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# EFFECT OF AQUEOUS PROBIOTICS *(LACTOBACILLUS FERMENTUM)* ON THE GROWTH PERFORMANCE AND APPARENT NUTRIENT DIGESTIBILITY OF COBB-500 BROILER CHICKENS

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**Abstract**

This experiment was conducted to evaluate the effects of aqueous probiotics *(Lactobacillus fermentum)* supplementation on growth performancee and apparent nutrients digestibility of Cobb- 500 broiler chickens. One hundred fifty-day old chicks were purchased from Olam Farm limited were randomly divided into five treatments, each group was replicated three times with ten birds per replicate using completely randomized design. Treatment 1 served as the control group, that is, without probiotic supplementation, Treatment 2 received probiotics*(Lactobacillus fermentum)* of 7.5 g/ 4 litres of water, Treatment 3 received 15 g/ 4 litres of water, Treatment 4 received 22.5 g/ 4 litres and Treatment 5 received 30 g/ 4 litres of water. Data on daily water intake, daily feed intake, weekly body weight, weekly body weight gain and weekly feed conversion ratio were collected. All data collected were analysed using one way analysis of variance (ANOVA). The results obtained on growth performance showed that the dietary treatments influenced ($p<0.05$) final weight, body weight gain and feed conversion ratio. Birds on 30 g/ 4 litres did better than other treatments, with a final weight of 2984.00 g, weight gain of 2764.10 g and feed conversion ratio of 1.55.The apparent nutrients digestibility showed that dietary treatments affected all the nutrient digestibility parameters measured. Dry matter, crude protein, crude fibre, ether extract, ash and Nitrgen free extract (NFE) were better digested with 7.5 g/ 4 litres of water of *Lactobacillus fermentum* probiotic.

**Keywords**: Aqueous Probiotics; *Lactobaccilus fermentum*; Performance; Nutrient digestiility

## Description of problem

Poultry are the cheapest source of animal protein, contributing significantly to supplying the growing demand for animal food products around the world (Farrell, 2013). The consumption and trade in poultry products are increasing rapidly as the human population also increases, making it the second largest source of meat after pork (FAO, 2014). A major challenge of developed countries as Nigeria is increase in population without equivalent increase in animal production. Poultry meat, like other meats, milk, and eggs, has a protein component usually defined as 'high quality'. Tremendous demand for animal protein has caused an expansion of broiler farming. Now due to this demand, antibiotics are extensively used to promote growth in poultry production or control infectious disease. But recently research shows that their use in poultry production causes antibiotic resistance in bird, while their residues may be passed on to human leading to public health hazards. Since public health is at high risk, the use of antibiotics is being replaced by alternative growth promoters like probiotics (Alimohamadi *et al.,* 2014).

Probiotics are possible alternative to antibiotics as growth promoters; they are live microorganisms that contribute to the health and balance of host intestinal tract (Fuller, 1989). Generally probiotic preparations are used on farms as soon as chicks arrive. The most common routes of administering probiotic preparations are in feed and water (Higgins *et al.,* 2008). Mastbaum *et al.* (1997) used probiotic either via the feed or drinking water in broilers. They reported that administration of probiotics via drinking water significantly affected live weight gain and feed conversion efficiency at the end of the day 41. They also emphasized that this beneficial effect was clearer at the end of the day

31 (finisher phase). However, most of the probiotics used are expensive because they are imported. Therefore, this study was carried out to determine the effect of locally produced *Lactobacillus fermentum* probiotics on growth performance of broiler chickens.

**Materials and methods**

The experiment was carried out at the Department of Animal Production Teaching and Research Farm (Poultry Unit), located at Federal University of Technology Minna, Bosso Campus, Minna Niger State.

**Source of Experimental Bird, Feed, Source of Probiotics and Experimental Design**

A total sum of 150 one day old cobb-500 broiler chicks was purchased from Olam Farm Limited Kaduna, Kaduna state. The probiotic used *(Lactobacillus fermentum)* was purchased from Emmanuel Agrolife Enterprise Lokoja, Kogi State, and the feed ingredients were purchased from Sam Agro Vet, Minna, Niger State. The Completely Randomized Design (CRD) was used to distribute the one hundred and fifty 5irds (100) obtained from Olam Farm Limited Kaduna to five treatments were replicated thrice, with ten birds per replicate. Treatment 1 was the control without probiotics supplementation. Treatments 2, 3, 4, and 5 were water supplemented with 7.5, 15, 22.5, and 30 g of probiotics per 4 litres of water respectively. Single phase feeding was employed during the feeding trial. Diets contained 21 % CP and 3,085 ME (Kcal/kg).

