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EFFECT OF HERBAL SUPPLEMENT ON GROWTH RESPONSE AND FAECAL EGG COUNTS OF COCKERELS

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ABSTRACT: *This study was carried out on 180 day-old cockerels to determine their growth response and faecal egg counts to herbal supplement administration. The birds were brooded and allotted to four treatment groups of 45 birds with three replicates of 15 birds each. The experimental treatment was based on the frequency of administration of the herbal supplement: Control, Weekly, Fortnightly, and every three weeks. Data on growth response and microbial counts were taken. Data obtained were subjected to One-way Analysis of Variance in a Completely Randomised Design. Herbal supplement had significant (P<0.05) effect on the bacteria and oocyst count of cockerels. Bacteria count was highest in the control treatment, while values were significantly similar in cockerels administered with herbal supplement. Oocsyt count was significantly (P<0.05) influenced with highest values obtained in control with lowest values statistically similar in treatment 2, 3 and 4 respectively. The effect of herbal supplement on the growth response of cockerels revealed that most parameters were not significantly (P>0.05) influenced by herbal supplement except Feed: Gain and average weight gain. The best Feed: Gain value and average weight gain was obtained in birds administered the herbal supplement weekly (treatment 2). Conclusively, herbal supplement (extracts) can serve and be used as antibiotic alternatives in poultry for better performance and utilization of feed in terms of feed: gain and weight gain particularly to control the growth of harmful bacteria.*

Key words: *Herbal Supplement, Growth Response, Faecal Egg Count, Bacteria Count, Oocsyt Count.*

ORIGINAL ARTICLE

INTRODUCTION

Antibiotics have been used for more than half a century in poultry feed for improving performance, reducing some pathogenic microorganisms and increasing some useful microorganisms in intestinal tract of these birds (Gibson and Fuller, 2000). The use of herbal feed supplements for poultry is popular worldwide. Herbal preparations composed of single or multiple plant ingredients that are used in poultry for various indications (Waghmare et al., 2006; Ramnath et al., 2008). Many of the herbal supplements are based on the earlier compilations of various traditional medicine systems and are used for medicinal and non medicinal purposes (Okitoi et al., 2007).

One alternative to antimicrobial feed additives is essential oils derived from herbs and spices. Today, this practice is receiving much attention particularly in broiler chickens (Alçiçek et al., 2003, 2004; García et al., 2007) and laying hens (Çabuk et al., 2006). Herbal essential oils assist in colonization of the beneficial microbial population within the gastrointestinal tract to more balanced levels (Jang et al., 2007). Besides their antimicrobial properties (Ultee et al., 2002), they also exhibit antioxidant (Basmaciolu et al., 2004), antifungal (Shin and Lim, 2004), digestion-stimulating, and enzymatic (Jamroz et al., 2003, 2005; Hernandez et al., 2004) activities.

The benefits of essential oils from herbs and species in poultry diets have been recently demonstrated, not only in terms of improving performance traits but also in inhibiting pathogenic bacteria and reducing residue hazard of meat and egg products (Hertrampf, 2001). These nutrient-sparing and health-promoting effects are most likely attributable to the effects of essential oils within the gastrointestinal track on improving the balance of gut microflora and improving nutrient digestion and absorption (Jamroz et al., 2005).

However, experimental studies indicated that essential oils, either individually or in specific blends, were able to produce benefits comparable to traditional growth promoters including antibiotic, organic acid, prebiotic, and probiotic in maintaining general health status and performance of broilers (Alçiçek et al., 2003; Zhang et al., 2005) and laying hens (Çabuk et al., 2006). In comparison with the vast number of research papers published on the essential oil mixture (EOM) and plant extract supplementation to broiler diets in the past decade (Alçiçek et al., 2004; Hernandez et al., 2004; Jamroz et al., 2005), there is relatively little published data on laying hens (Ma et al.,

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2005; Çabuk et al., 2006) and broiler breeders (Ather, 2000), which demonstrated antioxidant, immunostimulator, and performance enhancer aspects.

The prevention of diseases and enhancement of growth, FI and feed efficiency are critical factors in modern broiler production. With the removal of antibiotic and growth promoters from poultry diets in different areas of the world, it is of interest to investigate potential alternatives to maintain good growth performance and good intestinal microbial populations, particularly to control the growth of harmful bacteria. Therefore, study was carried to determine the effect of herbal supplements on growth response and microbial counts of cockerels.

