their beneficial effects on growth rate and feed efficiency (Islam *et al.,* 2004); and in the prevention of intestinal infections (Fuller, 1982). In addition probiotics improves performance and feed conversion ratio of poultry (Santos and Ferket, 2006).

According to the current adopted definition by Food and Agricultural Organization and World Health Organization (2002), probiotics are; live microorganisms which when administered in adequate amount confer a health benefit on the host. In addition, probiotics include viable microbial and microbial fermentation products which are beneficial to decrease the undesirable micro flora population in the gastro intestinal tract of chicken (Chiang and Hsieh, 1995), by stimulating the immune system (Patterson and Burkholder, 2003). The most important merit of using probiotics is that: it neither has any residual effects on animal production nor exerts any antibiotic resistance by consumption, (Alkhalf *et al*., 2010).

Therefore, in view of the potentially beneficial effects of probiotics supplementation, the present study was undertaken to find out the probable effects of probiotics supplementation on body weight gain, feed consumption, feed conversion ratio, mortality and cost of broiler production in 'Agrited' broiler chickens. The levels of probiotic used in the study was drawn using the manufacturers recommendation of 0.05g/100kg feed (500g/metric ton) and the levels found in the literature that ranges from 0.05 – 0.16g/100kg feed. The levels were increased in the present study to ascertain the efficiency of increasing the levels if any above that was recommended by manufacturers.

MATERIALS AND METHODS

The study was carried out in the poultry production unit of the Teaching and Research Farm of the Department of Animal Science and Range Management, Modibbo Adama University of Technology (MAUTECH) Yola, Adamawa State, Nigeria. Two hundred broiler chicks were randomly allotted to five diets with inclusion of probiotic containing species of beneficial bacteria *(Lactobacillus acidophilus*) two live yeast culture (*Saccharomyces cerevislae* SC-47 and *Saccharomyces boulardii)* and *one protein enzyme (Alpha amylase)* at 0.0 (T1), 0.05 (T2), 0.15(T3), 0.1(T4) and 0.20% (T5) in a completely randomized design. Based on the vaccination schedule for north eastern Nigeria, chicks were vaccinated against infectious bursal disease (IBD) and Newcastle disease. Feed and water were given *ad-libitum* and the study lasted for the period of eight weeks. The percentage ingredients composition of starter and finisher diets are presented in Tables 1 and 2.

All data generated from the study were subjected to analysis of variance as described by Steel and Torrie (1980). Means were using Duncan's Multiple Range Test, where significant differences exist.

Table 1: Ingredients Composition (%) and Calculated Analysis of Broiler Starter Diet

	Diets				
Ingredients	1	2	3	4	5
Maize	46.27	46.20	46.13	46.07	46.10
Soybean	35.43	35.45	35.47	35.48	35.40
Wheat offal	10	10	10	10	10
Fish meal	4.0	4.0	4.0	4.0	4.0
Bone meal	1.5	1.5	1.5	1.5	1.5
Lime stone	2.0	2.0	2.0	2.0	2.0
Premix*	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.1	0.1	0.1	0.1	0.1
Methionine	0.2	0.2	0.2	0.2	0.2
Probiotics	0.0	0.05	0.1	0.15	0.2
Total	100	100	100	100	100
Calculated Analysis					
Crude Protein (%)	23.00	23.00	23.00	23.00	23.00
ME (kcal/kg)	2998	2996	2995	2993	2991
Crude Fiber (%)	4.07	4.07	4.07	4.07	4.06
Calcium (Ca) %	1.49	1.49	1.49	1.49	1.49
Phosphorus (P) %	0.79	0.79	0.79	0.79	0.79
Lysine (%)	1.25	1.25	1.25	1.25	1.25
Methionine (%)	0.71	0.71	0.71	0.71	0.71

Vit. /Minerals Premix each kg contains; Vitimin A500iu,Vitamin D3,888000iu,Vitamin E, 12,000mg, Vitamin K3, 15,000mg, Vitamin B1, 1000mg, B2, 2000mg, Vitamin B6, 15oomg, Niacin, 12000mg, Pantorhenic acid, 2000mg, Biotin, 1000mg, Vitamin B12, 3000mg, Folic acid 1500mg, Choline Chloride< 60,000mg, Manganese, 10,000mg Iron, 1500mg, Zinc, 800mg, Copper 400mg, Iodine, 80mg, Cobalt 4omg, Selenium, 8000mg.

