Probiotic Lactic Acid Bacteria to the Rescue of Antibiotics in Broiler Production

ABSTRACT
The research was aimed at studying the effect of Lactobacillus fermentum, Lactobacillus plantenrun and Weissalla ciberia on growth performance, feed conversion ratio and mortality of broiler chicken. This was design to find a possible alternative to antibiotics in broiler production. The study was carried out at the department of microbiology, faculty of sciences Kaduna State University, Kaduna between January to April 2018. A total of ten raw milk samples were screen for the isolation of Lactic Acid Bacteria (LAB) and 21 day old chicks were administered probiotics (Lactobacillus fermentum, Lactobacillus plantenrun and Weissalla ciberia) in water at 10^8 cells/milliliters/isolates/birds/day for six weeks. Body Weight (BW), Weight Gain (WG) and Feed Intake (FI) were measured weekly just as feed conversion ratio was calculated and mortality was recorded throughout the duration of the experiment. The result showed the identification of Lactobacillus fermentum, Lactobacillus plantenrun and Weissalla ciberia that were used as probiotics. Significant differences was observe between treatment on BW at day 14 P= P=0.0292, WG P=0.0004 and FI P=0.0176, day 21 P=0.0329, WG P=0.0004 and FI P=0.0176, day 28 P=0.0025, WG P=0.0053 and FI P=0.0189, day 42 WG P=0.0112 and FI P=0.0006. Probiotics group showed a better body weight and weight gain with a lower feed intake and highest feed conversion ratio. There was a progressive increase in weight gain from week one to the fourth week and decreases from week five and week six. The LAB group recorded 5%, mortality, antibiotics group recorded 10% and the control group recorded 0%. Probiotic lactic acid bacteria showed a significant promise to replace antibiotics in broiler production as it shows clearly its edge over antibiotics in this research work.

Keywords: Probiotics, Antibiotics, Lactic, Acid, Bacteria, Broiler, Production

1. INTRODUCTION
Probiotics is a Specific live or inactivated microbial cultures that have documented targets in reducing the risk of human disease or in their nutritional management [1]. The fundamental
principle of in-feed antibiotics and probiotics is that they influence the composition of intestinal microflora in favour of the host [2]. Scientific studies have shown a beneficial effect of such products on the growth, feed consumption, and stabilization of animal health. However, a long-term use of antibiotics and chemical growth promoters increases the occurrence of resistant pathogenic micro-organisms and reduces the efficacy of antibiotics and chemotherapeutics in the treatment of some diseases [2].

The Lactic Acid Bacteria (LAB) are a group of Gram-positive bacteria, non-respiring non-spore-forming, cocci or rods, which produce lactic acid as the major end product of the fermentation of carbohydrates [3]. [4] Look at Lactic acid bacteria as a group of Gram-positive bacteria that lack cytochromes and preferring anaerobic conditions, fastidious, acid-tolerant and strictly fermentative. They are catalase, oxidase, indole, methyl red, vogens-proskauer and citrate negative [5]. Among different genera of LAB; Lactobacilli produce various organic acids like lactic acid, acetic acid and propionic acid exhibiting anti-microbial activity [6; 7]. Lactobacillus plantarum isolated from soy milk also have strong antibacterial activity against E. coli and other pathogenic bacteria [8]. Lactobacillus fermentum was reported to have improved the intestinal balance of the diverse microflora species in the rectum of broiler chickens [9]. They are also responsible for the production of produced bacteriocin [10] and diminished atopic dermatitis [11].

The European Food Safety Authority (ESFA) in April, 2007 published a survey on the levels of Salmonella detected in broiler flocks (chickens reared for meat) across the European Union in 2005-6. It was reported that one in four broiler flocks rose over the one year period, was Salmonella-positive. Salmonella enteritidis has been related to human salmonellosis, a common and widespread zoonosis worldwide [12]. Both the association of salmonella infections with the consumption of poultry products and the fact that in the live bird Salmonella carriage is mainly asymptomatic have been led to a demand to find ways of preventing infection of commercially reared poultry and product contamination [13]. The probiotic properties of LAB have been widely studied, demonstrating that their capability of adhering to mucus and epithelial cells is one of the potential mechanisms of providing a competitive advantage in the intestinal microbiota [14] and consequently inhibiting the in vitro growth of S. enteritidis [15]. Studies on probiotics products incorporating L. fermentum and Saccharomyces cerevisiae indicated that
they improved the intestinal balance of the diverse microflora species in the rectum of broiler chickens [9].

