PERFORMANCE OF LAYING HENS FED DIETS CONTAINING DIFFERENT LEVELS OF BIOTRONIC ® TOP FORTE (39-74 WEEK)

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ABSTRACT
Study was conducted to evaluate the efficacy of combined organic acids and their salts with a phytochemical (Biotronic® Top Forte) as an alternative to the conventional antibiotics used in poultry production on the performance of laying hens. Five hundred and sixty seven (567) layers were used and were intensively managed. The layer hens were randomly assigned into seven treatment groups in a complete randomized design, with Biotronic® Top Forte included at 0, 100, 200, 300,400,500g and oxytetracycline at 0.8g/100kg in the diets representing T_1, T_2, T_3, T_4, T_5, T_6 and T_7. Performance parameters were studied. Results from the study showed a significant ($p<0.05$) influence of Biotronic® Top Forte on FCR, total egg number, total egg weight, %HHEP, %HDEP, feed cost/crate of eggs, feed cost/dozen eggs and egg quality characteristics. Birds on 500g Biotronic® Top Forte inclusion had better FCR (1.35), total egg number (251.79), total egg weight (17264.4g), %HHEP (99.91), %HDEP (99.91), feed cost/crate of eggs (₦282.98), feed cost/dozen eggs (₦ 113.19), egg weight (67.83g), yolk weight (16.81g), yolk height (18.63mm), yolk diameter (75.66mm) and haugh unit (78.50) when compared with birds on 0 inclusion, oxytetracycline and birds on lower levels of Biotronic® Top Forte.. Birds on diets containing 500g of Biotronic® top Forte inclusion reduced cost of egg production by 9.11% and had higher egg production (13.02%) when compared with birds on 0 inclusion diets, birds on diets containing oxytetracycline and birds on lower levels of Biotronic® Top Forte. It was concluded that 500g/100kg inclusion of Biotronic® top Forte could be used to replace antibiotics in diets of laying birds, to achieve better bird performance, reduced production cost and produce healthier poultry products for human safe consumption.
Keyword: Growth Promoter, Performance, layers, Organic acids and Phytochemical

INTRODUCTION
High levels of production and efficient feed conversion are the need of the modern poultry industry, which to a certain extent could be achieved by the use of specific feed additives. (Agbai *et al., 2*020) Antibiotic feed additives as growth promoters have long been supplemented to poultry feed to stabilize the intestinal microbial flora, improve the general performances and prevent some specific intestinal pathology (Hassan *et al*., 2010). However, due to the emergence of microbes resistant to antibiotics which are used to treat human and animal infections, the European Commission (EC) decided to phase out, and ultimately ban the marketing and use of antibiotics as growth promoters in feed (EFSA, 2015). Antibiotics removal has led to poultry performance problems, feed conversion increases and a rise in the incidence of certain animal diseases, such as (subclinical) necrotic enteritis (Castano, 2007). Such a situation has compelled the researchers to explore the utility of other non-therapeutic alternatives like organic acids, enzymes, probiotics, prebiotics, herbs, essential oils and immune stimulants as feed additives in poultry production. There have been a significantly increased number of studies focused on searching for alternatives to antibiotics with similar antimicrobial and growth-promoting effects without inducing bacterial resistance and potential side effects to animals. Dietary organic acids have gained greater attention because of their antimicrobial activity against pathogenic bacteria and the fact that these compounds can induce a pH reduction in the gastrointestinal tract (GIT), which can improve nutrient utilization in poultry diets (Eckel *et al*., 1992). Organic acid treatments composed of individual acids and blends of several acids have been found to perform antimicrobial activities similar to those of antibiotics (Boling *et al*., 2002). The European Union allowed the use of organic acids and their salts in poultry production because these are generally considered safe (Adil *et al*., 2010). The Biotronic® Top Forte combines selected organic acids and their salts with a phytochemical and the unique Biomin® Permeabilizing Complex fully utilizing a unique synergism in their mode of action. The Biomin® Permeabilizing Complex boosts the activity of the active ingredients (the

organic acids and the phytochemical) and facilitates their entry by permeating the outer membrane of Gram-negative bacteria (Biomin, 2018). The study was carried out to determine the effect of diets containing different levels of Biotronic® Top Forte on performance of laying hens 39-74 weeks of age