MATERIALS AND METHODS

Experimental site

The research work was carried out at the poultry unit of Teaching and Research Farm Directorate (TREFAD), Federal University of Agriculture Abeokuta (FUNAAB), Ogun state, Nigeria. Located on latitude7° 15'N, longitude 3° 26' E and its 76m above sea level (Google Earth, 2010). The research site is located in the derived savannah zone of south-west Nigeria with relative humidity in the rainy season (late March - October) and dry season (November – early March) ranged between 63 - 96% and 55 – 84% respectively. It has a mean annual precipitation of 1,037mm and with a mean annual temperature of 34.7°C (Google Earth, 2012).

Experimental birds and management

A total of 180 day-old cockerels (Oba's black strain) were obtained from Obasanjo Farms Holdings, Nigeria, for the study. The birds were floor brooded for the first week and were raised on deep litter system from 0-8 weeks (chicks phase). Feed and water were supplied *ad libitum*.

Experimental treatment

Superliv®, a liquid herbal mixture produced by Ayurvet India and marketed in Nigeria by Animal Care Konsult was applied in water at the recommended dosage of 5ml/100 birds/day (chick's stage). Each 10ml of the herbal supplements contains (in mg): *Achyrantes aspera*- 192.77; *Aphanamixis polystachya*-120.48; *Andrographis paniculata* 192.77; *Azadirachta indica*- 192.77; *Boerhavia diffusa*-216.87; *Citrullus colocynthis*-120.48; *Convolvulus alsinoides*- 48.19; *Eclipta alba*- 192.77; *Fumaria indica*- 72.29; *Ichnocarpus frutescens*- 144.58; *Phyllanthus niruri*- 192.77; *Phyllanthus emblica*- 90.36; *Picrorrhiza kurroa*- 48.19; *Solanum nigrum* -192.77; *Sida cordifolia* -120.48; *Tephrosia purpurea*- 72.29; *Terminalia arjuna*- 120.48; *Terminalia chebula*- 144.58; *Tinospora cordifolia*- 24.10; Aqeous base q.s to – 10.00ml.

The experimental treatments was based on the frequency of administration of the herbal supplement viz Control (treatment 1), Weekly (treatment 2), Fortnightly (treatment 3), every three weeks (treatment 4), as illustrated in the figure 1.

Table 1 - Active ingredients of the herbal supplement and their percentage level of composition

Serial Number	Active ingredient (Chemical structural name)	% Composition
1	1,2,4, Triazolo (1,5-a) pyrimidine	83.39
2	Tricyclo[4.4.0.0(3,9)]decan-4-ol Stereoisomer	2.99
3	1-Aminopyrene	2.6
4	Tricyclo(4.4.0.0(3,9))decan-4-ol,stereoisomer	1.63
5	4-Acetyl-6-methoxy-2(1H) quinolinone	1.36
6	Lanosta-8,2 4-dien-3-ol,acetate	1.31
7	24-Noroleana-4(23),12 diene	1.22
8	Tricyclo(5.2.1.0(2,6) decan-3-one	0.96
9	6-oxabicyclo(3.1.0)hexane-3-carbonitrile	0.93
10	4-n-Butylthiane, S,S-dioxide	0.88
11	Tetrazole	0.45
12	6-oxabicyclo(3.1.0)hexane-3-carbonitrile	0.37
13	Ethanone	0.34
14	1,3-Diphenyl-2-hydroxy-4-ethoxycarbonyl-4H-pyridazino(6,1-a) isoquinoline	0.26
15	Trans-1,4-cyclohexanedicarbonitril 4H-Thiopyran-4-one	0.25
16	Exo-Norbornyl alcohol	0.24
17	Trans-1,4-cyclohexanedicarbonitril	0.20
18	Cyclohexane	0.19
19	Cyclopentane	0.18
20	Acrolein	0.15
21	1-(4-Amino-furazan-3-yl)-5-methyl-1H-(triazole-4-carboxylic acid amide	0.10

Experimental design

The birds were randomly allotted to the four treatments of 90 chicks each and further divided into three replicates of 30 chicks each. Each replicate was housed in a cubicle measuring 2 x 3 m^2 in an open sided poultry house.

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Experimental diets

Chicks mash containing 18.71% CP and 10.32MJ/Kg was supplied in this trial. The feed formulation is presented in Table 2.