This research was aimed at studying the effect of *Lactobacillus fermentum*, *Lactobacillus plantenrun* and *Weissella ciberia* on growth performance, feed conversion ratio and mortality of broiler chicken.

2. MATERIAL AND METHODS

2.1 Isolation and Biochemical Identification of Lactic Acid Bacterial

A total of ten raw cow milk samples were collected directly from the hawkers within Kaduna metropolis, Kaduna state, northern Nigerian. The samples were collected aseptically in a sterile bottles and kept cool in an ice bag and transported to Department of Microbiology laboratory, Kaduna State University for isolation of lactic acid bacteria. Ten milliliters of the milk samples was aseptically measured and homogenized to obtain a uniform sample. From each sample, a 1:10 (one milliliter of sample into ten milliliters of sterile peptone water) dilution was subsequently made using peptone water followed by making a 10 fold serial dilution. Then 0.1 milliliter (ml) from each dilution was subcultured in duplicate into De Man, Rogosa and Sharpe (MRS) agar used for isolating LAB. To prevent the growth of yeasts, the media was supplemented with 100 mgL⁻¹ of cycloheximide [16] before incubation. The MRS agar plates were incubated aerobically and anaerobically using the Gas Pack system at 37°C for 48hrs. Colonies were randomly selected and then streaked on MRS agar severally to purify the strains and subsequently stored at 37°C for further identification [17].

All the purified strains were initially tested for gram reaction, catalase production and spore formation [16]. The strains were further tested for Indole, Methyl red, Voges proskauer Citrate utilization (IMViC) using the method of [18].

2.2 Molecular Identification of Lactic Acid Bacteria

2.2.1 DNA extraction and Storage

The DNA extraction was achieved according to the manual method described by [19]. The extracted DNA was stored at -20°C. Purity of DNA was verified by electrophoresis in 0.8% (w/v) agarose gel (Merck KGaA Germany) in TAE 1X buffer under UV light after staining with ethidium bromide.
2.2.2 Amplification of Extracted Genetic Material

The PCR reaction mixture consisted of 5 µl of 10X buffer (100 mM HCl pH 8.3) 20 mM MgCl₂, 500 mM KCl, 1% gelatin, 200 µM concentrations each of deoxyribonucleotide triphosphates (dATP, dTTP, dGTP and dCTP), 0.5 µl of each primer (GGACTACAGGTTATCTAAT 16S for primer RIBOS-1 Forward and AGAGTTTGATCCTGG 16S for primer RIBOS-2 Reverse), template genomic DNA, 200 ng and 1.5 units of Taq polymerase. The PCR was run in a programmable thermocycler (Bulldog bio Inc, USA) having an initial delay at 95 °C for 10 min and final delay at 72 °C for 10 min followed by 30 cycles of denaturation at 95 °C for 1 min, annealing at 55 °C for 1 min followed by extension at 72 °C for 1 min. PCR amplified product was resolved in a 1.5% agarose gel by electrophoresis.

2.2.3 Purification and Sequencing of PCR products

The PCR purification was done using kit (QIAquick USA). The Purified PCR products were sent to GATC (Accegen Biotech USA) for sequencing. Sequence annotation and database searches for similar sequences were done using BLAST at National Center for Biotechnology Information (https://blast.ncbi.nlm.nih.gov/Blast.cgi) to determine the closest known relative species.

