EFFECT OF *MORINGA OLEIFERA* LEAF MEAL ON GROWTH PERFORMANCE AND FECAL BACTERIAL COUNT IN BROILER CHICKS

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ABSTRACT
Antibiotic growth promoters (AGPs) have been an integral part of the poultry industry for more than sixty years. The AGPs were however suspected to cause cross and multiple antibiotic resistances, leading to a ban on their use in broiler nutrition. Phytogenic additives in animal nutrition have thus attracted attention for their potential role as alternatives to AGPs. *Moringa oleifera* is known to possess important medicinal properties including antibacterial and antifungal activities. This experiment, which was carried out in a rural part of Kogi State of Nigeria, was conducted to evaluate the effect of *Moringa oleifera* Leaf Meal (MOLM) on the growth performance and fecal bacterial count of broiler chicks. A total of 48 day-old Abor acre commercial broiler chickens were used. They were randomly allotted to 4 dietary treatment groups in a complete randomized design experiment, each treatment consisting of three replicates, with four birds per replicate. The dietary treatments were maize-based commercial starter ration supplemented with MOLM at levels of 0% (T1 = control), 2.5% (T2), 5% (T3) and 7.5% (T4) respectively. Inclusion of MOLM in broiler starter diets resulted in a non-significant but steady improvement in feed intake of birds with increase in the inclusion level of MOLM. There was also a non-significant improvement in the final weight, weight gain and feed conversion efficiency of starter birds placed on diets enriched with MOLM, with the control group having the highest FCR and feed cost per gram of meat produced. There was however no noticeable effect of MOLM on fecal bacterial count of the chicks. *Moringa oleifera*Leaf Meal can therefore be added to broiler diets particularly at 5% level for the purpose of improving the feed conversion efficiency of the chicks which may also result in reduced feed cost.
Keywords: Broiler, Moringa, performance, bacterial count.

INTRODUCTION
Poultry production is one of the fastest means of increasing animal protein supply to human diet in form of meat and eggs. Broiler chicken accounts for a major source of poultry meat. Its production is however influenced by poor quality feed/disease challenges resulting in poor performance and increased cost of production (Obioha, 1992). Antibiotics, which are synthetic or semi-synthetic compounds with antimicrobial activities, have been an integral part of the poultry industry for more than sixty years, where they are used as growth promoters and to treat diseases in chickens (Nassir and Grashorn, 2010). The use of these synthetic substances however, was soon found to have emergence of antibiotic-resistant pathogens. The challenge of maintaining healthy chicken flock and fulfilling consumer expectations in relation to product quality has triggered the interest of producers in using natural feeding supplements, particularly herbs. Previous studies have demonstrated positive effects of herbal supplements on production performance and health of broiler chickens (Okafor et al., 2014; Emmanuel, 2016). Olobatoke and Oloniruha (2009) and Olobatoke and Mulugeta (2011) similarly reported positive effects of bitter leaf and garlic powder on hematological indices and fecal bacterial load of cockerels and laying birds respectively. Moringa is a fast- growing, drought- resistant tree native to the Himalayas in Northwest India and widely cultivated in tropical and sub- tropical areas. It is reported to possess medicinalproperties including antibacterial and antifungal activities (Nickon et al., 2003; Patell, 2011). Ochi et al. (2015) observed that Moringa oleifera seeds enhanced the performance of broilers during the finisher period. This study was conducted to evaluate the effect of Moringa oleifera leaf meal on growth performance and fecal bacterial load of broiler chicks.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the poultry unit of livestock section of College of Agriculture, Division of Agricultural Colleges (DAC), Ahmadu Bello University (ABU) Kabba Campus, Kogi State. Kabba is located in Southern Guinea Savanna ecological Zone of Nigeria (Latitude of $075^0$3'N and Longitude $6^0$08'E). The rainfall spans from April to November and peaksbetween June and September. The dry season extends from December to March. The mean annual rainfall is 1,570mm per annum with an annual temperature range of 18-32°C. The mean relative humidity (R.H) is 59%.

Preparation of *Moringa oleifera* leaf meal

M. oleifera leaves were harvested from the College premises. Fresh green and undamaged leaves were air-dried with no direct sunlight exposure, with constant turning over to avert fungal growth. The leaves were grinded to a fine powder to form the *Moringaoleifera* leaf meal (MOLM), which was then tightly packaged in polythene plastic bags, sealed and kept at room temperature until required.

Experimental diets and management

Fifty day-old Arbor acre broiler chicks obtained from Dantee Farm in Kwara State, Nigeria, were used for the experiment. The average initial weights of the birds were determined. The experiment consists of four (4) treatments in a complete randomized design. Each treatment was replicated three times with four birds per replicate. The dietary treatments consist of commercial broiler starter feed (Vital®) as the basal diet. This was enriched with MOLM at 0%, 2.5%, 5% and 7.5% representing T1, T2, T3, and T4 respectively, where T1 served as the control. The inclusion levels were on weight-weight ratio basis. The birds were housed in deep litter pens and reared under similar managerial conditions. Clean drinking water was supplied to the birds *ad libitum* throughout the study period and the experiment lasted for four weeks. Mortality and feed consumption of birds were recorded on daily basis whereas body weight, weight gain and feed conversion ratio were assessed weekly.

