



Performance of Broilers Birds Administered Graded Levels Oxytetracycline in Sokoto, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The study investigated the effect of oxytetracycline on broiler birds.

Study Design: The study was conducted using a total of 288 broiler birds in a Completely Randomized Design with four treatments T₁ (20 mg/kg), T₂ (40 mg/kg), T₃ (60 mg/kg) and T₄ (control).

Place and Duration of Study: (to be furnished)

Methodology: to be furnished

Results: The result shows no significant difference ($P>0.05$) among T₄ (control), T₂ and T₃ in all parameters measured except between T₄ and T₂ in final body weight. Where birds in T₄ have significantly higher values than those in T₂. At finisher stage, birds fed 20mg/kg OTC (T₁) recorded lower feed intake, body weight and average body weight gain per bird compared to birds in T₂, T₃ and T₄. There is no significant difference ($P<0.05$) between T₂, T₃ and T₄ in terms of final body weight gain per bird. Total feed intake is higher in control (T₄) compared to T₃, T₂ and T₁)

Keywords: Broilers; oxytetracycline; antibiotics; performance.

1. INTRODUCTION

The use of antibiotics as feed additives has been a hallmark of modern animal husbandry; however, this widespread practice is not without criticism [1]. Concerns were raised that the use of antibiotics as therapeutics and for growth promotion could lead to a problem of increasing resistance in bacteria of human and animal origin, particularly regarding resistance in gram-negative bacteria (*Salmonella* spp. and *Escherichia coli*).

In Nigerian poultry farms, it is a common practice to add antibiotics in drinking water at the time of vaccinations. Antibiotics are also added in self formulated and commercial feeds. Antibiotics are also given as medications in prevention and control instances. Most farmers administer antibiotics at the time of vaccination without scientific knowledge of the effects on the immune response. Database on the effects of such practices on the immune system is scarce, and more authenticated studies are needed to investigate the impact of Antibiotics on the immune system at the time of vaccination [2].

Some of the commonly used antibiotics today in poultry industries in developing countries like Nigeria that need to be studied on drug residue concentration in various organs and tissues of animal bodies are; *Tylosine*, *Neomycin*, *Gentiamycin*, *Tetracyclines*, (*Chlortelvacycline*, *Oxytetracycline*), *Sulfonamides*, *Penicillin* (*Ampicillin*), *Arsenicals* (*Roxarsone*), *Enrofloxacin* and *Erythromycin* [3]. However, it is highly recommended that whichever type of antibiotics a farmer uses, care should be taken to stick or abide by its withdrawal period prior to consuming either meat or eggs obtained from the animal the drugs were administered to. The acceptable maximum residue limit (MRL) for OTC as recommended by the joint FOA/WHO Expert committee on food Additives is 0.2, 0.6 and 1.2 micro gram/gram for tissue, liver and kidney respectively (FAO/WHO, 2015).

2. MATERIALS AND METHODS

2.1 The Study Area

The study was carried out at the poultry production unit of the Teaching and Research farm in the Department of Animal Science, Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto. Sokoto is located between latitudes 12° and 13°N, Longitudes 4° and 6° E in

the northern part of Nigeria and lies at an altitude of 350 m above the sea level [4]. The state falls within the Sudan Savannah vegetation zone with alternating short rainfall and long dry season. A dry period (harmattan) occurs between October and February [5]. The annual rainfall is about 700 mm.

2.2 Experimental Design

The study was conducted by using a Complete Randomised Design. A total of 288 broiler birds were used in 4 treatments, (72 birds per treatment) replicated 6 times, with 12 birds in each replicate. Treatment 1 was (20 mg/kg) 20 mg/kg (OTC at half recommendation), Treatment 2 (40 mg/kg) (Antibiotics at recommended dose), Treatment 3 (60 mg/kg) with (Antibiotics at above recommended dose), and finally treatment 4 control (0 %Antibiotics) which were administered via drinking water.

