Nigerian J. Anim. Sci. 2016 (1):91 - 98

Effect of a Commercial Brand of Organic Acids on the Performance of Broiler Chickens

Onimisi P. A* and Ponji A.

Department of Animal Science Ahmadu Bello University Zaria

onimisiphil@yahoo.com +234 8057228486

Target Audience: Poultry farmers, Poultry Researchers, Feed millers

Abstract

A study was carried out to evaluate the effect of Biotronic® SE (BSE), a commercial brand of Bio acids on the performance of broiler chickens. Two hundred and forty broiler chickens were assigned to four experimental diets, each with three replicates having 20 chicks per replicate. Treatments 1, 2, 3 and 4were supplemented with 0g, 300g,400g, and 500g BSE at the starter phase (0-4 weeks) and0g, 200g,300g, and 400g BSE at the finisher phase (5-8 weeks) respectively. Treatment diets and clean water were suppliedad libitum for the eight weeks of the experiment. Growth parameters taken include initial weight, final weight, feed consumption, feed conversion ratio, feed cost per kilogram and feed cost per kilogram gain for all treatments. At the end of the finisher phase, six birds selected to represent the average weight per replicate were used for carcass analysis and measurement of pH of intestinal organs. All data generated were subjected to analysis of variance and differences in mean were compared using Duncan multiple range test. From the result of the study, birds fed diets containing 300g\100kg BSE showed significantly (P<0.05) better performance in terms of weight gain, feed conversion ratio and feed cost per kg gain at the starter phase. However at the finisher phase birds supplemented with 400g\100kgBSE showed best performance in terms of feed conversion ratio and feed cost per kg gain.Significant (p<0.05) differences existed for breast and back cut parts but with no specific trend and similarly for intestinal length and gizzard while all the other carcass parameters were not significantly (p>0.05) different across the treatments. The PH values for the intestinal organs showed no significant (p>0.05) differences for crop, duodenum, jejunum and ileum. There was however significant (p<0.05) differences for proventriculus, gizzard, caecum, Colon and liver. It may be concluded that supplementation of broiler diets with 300g\100kg of feed at starter phase and 400g\100kg at finisher phase improves broiler performance and significantly reduce cost of production.

Keywords: Broiler chickens, Biotronic® SE, growth, intestinal pH

Description of Problem

Poultry are vulnerable to potentially pathogenic microorganisms such as *Salmonella sp*., and *Clostridium sp. Such p*athogenic microflora in the small intestine competes with the host for nutrients and also reduces the digestion of fat and fat-soluble vitamins due to deconjugating effects of bile acids (1). This depresses growth performance and

increases incidence of disease. For over 50 years now, antibiotics have been given at sub therapeutic dosage (as feed additive) to stabilize the intestinal microflora and improve the general performances and prevent some specific intestinal pathology and promote growth (2).

The use of antibiotics as growth promoter and therapeuticfeed additive in animals started appropriately five decades ago (3). Usually, antimicrobial growth promoters (AGPs) are administered at low doses, absorbed minimally from the gut and when incorporated into the feed, they act by specifically reducing the number of pathogenic bacteria (4). Recently, most AGPs have been banned from use because feeding of antibiotics are risky (5), considering the possibilities of antibiotic residue, the development of drug resistant bacteria and reduction in the ability to cure these bacteria diseases in human (6).

Concerns for food safety and environmental conservation are the major focus of poultry industry as constant efforts has been at producing safer human foods from animal sources more efficiently and at lower cost. Therefore, the search for alternative products that could be used in poultry diet to aid growth promotion, feed utilization and maintenance of gut health is ongoing. This has given impetus to continued search for new feed additives that could increase rate of growth and level of production. Bio-acids are one of such alternatives to AGPs that have been evaluated with promising results.

This study was therefore aimed at evaluating the optimum level of inclusion of anacidifier (Biotronics®SE) in the diets of broiler chickens.