**Data Collection**

Initial body weight, final body weight, feed intake, water intake, body weight, and feed conversion ratio were obtained. Feed intake was recorded daily and the birds weighed weekly after the initial bdy weight. Feed intake was determined by weighing the feed offered and the left-over after 24 hours.

**Digestibility Study**

Digestibility study was carried out at the eighth week of the experiment using 2 birds per replicate. Total collection method was used; it involves keeping of the birds in metabolic cages, feeding them with a known quantity of feed and allowed three days of acclimatization followed by four days of total faecal collection from each replicate. Total faeces voided by each replicate were collected. The faeces were weighed (wet) and oven dried at 85 $^0$C until a constant weight was obtained. At the end of the faecal collection, the total dry faeces for each treatment were bulked and 10 % was weighed and grounded to a size that could pass through a 2 mm sieve for proximate analysis. Dry matter, crude fibre, crude protein, ether extract, nitrogen free extract and ash contents of the faeces and were determined using AOAC (2001) methods. The difference between the nutrients in the feed consumed and the nutrient in the faeces voided multiply by 100 percent gave the apparent digestibility coefficient of the feed and feacal. Nutrient digestibility was determined using this formula:

$$\text{Nutrient digestibility} = \frac{\text{Nutrient in feed intake} - \text{Nutrient in faeces voided}}{\text{Nutrient in feed intake}} \times 100$$

**Results and Discussion**

**Growth performance**

Table 1 shows the results of the effect of the growth performance parameter on broiler birds administered aqueous proiotics. The results showed that, there were significant differences ($p<0.05$) in all the growth parameters measured except the initial weight and feed intake.The results indicated that probiotic *(Lactobacillus fermentum)* in the drinking water of chickens enhanced growth performance (final weight, weight gain and feed conversion ratio) when compared to the control group.Studies have shown that probiotics improve nutritional and bird health status of chickens, they regulates and balances microbiota in the gut, thus, minimizing pathological conditions (Chaucheyras-Durand and Durand, 2010). Furthermore, Zhang and Kim (2014) indicated that probiotics regulates the microbial environment in the gut, reduce digestive upsets and prevent pathogenic gut bacteria, thereby improve live weight gain, improve feed conversion ratio and reduce mortality. The enhanced performance may also be associated with increased villus height, which increases absorption of nutrients from the

intestine (FAO, 2016). The birds on the 30 g / 4 litres of water did better than the other treatments, they also had higher numerical feed intake compared to the other treatment. This might imply that this probiotic enhanced feed intake and it is the optimal dosage for improve performance of this broiler chicken.The results disagree with the findings of (Duwa *et al.*, 2019) whose findings showed that there was no significant effect of probiotic on body weight gain and feed conversion ratio.

**Nutrient digestibiity**

The result of the effects of aqueous probiotic on the apparent nutrient digestibility of broiler chickens is presented in Table 2. The results showed that, there were significant differences in all the parameters measured. Low level of probiotics *(Lactobacillus fermentum)* (7.5 g/ 4 litres) improved dry matter, crude fibre, ether extract and NFE when compared with the other probiotic treatments. This might mean that this low dosage stimulates better digestibility of these nutrients. However, this did not translate to better performance. Similar results were reported by Zhang and Kim (2014) who observed that apparent ileal digestibility (AID) of essential amino acids was improved in bird fed a maize soybean-based diet supplemented with a low dose (1 to 2 x$10^2$ cfu/g) of a multi strain commercial probiotic (probion) containing *Lactoacillus acidiphilus*, *Bifidobacterium Substilis* and *Clostridium butyricum*. Furthermore, the improvement in the treated group of 7.5 g/ 4 litres of water might be attributed to the fact that it is been administered in lower dosage. Different probiotics exert their effects through various mechanisms and this is not yet fully understood, it is presumed to be due to their action either in the gastro-intestinal lumen or the wall of the Gastro intestinal tract (GIT). Although probiotics are being used as a substitute for Antibiotic growth promoter (AGP), the mechanism of action of these feed additives appears to be different (Fajardo *et al*., 2012).

