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Effect of administering lactic acid bacteria (*lactobacillus bulgaricus*) as growth promoter on performance of broiler chickens *at starter phase*

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Abstract

The experiment was carried out at the poultry unit of the teachings and research farm, department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna to determine the effect of administering Lactic Acid Bacteria (LAB) as growth promoter to check the performance of broiler chickens at starter phase. 210 day old broiler chicks were used. The birds were randomly allotted to five treatment groups. Each treatment having three replicate with 16 birds. T_1 was the control with no LAB administered, T_2 had LAB administered weekly, T_3 had the probiotic administered at one-week interval, T_4 had LAB administered at week 1 and 4. While in T_5 LAB was given only once. The birds were fed locally formulated diet irrespective of treatment while the LAB was administered through their drinking water at a concentration of 10^6 cfu/ml diluted into 4 litres of chlorine-free water at different intervals. At the end of the study, final weight and total weight gain were found to have significant ($P<0.05$) difference at the starter phase, with T_4 showing much performance. At the end of the study, it was deduced that lactic acid bacteria can conveniently be used to improve performance of broiler chicken at the starter phase when administered at concentration of 10^6 cfu/ml diluted into 4 litres of chlorine-free water.

Keywords: probiotics, Lactic Acid Bacteria, antibiotics, broiler chickens, performance.

Effet de l'administration de bactéries lactiques (Lactobacillus bulgaricus) comme stimulateur de croissance sur les performances des poulets de chair en phase de démarrage

Résumé

L'expérience a été réalisée dans l'unité avicole de la ferme d'enseignement et de recherche, département de production animale, école d'agriculture et de technologie agricole, Université fédérale de technologie de Minna, pour déterminer l'effet de l'administration de bactéries lactiques (LAB) comme promoteur de croissance sur vérifier les performances des poulets de chair lors de la phase de démarrage. Des poussins de chair âgés de 210 jours ont été utilisés. Les oiseaux ont été répartis au hasard dans cinq groupes de traitement. Chaque traitement comporte trois répétitions avec 16 oiseaux. T_1 était le contrôle sans LAB administré, T_2 avait LAB administré chaque semaine, T_3 avait administré le probiotique à une semaine d'intervalle, T_4 avait LAB administré aux semaines 1 et 4. Alors qu'en T_5 LAB

n'avait été administré qu'une seule fois. Les oiseaux ont été nourris avec un régime formulé localement quel que soit le traitement, tandis que le LAB a été administré dans leur eau de boisson à une concentration de 106 ufc/ml diluée dans 4 litres d'eau sans chlore à différents intervalles. À la fin de l'étude, il a été constaté que le poids final et le gain de poids total présentaient une différence significative (P < 0,05) lors de la phase de démarrage, le T_4 montrant de grandes performances. À la fin de l'étude, il a été déduit que les bactéries lactiques peuvent être utilisées de manière pratique pour améliorer les performances des poulets de chair lors de la phase de démarrage lorsqu'elles sont administrées à une concentration de 106 ufc/ml diluées dans 4 litres d'eau sans chlore.

Mots-clés: probiotiques, bactéries lactiques, antibiotiques, poulets de chair, performance.

Introduction

Probiotics and other organics used to boost performance of animals especially chickens have really resulted in improved production and consequently, more availability of animal protein and improved intake. Just as in many developing nations, Nigeria's dietary animal protein intake fall short by 4.5g of recommended 35g per person/day (FAO 2001). Poultry production is one of the most active field of Agriculture gaining unprecedented acceptance. This is due to the increasing and persistence demand for poultry product such as meat, eggs as well as poultry liter used as manure or source of protein in ruminant nutrition. In recent times, commercial poultry farmers are faced with different challenges. One of such challenges is the focal point of this study. The principal goal of any poultry farmer is to improve his production using locally and readily available resources to maximize profit. But with the recent awareness regarding antibiotic resistance and ban on the usage of antibiotic particularly in the United States of America which is one of the biggest producer and consumers of poultry product in the world, there has been a conscious effort to find a replacement to antibiotic in poultry production (Ahmah, 2004). Several alternatives have been considered, such as probiotics, which are defined as live microorganisms that confer a health benefit on the host [Shokaiyan *et al.,* 2019]

Sub-therapeutic use of antibiotics in poultry production has been undesirable due to the residuals in meat product and development of antibiotics-resistant bacteria population in human. In Europe, usage of antibiotics as growth promoting agent has been discouraged. In addition, increase pressure by poultry users and regulatory agencies for reduction or complete stoppage of the use of antibiotics in food processing animals has led to the need to secure an alternative to maintain health and production in animal.