The specific objective was to evaluate the effect of supplementing diets with Biotronics®SE on growth performance, carcass characteristics and the pH of intestinal organs of broiler chickens

Materials and Methods

Experimental site

The experiment was conducted at the Teaching and Research farm, Department of Animal Science, Ahmadu Bello University, Zaria Nigeria. Zaria Nigeria is located within the Northern Guinea Savannah zone with latitude $11^0$9' 45"N, longitude 7^0 38' 8"E, and an altitude of 610m above sea level. The area is predominantly a hot environment with a sub humid tropical climate characterized by distinct wet and dry seasons. The mean annual rainfall of is about 1093mm with most of it falling between the months of April and October. The mean monthly minimum air temperature is lowest (13.8 ^{0}C) during the period of strongest and most constant northeast winds (Harmattan) in December and January and highest (35.7 ^{0}C) prior to and during the onset of rains in late April (7).

Experimental design and management of birds

Two hundred and fifty (250) Hubbard breed of day old broiler chicks were used in a Completely Randomized Design (CRD) consisting of four dietary treatments and three replicates per treatment. The birds were randomly divided into the various treatments with three replicates each. The experimental diets were assigned to the birds with treatment 1 serving as the control without BSE while dietary treatment 2, 3

and 4 diet was supplemented with 200g, 300g and 400gat starter phase and200g 300g, and 400gBSE per 100 Kg feed at the finisher phase respectively. The experimental diets were formulated to meet standard requirements using the adjusted recommendations of NRC (8), as shown in tables 1 and 2 for starter and finisher diets respectively.

Growth study

The birds were weighed at the beginning of the experiment and weekly thereafter. Data were collected on initial weight, final body weight, average weight gain, feed intake, feed conversion ratio, feed cost per kilogram and the cost of feed per kilogram weight gain (N/Kg) and mortality was recorded as it occurred.

Carcass Study

At the end of the experiment, three birds of about the average group weight were selected from each replicate, slaughtered, eviscerated, dressed and cut into parts for carcass characteristics and organ measurements. All the values obtained were expressed as percentage of dressed weight of the birds. Similarly, the weights of the visceral organs such as kidney, lung, liver, intestine empty and length, and empty gizzard were also taken 6and expressed as percentage of live weight of the birds.

Table I Composition of Broiler Starter Diet

Ingredient	Level of Biotronic®SE g/100Kg diet			
	0g	**300g**	**400g**	**500g**
Maize	57.00	57.00	57.00	57.00
SoyabeansCake	29.00	29.00	29.00	29.00
Groundnut Cake	10.00	10.00	10.00	10.00
Bonemeal	3.00	3.00	3.00	3.00
Limestone	0.25	0.25	0.25	0.25
Common Salt	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Lysine	0.00	0.00	0.00	0.00
Vit-min premix[A]	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis				
ME Kcals/kg	2,920	2,920	2,920	2,920
Crude protein %	23.00	23.00	23.00	23.00
Crude Fibre %	3.59	3.59	3.59	3.59
Ether Extract %	3.19	3.19	3.19	3.19
Calcium %	1.25	1.25	1.25	1.25
Phosphorus %	0.87	0.87	0.87	0.87
Lysine %	1.34	1.34	1.34	1.34
Methionine %	0.55	0.55	0.55	0.55
Feed cost (? /kg)	88.72	89.84	90.34	90.84

[A]Broiler vitamin premix supplied the following vitamins and trace elements per kg diet: vitA (7812.5 IU), vitD3 (1562.5 IU), vit E (25.0mg), vitK3 (1.25mg), vitB1 (1.8mg), vitB2 (3.44mg), niacin (34.4mg), calciumpantothenate (7.19mg), vitB3 (3.1mg), vitB12 (0.02mg), choline chloride (312.5mg), folic acid (0.6mg), biotin (0.1mg), manganese (75mg), iron (62.5mg), zinc (50.0mg), copper (5.3mg), iodine (0.9mg), cobalt (0.2mg), selenium

Table II Composition of Broiler Finisher Diets

	Level of Biotronic®SE g/100Kg diet			
Ingredient	**0g**	**200g**	**300g**	**400g**
Maize	60.00	60.00	60.00	60.00
SoyabeansCake	15.00	15.00	15.00	15.00
Groundnut Cake	15.00	15.00	15.00	15.00
Maize Offal	5.60	5.60	5.60	5.60
Bonemeal	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50
Common Salt	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Vit-min premix[A]	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis				
ME Kcals/kg	2,933	2,933	2,933	2,933
Crude protein %	20.00	20.00	20.00	20.00
Crude Fibre %	4.23	4.23	4.23	4.23
Ether Extract %	3.53	3.53	3.53	3.53
Calcium %	1.32	1.32	1.32	1.32
Phosphorus %	0.86	0.86	0.86	0.86
Lysine %	1.08	1.08	1.08	1.08
Methionine %	0.52	0.52	0.52	0.52
Feed cost(? /kg)	78.50	79.50	80.00	80.50