Table 2: Ingredients Composition (%) and Calculated Analysis of Broiler Finisher Diet

	Diets				
Ingredients	1	2	3	4	5
Maize	50.60	50.53	50.47	50.40	50.33
Soybean	28.10	28.12	28.13	28.15	28.17
Wheat offal	15	15	15	15	15
Fish meal	2.0	2.0	2.0	2.0	2.0
Bone meal	1.5	1.5	1.5	1.5	1.5
Lime stone	2.0	2.0	2.0	2.0	2.0
Premix*	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.1	0.1	0.1	0.1	0.1
Methionine	0.2	0.2	0.2	0.2	0.2
Probiotics	0.0	0.05	0.1	0.15	0.2
Total	100	100	100	100	100
Calculated Analysis					
Crude Protein (%)	20.00	20.00	20.00	20.00	20.00
ME (kcal/kg)	2910	2908	2906	2905	2908
Crude Fiber (%)	4.31	4.3	4.3	4.3	4.3
Calcium (Ca) %	1.42	1.42	1.42	1.42	1.42
Phosphorus (P) %	0.99	0.99	0.99	0.99	0.99
Lysine (%)	1.10	1.10	1.10	1.10	1.10
Methionine (%)	0.64	0.64	0.64	0.64	0.64

Vit. /Minerals Premix each kg contains; Vitimin A500iu,Vitamin D3,888000iu,Vitamin E, 12,000mg, Vitamin K3, 15,000mg, Vitamin B1, 1000mg, B2, 2000mg, Vitamin B6, 15oomg, Niacin, 12000mg, Pantorhenic acid, 2000mg, Biotin, 1000mg, Vitamin B12, 3000mg, Folic acid 1500mg, Choline Chloride< 60,000mg, Manganese, 10,000mg Iron, 1500mg, Zinc, 800mg, Copper 400mg, Iodine, 80mg, Cobalt 4omg, Selenium, 8000mg.

RESULTS AND DISCUSSION

Proximate Composition of Experimental Broiler Starter and Finisher Diets

The result of chemical composition of the starter and finisher diets as analyzed according to (AOAC, 1994) showed the crude protein of the starter diets ranges from 22.89 to 24.0% and that of finisher diets was 20.0 to 21.20% while, the metabolisable energy was found range from 2951.97 to 3144.81 and 2973.24 to 3123.97 kcal/kg in starter and finisher diets respectively. The chemical composition revealed that the crude protein and metabolisable energy as well as other parameters met the requirement for broiler production under tropical environment (Olomu, 1995; NRC, 1984).

Performance of Broiler Chicks Fed Diets Containing Different Levels of Probiotic

Feed Intake

Daily feed intake of the birds was found to be significantly ($P<0.001$) different among treatment groups in the starter phase. Birds in T4 had the highest (59.90g) value while birds in T1 recorded the lowest (53.03g). However, daily feed intake in the finisher phase revealed a non-significant ($P>0.05$) difference among treatment groups. When the performance of the birds were pooled between starter and finisher in terms of daily feed intake it revealed significant difference ($P<0.01$) among treatment means and when compare to control group. T4 recorded the highest feed intake of 87.60g while birds in T1 recorded the lowest value of 84.08g.

The feed intake of birds in the present study is in line with the report of Mohammed *et al.* (2014) who study the effects of dietary inclusion of probiotic on the performance of broiler chickens; their report indicated a significant difference in feed intake with probiotic groups than in the control groups during the starter phase. Similarly, Nunes *et al.* (2012) replaced antibiotic with probiotic in broiler diets also reported a significant increase in feed intake among treatment groups between the periods of 1-21 days. However, the result was not in agreement with the report of Khaksefidi and Rahim (2005) who study effect of probiotic inclusion in the diets of broilers. The improvement in the performance of broiler chickens fed probiotic containing diets in terms of feed intake at the starter phase as observed in the study could be because of maintaining of beneficial microbial population as reported by (Teo and Tan, 2007).