2.3 Experimental Birds and their Management

Day old broiler chicks for this study were obtained from Agrited farm in Ibadan Oyo State Nigeria. The birds were transported to Sokoto under the cool hours of the evening through the night and arrived in the morning hours. The house was cleaned, washed and disinfected a week before the arrival of the birds. The birds were raised on deep litter in an experimental house, with open side walls and concrete floor. Litter materials (wood shavings and old newspaper) were spread on the floor for a period of five days, feeding trays and small drinkers were used for the first 0-4 weeks (Starter phase), while conical feeders and plastic containers with wire guard were used at finishing phase 4 -8 weeks, the litter was removed on weekly basis. Feed was given to the birds at free choice on tray feeders for the first 10 days and the tray feeders were replaced with small conical feeders at second week of their age for proper feed management and efficiency. Fresh water was given to the birds every morning in small drinkers. Their health care was ensured by giving them routine vaccination as at when due, proper sanitation and hygiene was ensured. The floor spacing was maintained at (4/9 ft) per replicate [6].

2.4 Experimental Diet Formulation

Maize, wheat offal, bone meal, Fish meal and salt were obtained from Sokoto central market.

Soya bean meal, Groundnut cake, limestone and micro ingredients such as Premix, Lysine, and Methionine were sourced from a vendor called Alkanchi farm ltd in the Sokoto Metropolis.

Feed ingredients that were used for this experiment, such as Maize, Groundnut cake (GNC), Soya bean meal and Bone meal required crushing so that the particle size will suit the group of birds the feed are to be meant for. Feed ingredients that were in powdery form were weighed and mixed with the crushed ones. The feed compounding was done on a clean concrete floor, and thoroughly mixed with shovel to a uniform mix.

2.5 Data Collection

Daily feed intake;

= Feed given (g or kg) – Feed leftover (g or kg)

Calculated as;

Average feed intake (AFI).

Average feed intake per/day (AFID)

Average feed intake per/bird (AFIB)

Body Weight (BW)

= Current/Final weight – Initial/previous weight

Body Weight Gain (BWG)

= Current/Final weight – Initial/previous weight

Calculated as;

Body Weight Gain (weekly)

Body Weight Gain per Bird (BWG/B) as adopted by Hann and Spindler (2002).

The feed conversion ratio by dividing weight gain by the feed intake, this could be expressed using formula below.

$$FCR = \frac{\text{feed intake}}{\text{weight gain}}$$

Mortality was recorded as it occurred on daily basis.

2.6 Data Analysis

ANOVA was used to compare the growth performances and feed efficiency of broiler birds administered with varying levels of OTC, where

significant differences ($P < 0.05$) occur, means were separated using Duncan New Multiple Range Test (DNMRT).

3. RESULTS

3.1 Performance of Broiler Birds Administered Oxytetracycline (0-4 weeks)

The performance of broiler birds administered graded levels of oxytetracycline at starter phase is presented in Table 2. The results shows significant difference ($P < 0.05$) in all the parameters except body weight gain/bird, feed conversion ratio and mortality. Birds in T3 (60mg/kg oxytetracycline) performs better ($P < 0.05$) in terms of feed intake, average feed intake per bird, average feed intake per bird per day, body weight per bird and body weight gain per bird compared to birds offered 20mg/kg dose of oxytetracycline (T2). The result shows no significant difference ($P > 0.05$) between T4 (control), T2 and T3 in all parameters measured except between T4 and T2 in final body weight. Where birds in T4 have significantly higher values than those in T2.

3.2 Performance of Broiler Birds Administered Oxytetracycline (4 to 8 weeks)

The result of finisher phase (Table 3). The result shows significant difference ($P < 0.05$) in total feed intake, body weight and average body gain per bird.

Birds fed 20mg/kg OTC (T1) recorded lower feed intake, body weight and average body weight gain per bird compared to birds in T2, T3 and T4. There is no significant difference ($P < 0.05$) between T2, T3 and T4 in terms of final body weight gain per bird. Total feed intake is higher in control (T4) compared to T3, T2 and T1).