[A]Broiler vitamin premix supplied the following vitamins and trace elements per kg diet: vitA (7812.5 IU), vitD3 (1562.5 IU), vit E (25.0mg), vitK3 (1.25mg), vitB1 (1.8mg), vitB2 (3.44mg), niacin (34.4mg), calciumpantothenate (7.19mg), vitB3 (3.1mg), vitB12 (0.02mg), choline chloride (312.5mg), folic acid (0.6mg), biotin (0.1mg), manganese (75mg), iron (62.5mg), zinc (50.0mg), copper (5.3mg), iodine (0.9mg), cobalt (0.2mg), selenium

Determination of pH of intestinal organs

At the end of the finisher phase, the pH of the various organs of the slaughtered chickens was measured using a digital pH meter. pH was measured for crop, duodenum, jejunum proventriculus, gizzard, caecum, colon and the liver

Statistical analysis

Data generated were subjected to Analysis of Variance (ANOVA) using the General Linear Model of Statistical Analysis System (9). The differences between treatment means were separated using Duncan Multiple Range Test (10).

Results and Discussion

The effect of BSE on the performance of broiler chicks is presented in table 3.The result shows significant ($P < 0.05$) differences for final weight, weight gain, feed consumed, feed conversion ratio and feed cost per Kg gain.

Feed consumed was higher for chickens supplemented with 400g and 500g BSE and significantly ($P < 0.05$) least for300g BSE in the diet than the rest of the treatments. Broiler chicks fed diet supplemented with 300g BSE shows best performance in terms of highest final weight and weight gained, best and least feed cost per kg gain

(? 143.74/kg)and feed conversion ratio (1.60).

BSE at 300Kg/100Kg feed reduced feed intake, increased body weight gain and also improved feed conversion of broiler chicks. This level of inclusion equally significantly decreased the cst of production, thereby resulting into higher profits for the farmer. The result of this work agrees with the report of (11), who indicated a possible role of acidifying agent in reducing pathogenic bacteria in the gut of poultry; which have been observed to improve bird performance. The 300Kg/100Kgfeed is the level recommended by the manufacturer and is equally optimal for broiler chicks in the Zaria field conditions. Higher levels did not result into any significant improvement in the performance of the birds.

Table III Effect of Biotronic® SE on the Performance of Broiler Chicks

Parameters	Level of Biotronic® SE g/100Kg diet				SEM
	0	300g	400g	500g	
Initial Weight (g/bird)	57.2	59.7	59.7	57.2	0.904
Final weight (g/bird)	875.9 ^{b}	935.6 ^{a}	878.9 ^{b}	883.3 ^{b}	11.98
Weight gain (g/bird)	818.7^{b}	875.9^{a}	819.2^{b}	826.1^{b}	16.70
Feed consumed (g/bird)	1428.8^{ab}	1398.7^{b}	1477.3^{a}	1479.2^{a}	36.61
FCR	1.75^{ab}	1.60^{a}	1.80^{b}	1.79^{b}	0.13
Feed cost/kg gain (? /kg)	155.26^{ab}	143.74^{a}	162.24^{b}	162.60^{b}	8.67

^{abc} Means within the same row with different letter superscripts are significantly different (P<0.05); SEM = Standard Error of Means.

The effect of Bio-acid on the performance of broiler chickens is presented in table 4.The result shows non-significant (P >0.05) differences for final weight and weight gain but significant differences were observed for feed consumed,feed conversion ratioand feed cost per kg gain.

Broiler chickens fed diet supplemented with 400g BSE show best performance in terms of feed consumed, feed conversion, and least cost of production. Birds in this group consumed less feed to gain similar weights with the other groups, showing a more efficient feed conversion. This level of inclusion is higher than the 200-300g/100Kg feed recommended for broiler finisher chickens by the manufacturer.This is contrary to the result of the starter chicks where levels higher than manufacturer's recommendation did not show any significant improvement in growth parameters measured.