Probiotics has the ability to register their beneficial effect by maintaining a normal intestinal balance achieved through stimulation of the immune system, lowering the blood serum cholesterol level, promote lactose tolerance, detoxifying colonic contents and secreting metabolites that are essential to maintain healthy intestine (Hooper *et al.,* 2001; Salma *et al.,* 2007; Willis *et al.*, 2008).

Strains of LAB such as lactobacillus, streptococci and bifidobacteria are the most common bacteria used in probiotic preparation. Lactic Acid Bacteria (a Lactobacilli species) are microaerophilic gram-positive bacteria typically contained in milk, fruits, and soil. They retain the natural equilibrium in chicken intestines while preserving the natural stability of the microflora. (Chen *et al.,* 2019) They reduce the fat content The ability of probiotics to

mitigate against pathogens may be attributed to competition for nutrient, production of antibacterial substances and the stimulation of immunity (Perdigon and Alvarres, 1995). Though it has been studied over a decade, *Lactobacillus reuteri* under stable condition, can convert glycerol to reuterin, a water soluble potent inhibitor of Gram-positive and Gram-negative bacteria over a wide range of pH and not affected by hydrolytic enzymes (Ortiz-Rivera *et al.,* 2017).

Growth stimulation is another factor where action of probiotic is said to have positive result. Although it is stated that, probiotic supplementation has no significant effect on performance of broiler chick (Ergun *et al.,* 2000. However, we are of the opinion that probiotics are the most potent growth promoters. To sum it all, scientists are increasingly providing evidence to prove that probiotics act by stimulating immune system, promote growth, positively affect feed conversion and hence production in farm animals. Several alternatives have been considered such as prebiotics, which is defined as micro-organisms that conifers help benefits on the host (Slokaaiyan., 2019)

In view of this it has become necessary to find an alternative to the use of antibiotic in food animal. Probiotic becomes an option due to its numerous benefits through conferment of a healthy benefit on the host (Shokaiyan *et al.,* 2019). It increases intestinal microbial community, promotes general and immunological health and improving feed digestion and nutrient absorption and thus improving growth performance in food-producing animals (Cao *et al.,* 2018). We, however hypothesized that, natural anti-microbes can have positive effect on the gut micro flora thereby improving broiler growth performance at starter phase. The objective of the study therefore is, to determine the effect of lactic acid bacteria administered at different intervals on the performance of broilers at starter phase.

Materials and Methods

The study was carried out *at the poultry unit of the Teachings and Research Farm, department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna* to investigate the effect of administering lactic acid bacteria to check the performance of broiler chickens at starter phase. A total of 210 day old broiler chicks were bought from a reputable Farrm and randomly and equally allotted to five experimental treatments in three replicate. Each treatment had 42 birds with 14 birds per replicate in a complete randomized design (CRD). The birds had free access to basal feed and water. The feed was locally formulated (Table 1).

Probiotic culture used for the experiment was obtained from fresh cow milk. The milk was obtained from Maizube Farm, Bida, Niger State in an airtight sterile container to avoid contamination. It was taken to the microbiology laboratory of the Department of Microbiology, School of Science and Science Education, Federal University of Technology, Minna for culturing and extraction of LAB. The medium used for the bacteria growth was lactic acid bacteria medium. It consists of the following: agar-agar (3.7g), gelatin (0.63g), glucose (1.25g), lactose (1.25g), and sucrose (0.13g). The chemicals were dissolved in a 250 ml conical flask using 100ml distilled water. It was then heated for complete dissolution of the agar-agar at 121^0C for 15 minutes and sterilized using electric autoclave. The media was allowed to cool to 45^0C before dispensing into sterile petri dishes. The petri dishes were flamed using Bunsen burner to avoid any possible contamination and allowed to gel on the bench.

Method of serial dilution was used to obtain the concentration of the bacteria in 1ml of the solution. Ten-fold serial dilution of the

organism was made out of which 10^6 cfu/ml was used as dilution factor. The dilution factor (10^6 cfu/ml) was taken to the experimental site and diluted into four liters of chlorine-free water. Before giving the probiotic to the birds, they were fasted for an hour and then allow to drinking the inoculated water for another hour.

LAB was administered orally every Tuesday morning depending on the treatment. It was administered in the following order; T_1 (control) no LAB administered, T_2 LAB administered every week. T_3 LAB administered at week and week 3, T_4 LAB administered at week 1 and 4 while T_5 had LAB administered only once.

Data obtained was processed using analysis of variance (ANOVA). The computer packaged used is SPSS 17.0 (2007). Duncan Multiple Test (1995) was used to separate means. The probability of ($p<0.05$) was considered as statement of statistical significance.