2.3 Standardization of Pure Isolates of LAB

The standardization was achieved by 0.5 McFarland turbidity standards. Preparation of 0.5 McFarland turbidity standard was done as described in (https://microbeonline.com/preparation-mcfarland-turbidity-standards). One milliliters (ml) of concentrated H₂SO₄ was added to 99 ml of distilled water in a conical flask and mix well. A 1 % v/v solution of H₂SO₄ is prepared. Then 0.5 grams (g) of dihydrate barium Chloride salt (BaCl₂. 2H₂O) was dissolved in 50 ml of distilled water. In this way, a 1 % w/v solution of BaCl₂ was prepared. This is followed by adding 0.6 ml of BaCl₂ solution to 99.4 ml of H₂SO₄ solution to make up to 100 ml. The solution was then mixed well. This is the stock solution of the 0.5 McFarland turbidity standards. Exactly 2ml of the solution was transferred into capped tubes and store at room temperature until ready for use.
2.4 Feeding of the Broiler Chickens with Lactic Acid Bacteria

A total of 60, one day old broiler chickens were used in this research work. Out of which 20 were fed with probiotic LAB, 20 were administered with antibiotics and 20 were used as control without antibiotic or probiotic. The standardized lactic acid bacteria (10^8 cells/milliliters/isolates/birds/day) was administered in 200ml of drinking water at day 6, 7, 8, 21, 22, and 23 [20]. The birds were administered vaccine against Gumboro virus at week 1 and 3, Lasota vaccine (newcastle disease) at week 2 and 4. Hybrid feed (Nigeria) was used to feed the birds which was provided in mash form in two phases (starter phase 0 to 3 weeks and finisher phase 4 to 6 weeks). Ethical approval was obtained from Kaduna State Ministry of Agriculture, Kaduna.

2.5 Evaluation of Growth Performance of Broilers, Feed Conversion Ratio and mortality

Weekly weight of birds was recorded per treatment from day one to the 6th week of the experiment. Growth performance parameters were measured as describe by [21]. Parameters such as body weight (BW) weight gain (WG), feed intake (FI), Feed conversion ratio (FCR), defined as FI:WG (g:g) were determine on weekly basis. Overall WG, FI and FCR were calculated for the whole duration of the experiment. The mortality was recorded throughout the duration of the experiment.

2.6 Data Analysis

The data were analyzed using one way analysis of variance with the aid of graph pad prism (USA) version 6. Statistically significant effects were further analyzed and means were compared using Duncan’s multiple range test. Statistical significance was determined at $P \leq 0.05$. 

Comment [D38]: Experimental design
Comment [D39]: chicks
Comment [D40]: 20 birds were fed on
Comment [D41]: Antibiotic or antibiotics?? What is the type of the tested antibiotic?? What are the dose and the course of treatment?
Comment [D42]: LAB
Comment [D43]: What is the amount of LAB?
Comment [D44]: At days ............ of age
Comment [D45]: Live vaccines
Comment [D46]: Gumboro disease virus
Comment [D47]: And La Sota vaccine (NewCastle disease virus)
Comment [D48]: Of gae.
Comment [D49]: From Nigeria
Comment [D50]: mash
Comment [D51]: old
Comment [D52]: Is there a number for this approval?
Comment [D53]: The measured parameters
Comment [D54]: The body weight of birds
Comment [D55]: Old of the chickens

Comment [D56]: One Way Analysis of Variance
Results and Discussion

Table 1: Biochemical Identification of Lactic Acid Bacteria

<table>
<thead>
<tr>
<th>Tests</th>
<th>2AN</th>
<th>3AN</th>
<th>4AN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colony characteristics</td>
<td>Convex colonies</td>
<td>Flat Circular Non-pigmented Colonies</td>
<td>Convex dispersed Colonies</td>
</tr>
<tr>
<td>Morphology</td>
<td>Rod</td>
<td>Rod</td>
<td>Elongated Rod</td>
</tr>
<tr>
<td>Gram staining</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Spore staining</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Catalase</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Indole</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Methyl red</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Voges-proskauer</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Citrate</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Possible organism</td>
<td><em>Lactobacillus spp</em></td>
<td><em>Lactobacillus spp</em></td>
<td><em>Lactobacillus spp</em></td>
</tr>
</tbody>
</table>

Key: 2AN, 3AN and 4AN are different Samples
Figure 1: DNA Band on agarose gel

Key:
M= positive control  4AN= Sample, 2AN= Sample, 3AN= Sample and  -Ve = negative control