The result of this work agrees with the report of (11), who indicated a possible role of acidifying agent in reducing pathogenic bacteria in the gut of poultry; which have been observed to improve bird. According to the report of (12), biotronicproducts improve animal growth performance through the reduction of common bacterial burden, stimulating productivity; as trial results in poultry and pigs have shown improvements in weight gains and feed conversion rates by 8 and 4%, respectively.

Table IV Effect of Biotronic®SE on the Performance of Broiler Chickens

Parameters	Level of Biotronic®SE g/100Kg diet 0g	200g	300g	400g	SEM
Initial Weight (g/bird)	926.7	935.4	924.4	944.4	17.19
Final weight (g/bird)	2417.9	2433.3	2444.3	2475.6	56.07
Weight gain (g/bird)	1891.2	1897.9	1919.9	1931.2	44.44
Feed consumed (g/bird)	4217.4[a]	4080.5[a]	3897.4[b]	3456.8[b]	135.48
FCR	2.23[b]	2.15[b]	2.03[b]	1.79[a]	0.13
Feed cost/kg gain (? /kg)	175.06[b]	170.92[b]	162.40[b]	144.10[a]	10.78

[abc]Means with different superscripts along the same row are significantly different (P<0.05), SEM = Standard Error of Means,

The result of carcass characteristics is presented in table 5.There was no significant difference observed for most of the parameters measured except for gizzard weight, length of intestine, breast and back cuts. Better performance was observed in treatment 4, birds with 400g BSE for breast and back cuts. Similarly for organ weights, gizzard weight and length of intestine was significantly best for this level of inclusion.

The difference in organ weight for gizzard and intestine length shows increased muscular activities on the birds fed with 400g BSE inclusion. This work agrees with the report of (13), who concluded that gizzard weight is determined by the amount of the muscular wall of the organ to reduce to minute feed particle

Table V Effect of Biotronic®SE on the Carcass Characteristics of Broiler Chickens

Parameters	Level of Biotronic®SE g/100Kg diet 0g	200g	300g	400g	SEM
Live Weight	2416.7	2356.7	2276.7	2173.3	106.745
Dressed Weight	1866.7	1833.3	1733.3	1673.3	114.794
Dressing %	77.25	78.19	75.95	75.99	2.06
Thigh[2]	12.29	11.38	11.96	12.71	0.81
Breast[2]	17.69[ab]	19.00[ab]	18.45[b]	21.98[a]	1.62
Back[2]	12.99[b]	13.97[b]	15.40[b]	18.99[a]	1.22
Drum Stick[2]	10.62	9.51	10.98	10.71	0.76
Liver[1]	2.20	1.84	1.82	1.85	0.24
Kidney[1]	0.97	0.27	0.52	0.42	0.24
Heart[1]	0.36	0.36	0.34	0.41	0.03
Lungs[1]	0.93	0.48	0.36	0.48	0.25
Intestine Weight[1]	2.63	2.60	2.63	2.68	0.20
Intestine Length[1]	4.35[b]	4.44[b]	4.59[b]	5.12[a]	0.22
Gizzard[1]	1.85[b]	1.98[b]	2.26[a]	2.46[a]	0.16

[abc]Means with different superscriptsalong the same row are significantly different (P<0.05), SEM = Standard Error of Means. [1]Results were expressed as percentage of live weight. [2] Results were expressed as percentage of dressed weight.

The result on effect of Biotronic® SEon the pH of the gastrointestinal tract is presented in table 6.Non-significant differences were observed for pH values of the crop and the sections of the small intestine.Higher levels of BSE in diet generally increased the acidity of gastrointestinal organs by reducing pH values.Higher acidity (lower pH values) was observed for most of the organs indiet with 400g BSE inclusion level.

The result of this work agrees with the report of (14), who stated that acidifiers have been found to improve growth performance through establishment of low gastro intestinal pH condition by supporting endogenous digestive enzymes and reducing undesired gut microorganisms.