Determination of Fecal bacterial Count

Fecal samples were aseptically taken from experimental birds by rectal swab on weekly basis and subjected to microbiological analysis using routine culture and isolation technique. Prior to sample collection, the anal region of the birds were usually thoroughly cleaned to avoid sample contamination. Samples were immediately taken to the laboratory for analysis. Serial dilutions of the samples were made using 2% buffered peptone water. Using a sensitive electronic scale, 0.1g faecal sample was weighed out from each replicate into labelled eppendorff tubes containing 0.9ml of the diluents. These were vortex-mixed for 2min and further dilutions were done serially until 10^{-8} ratio was obtained. Then 0.1ml of dilution ratios of 10^{-2}, 10^{-4}, 10^{-6} and 10^{-8} from each replicate were plated on plate count agar using the spread plate method.Plates were incubated at 37°C for 24 h after which colonies were counted and compared with the dilution factor to obtain the total bacterial count (McLandsborough, 2004).

Statistical Analysis

Data obtained from this experiment was subjected to analysis of variance (ANOVA) using the GLM of SAS (2001) for complete randomized design. All bacterial populations were transformed to $\log_{10}$ numbers of CFU/ml before statistical analysis. Results were considered significant if $P \leq 0.05$. Significant difference among treatment means was separated using the Duncan Multiple Range Test.

RESULTS AND DISCUSSION

Effect of MOLM on fecal total bacterial count of broiler chicks

Table 1 shows the effect of MOLM added to broiler diets on fecal total bacterial count of broiler chicks. There is no particular trend in the total bacterial count in the feces of experimental birds which may be an indication that MOLM does not have any noticeable effect on fecal total bacterial count of broiler chicks. This is contrary to the observations of Chongwe (2012) who reported a reduction in the microbial colonies of fecal samples obtained from indigenous chickens fed 10% MOLM for 8 weeks. This contradiction may be due to the low inclusion level of MOLM in the chicken's diets in the current study. There was however no mortality recorded in all the treatment groups throughout the period of the experiment.

Effect of MOLM on growth performance of broiler chicks

Results of the effects of MOLM as additive in diet of broiler chicks are shown in Table 2. Feed intake was highest in group receiving 7.5%

MOLM in the diets and lowest in the group fed diets supplemented with 5% MOLM. The latter similarly had the best feed conversion efficiency although birds on diets supplemented with 2.5% and 7.5% MOLM had the highest weight gain at the end of the experiment. Overall, birds in the control group had the lowest feed efficiency with FCR of 3.56 and the highest feed cost per gram of meat produced. However, differences in cumulative feed consumption, weight gain and FCR between treatment groups were not statistically significant. The improved feed intake in the birds fed MOLM-supplemented diets resulted in increased growth pattern. This accords with the reports of Kakengi et al. (2007) and may indicate the bird's preference for diets supplemented with MOLM perhaps due to increased bulk. Gadzirayi et al. (2012) similarly noted that inclusion of MOLM as protein supplement in broiler diets produced broilers of similar weight with those fed the conventional commercial feeds. This observation also agrees with the findings of Abdulsalamet al. (2015), although they in addition, reported that inclusion of MOLM up to 1% level adversely affected the broiler's performance at the chick stage. Contrary to the observations of this study however, Olugbemi et al. (2010) reported a decline in final weight and weight gain of broiler chickens as MOLM level increased in an MOLM-supplemented cassava based diets fed to broilers.

CONCLUSION

It was observed that the addition of *Moringaoleifera* leaf meal to broiler starter diet, particularly at 5% level, improved the feed intake of the birds and reduced the feed cost per gram of meat produced without causing any deleterious effects. There was however noeffect on fecal total bacterial count of broiler chicks.Further research is necessary to evaluate the effect of including *Moringaoleifera* leaf meal in the diet of broiler chicks at higher levels.

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Table 1 Effect of MOLM added to broiler diets on performance of broiler chicks

Parameter	Treatment			
	T1	T2	T3	T4
Weight gain (g)	533.3	616.6	592.9	616.6
Cumulative feed consumed/bird (g)	1900	1925	1828.2	2075
FCR	3.56	3.12	3.08	3.37
Feed cost/g meat (₦)	0.413	0.362	0.357	0.389

Table 2 Effect of MOLM added to broiler diets on fecal total bacterial count (logCFU) of broiler chicks.

TRT	Week			
	1	2	3	4
A	1.36	1.32	1.28	1.32
B	1.28	1.49	1.46	1.42
C	1.91	1.90	1.85	1.89
D	1.51	1.53	1.49	1.51