**Table 1 Growth performance of broiler chickens served different levels of aqueous *(Lactobacillus fermentum)* probiotics**

| Parameters | T1 | T2 | T3 | T4 | T5 | SEM | P- Vaue |
|---|---|---|---|---|---|---|---|
| Initial weight (g) | 215.25 | 213.75 | 215.05 | 215.80 | 219.85 | 0.771 | 0.06 |
| Final weight (g) | 2520.50$^{d}$ | 2754.00$^{b}$ | 2705.00$^{bc}$ | 2655.00$^{c}$ | 2984.00$^{a}$ | 51.087 | 0.00 |
| Weight gain (g) | 2305.20$^{d}$ | 2540.20$^{b}$ | 2490.00$^{bc}$ | 2439.20$^{c}$ | 2764.10$^{a}$ | 50.631 | 0.00 |
| Feed intake (g) | 4149.85 | 4179.80 | 4156.30 | 4083.30 | 4263.95 | 29.681 | 0.51 |
| FCR | 1.80$^{a}$ | 1.65$^{bc}$ | 1.67$^{b}$ | 1.68$^{b}$ | 1.55$^{c}$ | 0.029 | 0.01 |

a,b,c Means in the same row with different superscript are significantly different (p>0.05)

**Keys:** T1= Control 0gprobiotics; T2 = 7.5g probiotics/4 litres of water; T3= 15g probiotic/4 litres of water T4= 22g probiotic/ 4 litres of water; T5= 30g probiotic/4 litres of water; FCR= Feed Conversion Ratio

SEM: Standard error of mean

**Table 2 Nutrient digestibility of Cobb-500 broiler chickens administered aqueous *(Lactobacillus fermentum)* probiotics**

| Parameters | T1 | T2 | T3 | T4 | T5 | SEM | P-Value |
|---|---|---|---|---|---|---|---|
| Dry matter | 98.08$^{a}$ | 98.01$^{a}$ | 96.96$^{b}$ | 96.75$^{b}$ | 96.77$^{b}$ | 0.168 | 0.00 |
| Crudeprotein | 97.95$^{a}$ | 97.39$^{b}$ | 96.76$^{c}$ | 97.85$^{a}$ | 97.25$^{b}$ | 0.126 | 0.00 |
| Crude fibre | 99.14$^{a}$ | 98.87$^{a}$ | 98.09$^{b}$ | 96.13$^{d}$ | 97.58$^{c}$ | 0.290 | 0.00 |
| Etherextract | 99.15$^{ab}$ | 99.49$^{a}$ | 98.86$^{b}$ | 98.16$^{c}$ | 96.94$^{d}$ | 0.246 | 0.00 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ash | 97.01[b] | 97.71[a] | 95.59[d] | 95.64[d] | 96.64[c] | 0.224 | 0.00 |
| NFE | 97.92[a] | 97.77[a] | 96.73[b] | 96.69[b] | 96.54[b] | 0.165 | 0.00 |

ab, means in the same row with different superscript are significantly different (p>0.05)

**Keys;** NFE: Nitrogen Free Extract; T1= Control 0gprobiotics; T2 = 7.5g probiotics/4 litres of water; T3= 15g probiotic/4 litres of water; T4= 22g probiotic/ 4 litres of water; T5= 30g probiotic/4 litres of water; SEM: Standard error of mean

## Conclusion and Application

Dietary treatments influenced (p<0.05) final weight, weight gain and feed conversion ratio. All aqueous probiotics treatments did better (p<0.05) than the control and chickens on 30 g/ 4 litres of water did better than all the other treatments. SSimilarly, dietary treatment *(Lactobacillus fermentum*) affected all the nutrient digestibility parameters measured. Dry matter, crude fibre, ether extract, ash and NFE were digested better at 7.5 g/ 4 litres of *Lactobacillus fermentum*. Aqueous Lactobacillus fermentum of 30 g/ 4 litres is recommended for improve growth performance.

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