MATERIALS AND METHODS

The study was carried out at the Poultry Laying Unit, Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria. Zaria is located within the Northern Guinea Savanna Zone on latitude 11^0 11' 06" N and longitude 7^0 38' 55" E, at an altitude of 706m above sea level. The maximum temperature ranges from 26-32^{0}C depending on the season while the mean relative humidity during the dry and wet seasons are 21 and 72%, respectively. (Meteorological Unit, Institute of Agricultural Research, Ahmadu Bello University Zaria, 2016). This study was carried out to determine the effect of diets containing different levels of Biotronic® Top Forte on performance of laying hens 39-74 weeks of age. Five hundred and sixty seven (567) young layers were randomly assigned into seven treatment groups in a complete randomized design, with Biotronic® Top Forte included at 0, 100, 200, 300,400,500g and oxtetracycline as a positive control (oxytetracycline at 0.8g/100kg) in the diets representing T_1, T_2, T_3, T_4, T_5, T_6 and T_7 with 3 replicates of 27 birds each. The birds were intensively managed with all necessary routine management practices. Feed and water were provided *ad libitum* for the 36 weeks period of the study. Proximate analysis of the sample of experimental diets was done at the Biochemical Laboratory, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria according to methods described by (A.O.A.C, 2005) as presented on Table 2. Body weight of birds were taken at the beginning, end of the study and change in body weight was calculated. Feed intake was determined by obtaining the differences between the quantity of feed offered and the left over on 28-day period. Egg production was recorded daily and pooled on 28 - day period to calculate hen-day egg production and hen house egg production. Cost per crate eggs was calculated based on the prevailing market prices of the feed ingredients. Mortality was recorded as it occurred. Birds were cared for according to guidelines established by the University Animal Care Committee.

RESULTS AND DISCUSSION

Effect of diets containing different levels of Biotronic® Top Forte on laying performance of hens (39-74 weeks)

Table 1 shows the effect of diets containing different levels of Biotronic® Top Forte on laying performance of hens (39-74weeks). There were significant ($P<0.05$) differences in all parameters measured except for total feed intake and mortality. Birds on diets containing 500g inclusion of Biotronic® Top Forte had significantly ($P<0.05$) lower final weight (1849.00g), better FCR (1.34), higher egg number (251.79), had heavier egg weight (17264.40g), better %HDEP (99.91) and %HHEP (99.91) when compared with birds on diets containing 0g inclusion (1935g, 1.71, 219.02, 13915.12g, 89.03% and 89.03% respectively) of Biotronic® Top Forte, birds on diets containing Oxytetracycline (1974.33g, 1.53, 223.92, 14972.50, 88.87% and 88.87% respectively) and other treatments. Birds on diets containing 500g inclusion of Biotronic® Top Forte had significantly ($P<0.05$) better cost of total feed intake (₦2350.56), feed cost per crate of eggs (₦ 282.98) and feed cost per dozen eggs (₦112.18) when compared with birds on diets containing 0% inclusion (₦2268.72, 311.33 and 124.53 respectively) of Biotronic® Top Forte, birds on diets containing Oxytetracycline (₦2198.72, 294.66 and 117.86 respectively) and other treatments. Mortality of 1.19% was recorded at the last week of the experiment in birds on diets containing 400g inclusion of Biotronic® Top Forte. In this study, birds on higher supplementation of Biotronic® Top Forte (organic acid) showed the best results in FCR and egg production. This agreed with the report of Park *et al.* (2009) that higher organic acid inclusion in the diet of laying birds showed best result in egg production, decreased soft shell and FCR. The birds on higher Biotronic® Top Forte inclusion had reduced feed intake, such effect happened due to the antimicrobial activity of the Biotronic® Top Forte which brought about good feed absorption thereby resulted in improved feed conversion ratio and better laying performance. This agreed with the report of

Wang *et al.* (2009) that higher organic acid inclusion improved egg production when compared with hens on the control diet. Wang *et al.* (2009) suggested that such effect may have occurred because of the antimicrobial activity of the organic acid. It also agreed with the report of Dibner and Buttin, (2002) and Esmaeilipour *et al*. (2011) that high levels of organic acids added to the diets of laying hens also reduced the feed intake. The mortalities recorded in this study were not as a result of experimental diets but occurred as a result of cannibalism.