Figure 1 - Weekly administration of treatments (herbal supplement) to experimental birds

Weeks	Treatment 1	Treatment 2	Treatment3	Treatment4
1	—	⌞	⌞	⌞
2	—	⌞	—	—
3	—	⌞	⌞	—
4	—	⌞	—	⌞
5	—	⌞	⌞	—
6	—	⌞	—	—
7	—	⌞	⌞	⌞

Key: — : not given herbal supplement. ⌞ : herbal supplement given.

Table 2 - Diet Composition (%) for chicks' phase (0 – 8wks)

Ingredients	Chick starter
Maize	40.00
Fish meal	2.00
Soybean meal	18.00
Palm kernel cake	10.00
Wheat offal	25.00
Bone meal	2.00
Oyster shell	2.00
Lysine	0.25
Methionine	0.25
vit./min. premix[1]	0.25
Salt	0.25
Total	100.00
Determined analysis (%)	
Crude protein	18.71
Ether Extract	5.09
Crude fibre	4.56
Ash	3.58
Calcium	1.62
Phosphorus	0.93
Lysine	0.73
Methionine	0.28
Energy (MJ/Kg)	10.32

[1]Vit./Min. Premix contains B_1 1g; B_2 6g; B_{12} 0.02g; K_3 3g; E, 30g; biotin, 0.05g; folic acid, 1.5g; choline chloride, 250g; nicotinic acid, 30g; Ca-Pantothenate, 15g; Co, 0.4g; Cu, 8g; Fe, 32g; I, 0.8g; Zn, 40g; Mn, 64g; Se, 0.16g, BHT, 5g.

Data Collection

The following data were collected over the 56-day experimental period;

Performance Characteristics: The daily feed intake and the weekly weight gain was monitored and recorded. Records of daily mortality were also monitored in all phases of the experiment. Feed conversion ratio was computed on weekly basis in all the phases of the study. Protein and energy intake was also determined. The weight gain was determined by weighing birds in each replicate at the beginning of the experiment and subsequent weighing was done on weekly basis, afterwards, the difference in the body weights of two consecutive weeks for each replicate was recorded, thus; Weight Gain = Final Weight-Initial weight (g/bird/day); Average Weight Gain = Final weight- Initial weight (g/bird/day); Feed intake = Feed given-Feed left (g/bird/day); Feed : Gain = Amount of Feed Consumed/Weight Gain

Collection of faeces from experimental birds for bacterial count: At day old, fourth and eighth week of experiment, faecal samples was aseptically collected from the experimental birds with sterile swab sticks from three birds per replicate.

1g of faeces from the experimental bird was suspended in 9mls of sterile normal saline and serially diluted from test tube 1 to test tube 8, then discard 1ml from test tube 8.

MacCunkey agar medium was prepared by suspending 47g in 1 litre of distilled water. This was brought to boil to dissolve completely and then sterilized by autoclaving at 121^{o}C for 15minutes. After cooling to about 55^{o}C, it was poured into Petri-dish in which 1ml of serially diluted faecal suspension in sterile normal saline was dispensed. The inoculated plate was then incubated at 37^{o}C for 24hrs.

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The colonies on the plate were counted using a colony counter. The bacterial count was carried out at the microbiology laboratory of the college of veterinary medicine, University of Agriculture, Abeokuta.

Oocyst count: The method used for the oocyst count, known as McMaster method and it was as follows: 1- Weigh 3.0g of faeces or, if faeces are diarrhoeic, 3 teaspoonfuls; 2- Break up thoroughly in 42ml of water in a plastic container. This can be done using a homogenizer if available or in a stoppered bottle containing glass beads; 3- Pour through a fine mesh sieve (aperture 205μm. or 100 to 1 inch); 4- Collect filtrate, agitate and fill a 15ml test tube; 5- Centrifuge at 2000 rpm for 2 minutes; 6- Pour off supernatant, agitate sediment and fill tube to previous level with flotation solution; 7- Invert tube six times and remove fluid with pipette to fill both chambers and of McMaster slide. Leave no fluid in the pipette or else pipette rapidly, since the eggs will rise quickly in the flotation fluid; 8- Examine one chamber and multiply number of eggs or larvae under one etched area by 100, or two chambers and multiply by 50, to arrive at the number of eggs per gram of faeces (epg):

If 3g of faeces are dissolved in 42ml
Total volume is 45ml
Therefore 1g 15ml
The volume under etched area is 0.15ml
Therefore the number of eggs is multiplied by 100
If two chambers are examined, multiply by 50 (Urquhart et al., 1997).