4. DISCUSSION

4.1 Performance Characteristics of Broiler Birds Administered OTC (0-4 weeks)

Birds offered 20 mg/kg OTC consumed less feed compared to those offered higher dose and control. This postulates that giving below recommended dose of OTC leads to reduce feed intake, this patterns was clearly expressed in

AFIB and AFIBD. This result is however in line with the finding of Kumar *et al*, [7], who reported better feed intake with birds supplemented higher doses of OTC in his study.

Average body weight (ABW), Average weight \bird\day (ABW\B\D) follows the same patterns as feed intake, these are as a result of lower feed consumed in 20 mg/kg treatment, compared to other treatments. The lower feed intake, leads to lower body weight gain. This is however no doubt, because Zulkifli *et al*, [8] reported better feed intake, as well as better feed utilisation in his birds administered *Lactobacillus culture* compared to the group of birds administered lower dose of oxytetracycline. Results obtained in this study, is in line with the findings of Amerah *et al*, [9], who also reported lower total feed intake, lower weight gain to a particular treatment having lower dosage of medication compared to other treatments that had higher doses. Results on body weight gain (BWG), Body weight gain per bird (BWG/B), that reported to be significantly differ in the treatment of 20 mg/kg of OTC compared to other treatments, is an indication of the lower feed intake reported earlier, that resulted to lower weight gain. This is in line with the findings of Amerah *et al*, [9], who reported lower total feed intake, lower weight gain to a particular treatment having lower medications compared to the treatment having higher doses of medication.

FCR in this study showed better FCR in T1 (Below recommend), T3 (Above recommendation) and T4 (Control) ($P>0.05$), while T2 (Recommended dose) significantly higher than other treatments listed above ($P<0.05$). result is in line with the findings of Klavathy *et al*. [10], who reported better FCR in the antibiotics treatments than control treatment (treatment without antibiotics), but however the control treatment that is T4 of this study showed better FCR among other treatment, in this regards, this findings contradict that findings of Klavathy *et al*. [10]. Mortality result showed at this phase of the experiment indicated that no significant differences ($P>0.05$) exists statistically, however highest value of mortality was recorded for T1 (20 mg/kg) with the value of 3.00 compare to the values in other treatments. This may be as a result of inability of the dosage of OTC given to stop the cell division of bacterial growth. The 3.00% of mortality reported for the birds administered with 20 mg/kg of OTC, is far below 6.53% of Klavathy *et al*. [10], who administered 50 mg/kg of OTC.

4.2 Performance Characteristics of Broiler Birds Administered OTC (4-8 weeks)

From the result of TFI presented, it was showed that, significant difference ($P>0.05$) exists in T4

Table 1. Gross, Calculated and analyzed chemical composition of experimental starter and finisher diets

| Ingredient (kg) | Starter | Finisher |
|------------------------|-----------|-----------|
| Maize | 52.0 | 50.5 |
| Soya beans meal | 17.0 | 14.0 |
| Groundnut cake | 15.5 | 14.0 |
| Fish meal | 2.5 | 1.50 |
| Wheat offal | 8.0 | 11.0 |
| Limestone | 2.0 | 4.0 |
| Bone meal | 2.0 | 4.0 |
| Premix | 0.25 | 0.25 |
| Salt | 0.25 | 0.25 |
| Methionine | 0.25 | 0.25 |
| Lysine | 0.25 | 0.25 |
| Total | 100kg | 100kg |
| Analysed value of feed | Starter % | Finisher% |
| Crude protein | 22 | 20 |
| Energy kcal/kg | 3005 | 2850 |
| Methionine | 0.5 | 0.5 |
| Lysine | 1.0 | 0.9 |
| Calcium | 1.4 | 2.6 |
| Phosphorous | 0.6 | 0.8 |
| Fibre | 5.4 | 5.1 |