No significant difference ($P>0.05$) was obtained among treatment means in feed intake at the finisher phase which is in agreement with the report of Loddi *et al.* (2000) .Similarly, Correa *et al.* (2003) found no difference in feed intake of broilers fed diets supplemented with probiotics.

The non-significant ($P>0.05$) difference observed in finisher phase could be attributed to the unbalanced effect of intestinal flora with supplementation of microorganisms present in the probiotic at amount usually above that found in the digestive tract, there by interfering with feed intake of chickens (Nunes *et al.*, 2012). The non-significant difference observed in the finisher phase may also be related to the reduction in dietary protein levels.

Weight Gain

The results of daily weight gain indicated that, there were significant ($P<0.01$) differences among treatment groups compared to the birds in T1 in the starter phase. T4 recorded the highest (18.18g) daily weight gain while T1 recorded the lowest (14.06g). Similarly, significant different exist ($P<0.01$) among treatment groups with respect to daily weight gain, in the finisher phase T4 recorded the highest (35.24g) values while T1 recorded the lowest (26.81g) value. Furthermore, the daily weight gain was significantly different ($P<0.001$) among treatment groups when

performance was pooled between starter and finisher phases. Birds in T4 recorded the highest (26.71g) with birds in T1 recorded the lowest (20.43g).

The significant difference observed in daily weight gain of broiler chickens fed diets containing different levels of probiotic as supplement was in conformity with the report of Mahmud *et al.* (2014) who reported a significant difference between the control group and the treatment groups. This was also in line with findings of Zulkifli *et al.* (2000); Islam *et al.* (2004) and Kermanshahi and Rostami, (2006) who reported that supplementation of probiotic had significant effect on the growth performance of the broiler chickens. The result of this study was in agreement with the report of Chiang and Hsieh (1995) who obtained maximum growth response in broiler even using probiotic at very low level as 0.25g/kg feed. Moreover, the report of Alkhalf *et al.* (2010) in their study influence of probiotic supplementation on blood and growth performance in broiler chickens clearly demonstrated a significant improvement in body weight.

The improvement in daily weight gain observed in the study may be due to the increase efficiency of digestion and nutrient absorption processes due to presence of probiotic bacteria. As reported by Edens (2003) that the inclusion of desirable microorganisms (probiotics) in the diet allows the rapid development of beneficial bacteria in the digestive tract of host thereby improving its performance.

However, the result obtained in the study concerning body weight gain was in contrast with the findings of Ferreira and Kussakawa (1999) who reported that probiotic do not always have positive outcome in relation to weight gain.

Feed Conversion Ratio

Feed conversion ratio (FCR) was not significantly ($P>0.05$) affected by probiotic inclusion in the starter phase. While in the finisher phase and when performance was pooled between starter and finisher significant difference ($P<0.05$) was recorded among treatment groups. Birds in T1 (4.30) recorded high FCR while birds in T4 (3.27) recorded the lowest value.

The finding in the present study indicated that, the feed conversion ratio was not influenced ($P>0.05$) by supplementation of probiotic at the starter phase. This is in agreement with the report of Pelicano *et al.* (2004); Rocha *et al.* (2010) and Silva *et al.* (2011) in their separate studies on growth promoter additives and found that, growth promoter additives did not influence the result of feed conversion ratio of chicks in the initial rearing phase. However, the value of feed conversion ratio at the finishing and overall phases are found to be significant ($P<0.05$) among treatment groups. The result obtained was in agreement with the findings of Khaksefidi and Rahim (2005) who reported that, birds on the control group showed poor feed conversion ratio compare to those on probiotic ration. The improvement in feed conversion ratio found in some treatments may be due to maintaining normal intestinal micro flora by competitive exclusion and antagonism, altering metabolism by increasing digestive enzyme activities and by promoting digestive rate of energy nutrient by the probiotic Owosibo *et al.* (2013).