CONCLUSION AND RECOMMENDATION

The addition of the balanced acidifier product Biotronic® Top Forte, containing an organic acid blend of formic acid, propionic acid and their salts based on an inorganic carrier, increased in the absence of anti-biotic growth promoters the performance of laying hen at 500g inclusion level. Farmers could use Biotronic® Top Forte feed additives as replacement for antibiotic in laying hen for egg production at 500g/100kg diets to improve laying performance, egg quality characteristics and profitability.

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Table 1: Performance of Laying Hens Fed Diets Containing Different Levels of Biotronic ® Top Forte (39-74 Week)

	Levels of inclusion of Biotronic ® Top Forte (g)							
Parameters	0	100	200	300	400	500	Oxytet	**SEM**
Initial weight(g/b)	1818.30	1819.97	1971.80	1830.67	1851.00	1857.43	1814.90	70.28
Final weight (g/b)	1935.00^{a}	1932.33^{a}	1906.33^{ab}	1957.67^{a}	1941.00^{a}	1849.00^{b}	1974.33^{a}	30.60
Change in weight (g/b)	116.70^{ab}	112.37^{ab}	-65.47^{b}	127.00^{ab}	90.00^{ab}	-8.43^{ab}	159.43$_{a}$	72.74
Total feed intake (g/b)	23688.00	23688.00	23277.40	23244.60	23328.80	23004.10	22956.90	310.87
FCR(feed intake/egg M)	1.71^{d}	1.53^{c}	1.44^{b}	1.48^{bc}	1.46^{bc}	1.34^{a}	1.53^{c}	0.05
Total egg weight (/b)	13915.12^{d}	15526.00^{bc}	16220.70^{b}	15570.3^{bc}	16047.60^{bc}	17264.40^{a}	14972.50^{c}	403.54
Total egg number (b)	219.02^{d}	236.41^{abc}	244.68^{ab}	233.79^{bcd}	238.86^{abc}	251.77^{a}	223.92^{cd}	6.05
Daily egg weight (b)	63.01^{b}	65.75^{ab}	66.31^{ab}	66.60^{ab}	67.21^{ab}	68.57^{a}	66.87^{ab}	6.05
Cost / Kg feed	95.78^{a}	97.05^{c}	98.34^{d}	99.62^{e}	100.89^{f}	102.18^{g}	95.78^{b}	4.51
Cost of total feed intake (kg)	2268.72^{c}	2299.04^{b}	2288.98^{bc}	2291.56^{b}	2353.64^{cd}	2350.56^{d}	2198.72^{a}	30.37
Feed/dozen egg	1300.24^{a}	1205.36^{b}	1142.35^{bc}	1180.77^{bc}	1172.01^{bc}	1096.43^{c}	1230.61^{ab}	37.12
Feed/ crate egg	3250.60^{a}	3013.40^{abc}	2855.90^{bc}	2951.90^{bc}	2930.02^{bc}	2741.09^{c}	3076.50^{ab}	92.78
Feed cost/ dozen egg	124.53^{a}	116.99^{ab}	112.33^{ab}	117.62^{ab}	118.24^{ab}	112.18^{b}	117.86^{ab}	3.61
Feed cost/crate egg	311.33^{a}	292.47^{b}	280.83^{ab}	294.06^{b}	280.08^{ab}	282.98^{ab}	294.66^{b}	9.02
%HDEP	89.03^{c}	93.81^{bc}	97.10^{b}	92.77^{bc}	95.92^{ab}	99.91^{a}	88.87^{c}	2.24
%HHEP	89.03^{c}	93.811^{bc}	97.10^{ab}	92.77^{bc}	94.79^{ab}	99.92^{a}	88.87^{c}	2.35
Mortality (%)	-	-	-	-	1.19	-	-	0.55

^{abbcd} means within same row with different letter superscript are significantly different (P<0.05), SEM= Standard error of means, oxytet= Oxytetacycline, g/b= gram per bird, (/b)= per bird, FCR= feed conversion ratio, M= mass, %HDEP= Hen day egg production and HHEP= Hen house egg production

Table 2: Proximate Composition of Experimental Diets

Parameters %	Dry matter	Crude protein	Ash	Crude fibre	Ether Extract	Nitrogen free Extract
Composition	94.61	15.02	4.67	4.44	2.16	73.71