Table 2. Performance of broiler birds offered different dose of oxytetracycline at starter phase

| Parameters | Treatment 1 (20mg/kg) | Treatment 2 (40mg/kg) | Treatment 3 (60mg/kg) | Treatment 4 (Control) | SEM |
|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------|
| Total Feed Intake | 11023.63 ^b | 13364.92 ^a | 13380.98 ^a | 13498.70 ^a | 227.05 |
| Average Feed Intake/Bird | 1107.75 ^b | 1206.30 ^{ab} | 1412.59 ^a | 1231.39 ^{ab} | 82.78 |
| Average Feed Intake/Bird/Day | 158.25 ^b | 172.33 ^{ab} | 201.80 ^a | 175.91 ^{ab} | 11.82 |
| Final Body Weight | 1604.25 ^a | 1480.80 ^b | 1619.00 ^a | 1642.67 ^a | 15.77 |
| Body Weight Gain/Bird | 740.32 ^b | 880.43 ^a | 842.90 ^a | 830.78 ^a | 44.11 |
| Body Weight Gain/Bird/Day | 70.90 | 78.14 | 75.55 | 72.53 | 7.02 |
| Feed Conversion Ratio | 2.06 | 2.70 | 2.33 | 2.20 | 0.02 |
| Mortality | 3.00 | 1.50 | 1.33 | 1.67 | 0.78 |

a,b,c= Mean with different superscript across the row are significantly different (P<0.05)

Table 3. Performance of broiler birds offered different dose of oxytetracycline at finisher Phase

| Parameters | Treatment 1 (20mg/kg) | Treatment 2 (40 mg/kg) | Treatment 3 (60mg/kg) | Treatment 4 (Control) | SEM |
|------------------------------------|--------------------------|---------------------------|--------------------------|--------------------------|---------|
| Total Feed Intake | 8140.75 ^c | 11140.50 ^b | 11780.00 ^b | 14678.25 ^a | 1401.13 |
| Average Feed Intake/Bird | 890.68 | 1100.57 | 1150.98 | 1375.05 | 151.23 |
| Average Feed Intake/Bird /Day | 127.24 | 157.23 | 164.42 | 196.43 | 21.60 |
| Body Weight | 12259.07 ^b | 15275.23 ^a | 15547.52 ^a | 15108.35 ^a | 1140.95 |
| Body Weight Gain | 13259.10 | 15378.23 | 15647.52 | 15208.35 | 1140 |
| Average Body Weight Gain/Bird | 1359.83 ^b | 1581.27 ^a | 1593.93 ^a | 1533.33 ^a | 48.29 |
| Average Body Weight Gain/Bird /Day | 136.78 | 152.51 | 147.33 | 138.81 | 15.81 |
| Feed Conversion Ratio | 1.41 | 1.48 | 1.50 | 1.50 | 0.11 |
| Mortality | 0.00 | 0.17 | 0.00 | 0.00 | 0.04 |

Mean with different superscript across the row are significantly different (P<0.05)

(Control) having highest value of 14678.25 and T1 (20 mg/kg) having the lowest value of 8140.75. T2 (Recommended dose) and T4 (Above recommended) showed no significant differences ($P>0.05$). Significant difference only exists in T1 (20 mg/kg) and T4 (Control). This result is in contrary with the result of Klavathy *et al.* [10] who reported positive feed intake in OTC supplemented diet administered to broiler birds. Body weight result of the experimental broiler birds administered OTC showed that significant difference ($P<0.05$) exists in T1 (20 mg/kg) with the lowest value compared to other treatments, this is an indication that the lower TFI recorded above is responsible, as weight should increase with the increase in feed intake, and as the intake is reduced, the weight of the birds also reduced. This result is in line with findings of Amerah *et al.*[9], who reported lower TFI, lower weight gain in their findings to a particular treatment having lower medication than other treatments with higher doses of medication.

The result on FCR of this experiment at the finisher phase showed that no significant difference ($P>0.05$) exists among all the treatments. The result obtained from this finding is contradicting the finding of Klavathy *et al.* [10] who reported better FCR in the OTC supplemented diet than control. The Mortality result at this finisher phase showed no significant difference ($P>0.05$) exists among all the treatments, only T2 (Recommended dose) having slightly high value compared to other treatments.

5. CONCLUSION

The study conclude significant effect of dosage variation on performance of broiler bird administered diet with highest dosage of OTC supplementation had better performance, but no significant difference with recommended dosage and control but differed with below recommended dosage. However similar trend was obtained in average body weight gain per day.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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