The oocsyt count was carried out at the Parasitological laboratory of the College of Veterinary Medicine, Federal University of Agriculture, Abeokuta.

Statistical analysis

Data obtained were subjected to one-way analysis of variance in a Completely Randomised Design (CRD). Significant differences between means were separated using Duncan's Multiple Range Test (Duncan, 1955) as contained in SAS (2010).

Experimental model

$Y_{ij} = \mu + T_i + \varepsilon_{ij}$

Y_{ij} = Observed Yield observed value of the level of herbal supplementation, i and the replication, j within the level of the treatment. μ = Overall mean value; Ti = Effect of herbal supplementation; ε_{ij} = Random residual error.

RESULTS

The effect of herbal supplements on the bacteria count (Colony Forming Unit per ml) and oocyst count (Oocyst per Gram) of cockerel is presented in Table 3. Herbal supplement had significant ($P<0.05$) effect on the bacteria and oocyst count of cockerels. Bacteria count was highest in the control treatment, while values were significantly similar in cockerels administered with herbal supplement weekly, Fortnightly (treatment 3) and every three weeks (treatment 4). Oocsyt count was significantly ($P<0.05$) influenced with highest values obtained in control with lowest values statistically similar in treatment 2, 3 and 4 respectively.

The effect of herbal supplement on the growth response of cockerels in Table 4 revealed that most parameters were not significantly ($P>0.05$) influenced by herbal supplement except Feed: Gain and average weight gain. The best Feed: Gain value and average weight gain was obtained in birds administered the herbal supplement weekly (treatment 2). Though there was significant trend in the other parameters, however, there was a slight increase in percentage mortality was observed as the level of herbal administration was adjusted across the row of treatment.

Table 3 - Effect of herbal supplement on bacteria and oocyst count of cockerels

Parameters	Treatment 1	Treatment2	Treatment3	Treatment4	SEM
Bacteria count (cfu/ml)	42.00^{a}	27.33^{b}	23.17^{b}	29.67^{b}	8.20
Oocyst count(opg)	22500.00^{a}	13200.00^{b}	13800.00^{b}	13900.00^{b}	2040.36

$^{a, b}$: Mean values in the same row by factor with different letters (a, b) differ significantly ($P<0.05$); SEM standard error of means

Table 4 - Effect of herbal supplement on the growth performance and percentage mortality rate of cockerels

Parameters	Treatment1	Treatment2	Treatment3	Treatment4
Initial weight (g/bird)	33.75±0.59	36.25±1.77	36.50±1.76	36.58±2.95
Final weight (g/bird)	347.50±3.54	386.31±101.86	342.86±60.61	407.14±10.10
Total feed intake (g/bird)	249.10	239.05	248.37	244.45
Average feed intake (g/bird/day)	31.1±2.37	29.9±7.18	31.05±4.2	30.56±1.90
Average weight gain(g/bird/day)	5.40±0.29^{b}	6.26±1.23^{a}	5.40±0.07^{b}	6.12±0.74^{ab}
Feed : Gain	5.72±0.13^{a}	4.77±0.19^{b}	5.75±0.74^{a}	5.05±0.93^{a}
Mortality (%)	2.50±0.70	2.50±0.71	3.50±2.12	4.50±0.71

$^{a, b, c}$: means on the same row with different superscripts are significantly ($P< 0.05$) different.

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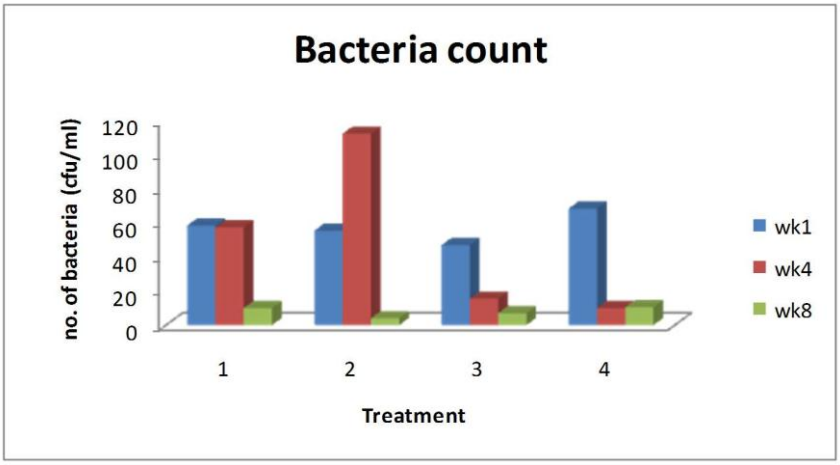