Table 2: Molecular Identification of Lactic Acid Bacteria

<table>
<thead>
<tr>
<th>Samples</th>
<th>Max Score</th>
<th>Query Cover</th>
<th>E-Value</th>
<th>Accession No.</th>
<th>Identification</th>
<th>Organism</th>
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<tr>
<td>2AN</td>
<td>1413</td>
<td>100%</td>
<td>0.0</td>
<td>NC010610.1</td>
<td>99%</td>
<td>L. fermentum</td>
</tr>
<tr>
<td>3AN</td>
<td>1282</td>
<td>100%</td>
<td>0.0</td>
<td>MF428738.1</td>
<td>99%</td>
<td>L. planterun</td>
</tr>
<tr>
<td>4AN</td>
<td>1373</td>
<td>100%</td>
<td>0.0</td>
<td>N2CP012873.1</td>
<td>98%</td>
<td>Weissella cibera</td>
</tr>
</tbody>
</table>
Table 3: Effects of Probiotic Lactic Acid Bacteria on Body Weight, Weight Gain, Feed Intake and Feed Conversion Ratio at Grower Stage

<table>
<thead>
<tr>
<th>EXPERIMENTAL TREATMENT</th>
<th>COMPONENTS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW (g)</td>
<td></td>
<td>110</td>
<td>106</td>
<td>109</td>
<td>0.13</td>
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<tr>
<td>WG (g)</td>
<td></td>
<td>67</td>
<td>63</td>
<td>66</td>
<td>0.44</td>
</tr>
<tr>
<td>FI (g)</td>
<td></td>
<td>107</td>
<td>107</td>
<td>106</td>
<td>0.97</td>
</tr>
<tr>
<td>FCR (FI/WG)</td>
<td></td>
<td>1.6</td>
<td>1.7</td>
<td>1.6</td>
<td></td>
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<tr>
<td></td>
<td>Week II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW (g)</td>
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<td>280</td>
<td>275</td>
<td>0.03</td>
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<tr>
<td>WG (g)</td>
<td></td>
<td>178</td>
<td>174</td>
<td>166</td>
<td>0.65</td>
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<tr>
<td>FI (g)</td>
<td></td>
<td>250</td>
<td>250</td>
<td>253</td>
<td>0.97</td>
</tr>
<tr>
<td>FCR (FI/WG)</td>
<td></td>
<td>1.4</td>
<td>1.4</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Week III</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW (g)</td>
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<td>625</td>
<td>560</td>
<td>550</td>
<td>0.03</td>
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<tr>
<td>WG (g)</td>
<td></td>
<td>337</td>
<td>280</td>
<td>275</td>
<td>0.0004</td>
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<tr>
<td>FI (g)</td>
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<td>395</td>
<td>368</td>
<td>363</td>
<td>0.02</td>
</tr>
<tr>
<td>FCR (FI/WG)</td>
<td></td>
<td>1.2</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
</tr>
</tbody>
</table>

Key:  
A = Probiotics group  
B = Antibiotics Control Group  
C = Negative Control Group  
a, b & c are mean of the treatment  
Significant value, * P < 0.05
Table 4: Effects of Probiotic Lactic Acid Bacteria on Body Weight, Weight Gain, Feed Intake and Feed Conversion Ratio at Finisher Stage

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>Week IV</th>
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<th></th>
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<tbody>
<tr>
<td>BW (g)</td>
<td>1100</td>
<td>975</td>
<td>1025</td>
<td>0.003</td>
</tr>
<tr>
<td>WG (g)</td>
<td>475</td>
<td>415</td>
<td>475</td>
<td>0.005</td>
</tr>
<tr>
<td>FI (g)</td>
<td>665</td>
<td>630</td>
<td>663</td>
<td>0.02</td>
</tr>
<tr>
<td>FCR (FI/WG)</td>
<td>1.4</td>
<td>1.5</td>
<td>1.4</td>
<td></td>
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<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>Week V</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BW (g)</td>
<td>1425</td>
<td>1350</td>
<td>1400</td>
<td>0.10</td>
</tr>
<tr>
<td>WG (g)</td>
<td>325</td>
<td>375</td>
<td>375</td>
<td>0.009</td>
</tr>
<tr>
<td>FI (g)</td>
<td>714</td>
<td>783</td>
<td>753</td>
<td>0.002</td>
</tr>
<tr>
<td>FCR (FI/WG)</td>
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<td>2.1</td>
<td>2.0</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>Week VI</th>
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</thead>
<tbody>
<tr>
<td>BW (g)</td>
<td>1775</td>
<td>1650</td>
<td>1650</td>
<td>0.01</td>
</tr>
<tr>
<td>WG (g)</td>
<td>350</td>
<td>300</td>
<td>250</td>
<td>0.53</td>
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<tr>
<td>FI (g)</td>
<td>879</td>
<td>783</td>
<td>760</td>
<td>0.001</td>
</tr>
<tr>
<td>FCR (FI/WG)</td>
<td>2.5</td>
<td>2.6</td>
<td>3.0</td>
<td></td>
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</tbody>
</table>