Mortality

The cumulative mortality rate was lower in the birds supplemented with probiotics than the control group over the period of 1-8 weeks. There was no mortality in the initial rearing period whereas, in the finisher phase five birds were recorded, three out of the five birds were from the control group. Cmiljanic *et al.* (2001) and Khaksefidi and Rahim (2005) noted similar findings. The low rate of mortality observed in the treated groups may be attributed to the ability of

probiotics to eliminate pathogenic bacteria from the digestive tract of broiler birds (Moktar, 2013).

However, O'Dea *et al.* (2006) reported that, there were no significant difference in broiler mortality between the probiotic treatment groups and the control group.

Table 3: Performance of Broiler Chickens Fed Diets Containing Graded Levels of Probiotic

Parameters	**Diets**					**SEM**
	1	**2**	**3**	**4**	**5**	
Initial weight (g)	148.00	153.00	156.00	154.00	153.00	3.59^{NS}
Week 4 weight (g)	541.75^{c}	601.50^{b}	596.50^{b}	663.00^{a}	618.50^{ab}	18.68**
Final weight (g)	1292.3^{c}	1428.8^{c}	1538.5^{ab}	1649.8^{a}	1505^{b}	42.84***
Starter phase	53.03^{c}	57.60^{b}	56.36^{b}	59.90^{a}	58.53^{ab}	0.58***
DFI (g)	14.06^{c}	16.02^{b}	15.72^{b}	18.18^{a}	16.63^{ab}	0.66**
DWG (g)	3.77	3.56	3.59	3.29	3.52	0.11^{NS}
FCR	0	0	0	0	0	-
Mortality (No)						
Finisher phase						
DFI (g)	115.12	115.92	116.57	115.30	115.28	0.44^{NS}
DWG (g)	26.81^{c}	29.55^{b}	33.64^{a}	35.24^{a}	31.66^{b}	0.87^{**}
FCR	4.3^{a}	3.92^{a}	3.47^{ab}	3.27^{b}	3.64^{a}	0.10*
Mortality	3	1	1	0	0	-
Overall performance	84.08^{b}	86.76^{a}	86.46^{a}	87.60^{a}	86.90^{a}	0.49**
DFI (g)	20.43^{c}	22.78^{c}	24.63^{ab}	26.71^{a}	24.14^{bc}	0.58***
DWG (g)	4.12^{a}	3.81^{a}	3.51^{ab}	3.28^{c}	3.60^{a}	0.09*
FCR	3	1	1	0	0	-
Mortality (No)						

a,b,c = Means within the same raw bearing different superscripts differ significantly (P<0.05)*, (P<0.01)**,(P<0.001)***.NS = Not significant, DWG = Daily weight gain, DFI = Daily feed intake, FCR = Feed conversion ratio, SEM = Standard Error of Means.

Economic Analysis

The economic analysis of broiler chickens fed diets containing different levels of probiotic is presented on table 3. The results obtained revealed a homogenous values in total feed intake across treatment groups, with a range of (4.71 to 4.91Kg) and significant variation in respect to feed cost, which ranges from 288.61 to 345.11 N/Kg gain). The finding of this study disagrees with the findings of Tarum (2008), and Owosibo *et al.* (2013) who reported insignificance in cost of feeding broilers with different strain of probiotics.

Table 3: The Economic Analysis of Production of Broiler Chickens Fed Diets Containing graded levels of probiotic

	Diets				
Parameters	**1**	**2**	**3**	**4**	**5**
Total feed intake (kg)	4.71	4.86	4.84	4.91	4.87
Feed cost (₦/kg)	85.71	86.50	87.35	88.17	88.98
Cost of total feed intake (₦/kg)	403.69	420.39	422.77	432.91	435.11
Total weight gain (kg)	1.14	1.28	1.38	1.50	1.35
Feed cost (₦/kg gain)	345.11	328.43	306.36	288.61	322.30
Cost Saving (₦)	_	25.68	47.75	65.50	31.81

kg = kilogram, ₦ = Naira

CONCLUSION

The result revealed that dietary supplementation of probiotic supported broiler chickens performance better than the control diet with reduction in feed cost. However, dietary level of 0.15% probiotic with a feed cost saving of ₦65.50 per kilogram was the most economical.

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