Figure 2 - Effect of herbal supplement on the bacteria count of cockerels

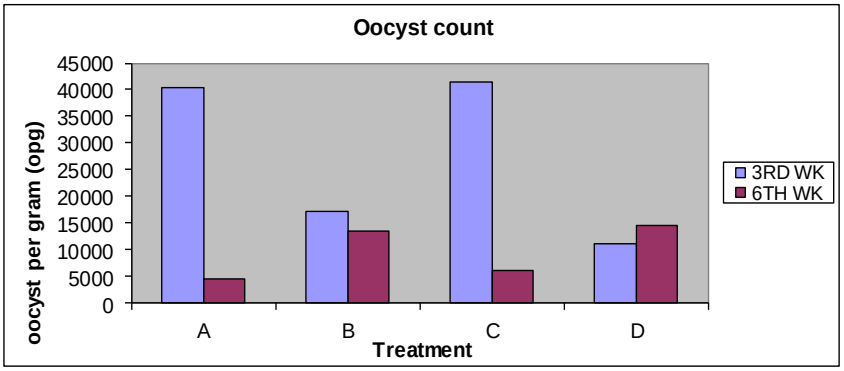

Figure 3 - Effect of herbal supplement on the oocyst count of cockerels

DISCUSSION

Recent scientific articles regarding dietary supplementation with etheric oils and the extracts of some plants indicated encouraging initial results (exhibited growth promotion, nutrient digestibility enhancement, and feed efficacy mechanisms in broiler chickens without affecting bird mortality; Alçiçek et al., 2003, 2004; Hernandez et al., 2004; Jamroz et al., 2005; Çabuk et al., 2006; Garcia et al., 2007). However, published data were not found in the scientific literature regarding the effect of oral herbal supplementation with essential oil on the growth rate of cockerels. The average weight gain of treated group of birds was higher than that obtained in the control group. This affirms the report of Sundermanna and Seshadri (1996) and Singh et al. (2009) who opined that provision of herbal and alternative essential oils as supplement to birds was capable of advancing growth and development of birds. There was similar improvement in weight gains of chicks compared to control groups by administering herbal products which corroborates the report of Narahari (1995) and also asserts report of Khan et al. 2008 who used herbal mixtures containing some of the herbs present in Superliv(R).The total feed consumption of the treatment groups demonstrated an insignificant difference ($P>0.05$) among treatment groups indicating that the supplementation of herbal product do not influence feed intake in birds as depicted in Table 4. The Feed: Gain of treatment 2 was significantly ($P<0.05$) lower than the values obtained and statistically similar in the control group and other treatment groups. This reveals the effectiveness of herbal supplementation in improving the feed utilization which results in improvement in growth and developmental processes. The results of present study are in concomitance with those reported by Narahari (1995) and Prajapati (1997) who stated that the use of herbal growth promoters improved feed conversion ratio and feed efficiency. Herbal supplements and alternatives are known to have stomachic, demulcent and tonic activity in addition to anabolic, adaptogenic, immunostimulant (because of the presence of antioxidants which are effective because they are willing to give up their own electrons to free radicals) and rejuvenative functions in the body.

Oocyst count was significantly influenced by the herbal supplement, a reduced amount of oocyst was recorded in the birds given the herbal supplement than in the control and this was affirmed by Allen et al. (1998) who reported that herbs reduces oocyst yield. However, the least value was obtained in treatment 2 where herbal supplement was given weekly. The results are also in line with Misra et al. (1993), who reported that herbal anticoccidial is effective to reduce feacal oocyst output. The herbal supplement had no significant antimicrobial in-vitro effect on the gram positive and gram negative bacteria at the manufacturers recommended dosage. However at an increased concentration of 60 -100% it had inhibitory growth effect on both the gram positive and negative bacteria The reduction in the counts is an indicant of efficacy of the herbal administration in the reduction of bacteria loads and cross infections in poultry.

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CONCLUSION

In conclusion, the performance of the birds was almost similar in response to herbal supplementation but with better values in treatment 2 for feed:gain and weight gain.. Bacterial and oocsyt count values were lowest in treatment 2. It can be recommended that herbal supplement (extracts) can serve and be used as antibiotic alternatives in poultry for better performance and utilization of feed in terms of feed:gain and weight gain particularly to control the growth of harmful bacteria.

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