Key:  
A = Probiotics group  
B = Antibiotics Control Group  
C = Negative Control Group  
a, b & c are mean of the treatment  
Significant value, * P < 0.05
Figure II: Effect of probiotic LAB Bacteria on body weight

Figure III: Effects of probiotic LAB Bacteria on weight gain
Figure IV: Effect of probiotic LAB Bacteria on Mortality

KEY: A= Probiotics, B= Antibiotics, C= Control

4.0 Discussion

A total of 10 fresh milk samples were used for the isolation of Lactic Acid Bacteria (LAB). After isolating many LAB, the isolates were purified further and three were finally identified morphologically, culturally, biochemically and molecularly. Table 1 shows the biochemical identification of the isolates. The colonies for 2AN appears Convex, 3AN appears flat, circular and non-pigmented, 4AN appears convex and dispersed. Their morphology shows that they are all rod shaped bacilli. All the isolates were positive to gram’s reaction and catalase but lack spores which might confirm the isolates were *Lactobacillus* spp in agreement with the work of [22; 23]. All the isolates were found to be negative to indole, methyl red, voges-proskauer and citrate utilization test which further confirm the isolates might be *Lactobacillus* spp. This is in agreement with the works of [5; 24; 25; 26]. The primer GGACTACAGGGTATCTAAT
16S for primer RIBOS-1 Forward and AGAGTTTGATCCTGG 16S REV primer RIBOS-2 Reverse with Amplicon size of 789bp were used to amplify the LAB DNA Sequence which were shown in table 2. The BLAST on National Center for Biotechnology Information (NCBI) website confirm sample 2AN to be *Lactobacillus fermentum* with accession number NC010610.1 and 99% identification, sample 3AN to be *Lactobacillus plantenrun* with accession number MF428738.1 and 99% identification and sample 4AN to be *Weissalla ciberia* with accession number N2CP012873.1 with 98% identification.

The effects of probiotic LAB on body weight, weight gain, feed intake and feed conversion ratio was shown in table 3&4 and figure II&III. At the grower stage, it was observed that there was no significant differences between the mean of the treatment on body weight, weight gain and feed intake at the end of first week (day 7) with P>0.05. At day 14 there was a significant differences between the mean of each treatment on body weight P<0.05 (P=0.0292), but there was no significant differences between the mean of each treatment on weight gain and feed intake P>0.05. At the end of second week (day 21), there was a significant differences between the mean of the treatment on body weight P=0.0329, weight gain P=0.0004 and feed intake P=0.0176. The probiotics group recorded the highest mean of body weight, weight gain feed intake and lowest feed conversion ratio. This was closely followed by antibiotics group and then control groups which shares the same mean for feed conversion ratio that is higher than that of the probiotics group. At the end of third week (day 28) there was a significant difference between mean of the treatment on body weight P=0.0025, weight gain P=0.0053 and feed intake P=0.0189 with probiotics group having the highest mean of weight, weight gain and feed intake, this was followed by control group while the antibiotics group recorded the lowest mean of weight, weight gain and feed conversion ratio at this day 28. These results were supported by the works of [21; 27; 28].