Results and Discussion

Table 1: Composition of Experimental Diet

Ingredients	**Comp0sition %**
Maize	39.86
Maize bran	11.40
Soy bean	49.09
Fish meal	3.00
Palm oil	1.30
Bone meal	1.20
Limestone	1.00
Lysine	0.20
Methionine	0.50
Salt	0.20
Premix	0.25
Total	100
Calculated values	
ME(Kcal/Kg)	2946.87
Crude protein%	23.00
Crude fibre	4.70
Lysine	1.30
Methionine	0.37
Calcium	0.51
Phosphorus	0.37

Premix (vitamin/Minerals) contributed the following per 100g diet: vit.A (7,500.00IU),vit.D (500.00IU), Vit. E (1000.00IU), Vit. B1 (375mg), Vit B2 (125mg), Vit. B3 (500mg), Vit B6 (159mg), Vit B12 (2.5mg), Vit K (15mg), Vit. C (10mg), and Folic acid (150mg),Cu (8.0mg), Ca (12.5mg), Fe (32mg), I (0.8mg), Se (100mg), Mg (0.25mg), Chlorine (120mg), panthotenic acid (14.4mg).

Table 2: Proximate Composition of the experimental Diet

Parameters	**Starter diet**
Dry matter	92.50
Crude protein	23.53
Crude fibre	4.47
Ether extract	6.34
Ash	8.50
NFE	49.46

Table 3: Performance of Broilers Administered Lactic Acid Bacteria at starter Phase

Parameters	T_1	T_2	T_3	T_4	T_5	SM	LS
Initial weight	30.95	32.60	28.20	30.77	32.32	0.66	NS
Final weight	638.46^{ab}	621.24^{abc}	613.67^{b}	652.32^{a}	601.30^{c}	6.37	*
BWG	607.51^{ab}	588.64^{ab}	585.48^{ab}	621.51^{a}	569.98^{b}	6.41	*
Feed intake	1439.04	1440.47	1360.05	1487.98	1480.49	2149	NS
FCR	2.28	2.45	2.34	2.40	2.46	0.04	SN

abc= means with the same superscript within the same row are not significantly ($p>0.05$) different
SEM=Standard Error Mean, BWG= Body weight gain
LS= Level of Significant
NS= Not significant
*= Significant at $p<0.05$
T (1,2,3,4 and 5) = Treatments

The effect of administering lactic acid bacteria as a growth promoter on performance of broiler chickens on starter phase is presented in Table 2. The initial weight as expected showed no level of significance ($p<0.05$) on the experimental birds. However, the results indicated that administration of *Lactobacillus bulgaricus* of 10^6cfu/ml in their drinking water at different intervals has significant ($p<0.05$) difference on body weight and final weight gain of birds in T4. This result is in agreement with the findings of Azza *et al.* (2012) and Ajuma *et al.* (2005), who reported improved weight gain in broilers whose diets were supplemented with probiotic products in their diet. Also Mohan *et al.,* (1996); Noh, (1997); Zilkifli *et al.* (2001) and Lan *et al.* (2003) reported more weight gain in birds fed probiotics as a growth promoter. There was no significant ($p>0.05$) different in feed intake across the treatments. The results also agreed with the findings of Murry *et al.* (2006) who observed reduced feed intake of feed containing probiotic as against the control. Yalcirkayl *et al.* (2008) reported similar observation, where they reported that, additive intake of probiotic does not have effect on feed intake in broilers. However, Habibi *et al.* (2013) discovered that there is low intake of diet containing probiotics as compared to the control diet, thereby increasing the availability of nutrient and improved digestion.

Feed conversation ratio also indicated no significant ($p>0.05$) difference across the treatments. This result is in agreement with the findings of Abmad, (2004) who could not find any difference in feed conversion ratio of broiler chickens in the treated group. Slokaiyan (2007) reported similar observation, that consumption and conversion ratio were not affected by dietary inclusion of probiotic and yeast supplementation. However, Habibi *et al.,* (2013) found that feeding broiler chickens with a diet containing probiotics, such as Bactocell has effect on growth and changing of useful microorganisms in the gut system and decreases the acidity of the consumed feed. It also prevents growth of pathogenic and urease producing bacteria. This leads to abundant nutrient due to bird's health improvement as a result of proper digestion and absorption with consequence body weight gain and feed conversion.

Conclusively, result from the study, evidently point to the fact that, Lactic Acid Bacteria can be successfully Used as growth promoter in poultry production especially broiler chickens. It is useful in improving weight gain when administered at two weeks interval (T_4) using a dilution rate of 10^6cfu/ml in four liters of water.

It is therefore recommended based on the results obtained from the study that, further research is needed to elucidate the mechanism of action of lactic acid bacteria at two weeks interval using a dilution rate of 10^6cfu/ml in four liters of chlorine-free water. It should further check performance as well as antibacterial action of lactic acid bacteria as a growth promoter in broiler production.

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