Table VI: Effect of Biotronic®SE on the pH of the Intestinal Organs of Broiler Chickens

	Level of Biotronic®SE g/100Kg diet					
Parameters	**0**	**200g**	**300g**	**400g**	**SEM**	**LOS**
Crop	5.9	6.0	5.8	6.1	0.255	NS
Proventriculus	6.7^{a}	6.4^{a}	5.9^{b}	6.2^{b}	0.212	*
Gizzard	7.0^{b}	7.0^{b}	7.3^{b}	7.9^{a}	0.268	*
Duodenum	7.3	7.4	7.9	7.0	0.341	NS
Jejenum	7.3	7.6	7.8	7.3	0.401	NS
Illeum	7.4	7.8	8.3	7.7	0.244	NS
Caecum 1	8.3^{b}	8.3^{b}	8.6^{b}	9.6^{a}	0.208	*
Caecum 2	8.0^{b}	8.1^{b}	8.6^{a}	8.7^{a}	0.672	*
Colon	7.7^{b}	8.0^{ab}	8.9^{a}	8.9^{b}	0.293	*
Liver	7.6^{b}	7.6^{b}	7.9^{a}	7.7^{ab}	0.071	*

^{abc}Means with different superscriptsalong the same row are significantly different ($P<0.05$), SEM = Standard Error of Means

Conclusion and Application

From the result obtained, the following conclusions are made:

1. Supplementing broiler chickens diet with 300g and 400g BSE/100 Kg feed for starter and finisher chickens respectively significantly improved birds' performance and lowers cost of production.
2. Gizzard size was significantly increased by 400g BSE.
3. Feed intake was reduced without the final liveweight being significantly reduced.

References

1. Engberg, R.M., M.S. Hedemann, T.D. Leser and Jensen, B. B(2000).Effect of zinc bacitracin and salinomycin on intestinal microflora and performance of broilers. *Poultry Science*, 79: 1311-1319.
2. Dibner, J. J. and Richards, J. D(2005). Antibiotic growth promoters in agriculture: history and mode of action. *Poultry Science*, 84:634643
3. Segura, A. and DeBloos, M. (2008). Acidifiers and their application as

growth promoters technical dept. Olpesactra Reus-cambrils, Spain.

4. Dafwang, I.I., M.E. Cook and Sunde, M. L. (1987).Interaction of dietary antibiotic supplementation and stocking density on broiler chick performance and immune response. *British Poultry Science*, 28: 47-55.
5. Neu, H.C (1992). The crisis in antibiotic resistances. *Science.* 257: 1064-1073.
6. Jensen, B.B. (1998). The impact of feeding additives on the microbial ecology of the gut in young pigs. *J. Anim. Feed Sci*., 7: 45-64.
7. Google Earth, (2015). Google location map; Google Earth imagery. *https://plus.google.com/+GoogleEarthRetrieval Date: February 5, 2015*
8. NRC (1994). *Nutrient Requirements of Poultry.* (9th revised edition.). National Research Council. National Academy Press. Washington, D.C., USA.
9. SAS (2002).Statistical Analysis Institute. Users Guide version 9 Edition, SAS Institute Inc. Calorina, USA.
10. Steel, R. G. D and Torrie J. H (1980). *Principles and procedures of Statistics*. A biometrical Approach (2nd ed) McGraw Hill Book Coy NIIY. Pp663
11. Chaveerach, P., D.A. Keuzenkamp, L.J. Lipman, and Van Knapen,F. (2004). Effect of organic acids in drinking water for young broilers on Campylobacter infection, volatile fatty acid production, gut microflora and histological cell changes. *Poult. Sci.* 83: 330-334
12. BIOMIN(2015). http://www.wattagnet.com/directories/290-product-database/listing/2937-biomin-biotronic-top3.
13. AdenijiA.A. (2004) Replacement Value of Soyabean Meal with Groundnut Cake with or without Fishmeal Supplementation in Diets of Pullet Chicks**.** *Journal of Applied Sciences Research*, 4(10): 1249-1252, INSInet Publication
14. Richards, J.D., J. Gong and Delange, C. E. M. (2005). The gastrointestinal microbial and its role in monogastric nutrition and health with an emphasis on pigs; current understanding possible modulations and New Technologies studies. *Can. J. Anim. Science*., 85: 421-435.