By the end of fourth week (day 35), no significant differences was observed between the mean of the treatment on body weight even though the probiotics group recorded the highest mean followed by control group and then antibiotics group. Significant differences was observed between the mean of the treatment on weight gain P=0.0089 and feed intake P=0.0017. The probiotics group recorded the lowest mean of weight gain at this 35th day as the antibiotic and control group shared the same mean which of cause is higher than the probiotics group. The
antibiotics group recorded the highest feed intake followed by the control group and the probiotics group recorded the least mean which is responsible for the probiotics group to have the highest feed conversion ratio followed by antibiotics group and then the control recorded the least. By the end of fifth week (day 42), a significant difference was also observed between the mean of the treatment on body weight (P=0.0112) with probiotics group having the highest mean while antibiotics and control group shared the same mean. There was no significant difference between mean of the treatment on weight gain even though the probiotics group recorded the highest mean followed by the antibiotics group as the control having the least mean. There was a significant difference between the mean of the treatment on feed intake (P=0.0006) with probiotics group consuming more feed which was followed by the antibiotics group and then, the control consuming the least feed. This resulted in probiotics having the least feed conversion ratio followed by the antibiotics group and the control with the highest feed conversion ratio. At the sixth week of this research, significant difference between the means was observed for body weight P=0.011 and feed intake P=0.0006, but there was no significant difference between the mean of weight gain P=0.5289. The Beneficial effects of supplementation of lactic acid bacteria, A (combination of Lactobacillus fermentum, Lactobacillus plantenrun and Weissalla ciberia) and B (antibiotic) on growth performance was supported by the works of [21; 28]; where they reported growth promoting effects among birds fed another antibiotic and birds administered a multi-species probiotic product (comprising Lactobacillus reuteri, Enterococcus faecium, Bifidobacterium animalis, Pediococcus acidilactici, Lactobacillus salivarius) in feed and water. The Improved body weight gain as observed in Figure I in this study, could be attributed to be induced by the synergistic effect of probiotic action including the improvement of FI and nutrient digestibility, maintenance of beneficial gut microflora and increased digestive enzyme activity [28]. An important function of probiotic bacteria or A is to provide protection of the host gastrointestinal tract from pathogens [29]. [30] Reported significant improvements in broiler performance in response to Bacillus, Lactobacillus and Clostridium based diets, which supports the present findings of combination of lactic acid bacteria. In this current research, it was compared with the three lactic acid bacteria (Lactobacillus fermentum, Lactobacillus plantenrun and Weissalla ciberia), the antibiotics and control (without LAB and antibiotics) but the LAB group was found to be the best. It has been suggested that LAB can promote broiler performance by improving digestive function, increasing the bioavailability of dietary micronutrients,
modulating intestinal microflora, enhancing immuno-modulation and better the health of the
broiler [31; 32; 33]. In figure I of this research, it was observed that, there was a progressive
increase in body weight throughout the duration of the treatment, with the lactic acid bacteria
group recorded the highest body weight throughout the duration of the research work. This is in
agreement with the work of [34] and [20] in which probiotic bacteria significantly increased
chickens’ body weight. Figure III showed the effect of experimental treatment on weight gain. It
was observe that there was a steady increase in weight gain from week 1 to week 4 and the
weight gain started declining from week 5 to week 6 with the lactic acid bacteria group recorded
the highest weight gain throughout the duration of the research which is in total agreement with
the work of [21] in which Probiotic treatment performed well in terms of overall body weight
gain and feed conversion ratio. The decline in the weight gain at week 5 and 6 could be as a
result of a sudden rise in environmental temperature at this stage of the experiment which is
backed by the work of [21] which was reported that environmental stress factors (e.g.,
temperature, stocking density) affects the efficacy of probiotics and in this present study imped
performance (body weight gain) of broiler at week 5 and 6.

Figure IV showed the effect of the experimental treatment on mortality. The result indicates that
one mortality was recorded at lactic acid bacteria group representing 5%, two mortality was
recorded for antibiotics group representing 10% and non was recorded for the control group
representing 0%. This is in total variance with the work of [28; 35] in which beneficial
microorganism reduced mortality owing to their synergistic and biotherapeutic effects which
marked decrease in mortality observed in broiler after probiotic administration [36].

Conclusion

Probiotic lactic acid bacteria showed a significant promise to replace antibiotics in broiler
production as it shows clearly its edge over antibiotics in this research. Hence lactic acid bacteria
can come to rescue antibiotics and further help to curtail antibiotic resistance.


