CARCASS CHARACTERISTICS OF BROILER CHICKENS PROVIDED WITH LOCALLY MADE PROBIOTICS AS REPLACEMENT FOR ANTIBIOTICS

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ABSTRACT

Locally formulated probiotics were prepared in the biological laboratory of Ekiti State Polytechnic in three separate 5 Litre capacity air-tight plastic kegs each having maize, sorghum and rice as substrates respectively. They were then used to wholly replace Tetracin® (a feed-grade antibiotic) in the diet of Arbor Acre broiler chickens in 3 separate treatments (corresponding to each formulation) through feed administration from week 2 onwards of brooding till week 8 of rearing. There were two control diets (Treatments 1 and 2, respectively) that had inclusion of Tetracin® at the recommended rate and no inclusion of Tetracin®, respectively. Initial and final body weight of birds were determined in addition to weekly feed intake. At the end of the feeding trial, 20 birds per treatment were slaughtered, defeathered, eviscerated and dressed, with primal cuts made and weight of various organs determined. The live weight, bled weight and eviscerated weight respectively were significantly (P<0.05) higher in Treatments 1 and 5 compared toTreatments 2, 3 and 4). As for the primal cuts, breast weight was significantly (P<0.05) higher in Treatments 1 (1405g), 2 (1468g) and 5 (1343g) compared to 3 (1063g) and 4 (1197g). Proximate composition revealed that the sorghum based probiotic had the highest protein content (2.67%) while it was least in maize (1.10%). The Nitrogen free extractives fraction was least in rice based probiotic (4.57%) and highest in maize (10.02%). It is recommended that local substrates be used in formulating probiotics in broiler chickens' diet for easy adoption by farmers.

Keywords: Probiotics, Antibiotics, Broiler chickens, Carcass, Meat quality

INTRODUCTION

Antibiotics have been used for many years in fighting pathogens in livestock and notoriously as growth promoters. The latter role has been met with justifiable criticism. They play a major role in building the immunocompetence (i.e. ability of the body to produce a normal immune response towards exposure to an antigen) of birds against infectious diseases. Gadde *et al.,* (2018) reported that over more than six decades dietary antibiotics have been used not only as a means to control infectious diseases but also to improve growth performance and feed utilization. Probiotics are live microorganisms which when administered in adequate amounts confer a beneficial health effect on the host. Lactic acid bacteria (LAB), *Bacillus* and *Bifidobacteria* are the most common types of probiotics (Parvez *et al.,* 2006). There has been a serious concern about the indiscriminate use of antibiotics as feed supplement in poultry. This has resulted in residue deposition of the antibiotics in animal products, which invariably pose health hazards to humans because of the potential development of antimicrobial resistance and about transference of antibiotic resistance genes from animal to human microbiota (Mathur and Singh, 2005). As a result of this, antibiotics used as growth promoters in poultry feeds are banned by the European Union (EU, 2006). In view of this, different alternatives that could enhance the natural defence mechanisms of animals and reduce the massive use of antibiotics should be looked into. Among such potential alternatives are prebiotics, probiotics, organic enzymes, yeast culture, extracts and essential oils of some herbs and spices (Hooge, 2006).

Generally, the optimum performances of livestock require the use of wholesome diet which can be procured at least cost in order to ensure profit maximization for the farmer. Chickens are one of the most common and widespread domestic animals. In Nigeria and several countries, consumers' awareness of the deleterious impact of indiscriminate antibiotic usage on livestock welfare and human health has influenced its gradual falling-off (Chah *et al.*, 2022). The National Agency for Food and Drugs Administration Control (NAFDAC) released a policy in November 2023 that banned the use of all classes of antibiotics as growth promoters in animal feed (Nairametrics, 2023) Consequently, the use of natural herbs, spices and their extracts (botanicals) which can be collectively regarded as phytogenics in chicken feeds does not only help to stimulate feed intake but also help to improve digestibility, antimicrobial, anti-inflammatory, anti-oxidant and immune-stimulant activity (Kumra *et al.,* 2014) with no harmful effect on the final consumer. Antibiotics are naturally-occurring synthetic or semi-synthetic compounds with antimicrobial activity and have been an integral part of the poultry industry for more than sixty years. They have been used as feed additives in the poultry industry to enhance gut health and to control subclinical diseases (Nasir and Grashorn, 2010). The use of these substances offered possibilities to improve animal performance and increased economic output of livestock. producing units. However, antibiotic growth promoters in poultry have been banned in some countries because of objectionable harmful and side effects. Such harmful effects include the development of microbial resistance to these products (Botsoglou and Fletouris, 2001). Consequently, alternatives like prebiotics, probiotics, organic acids, herbs, spices and various

plant extracts considered to be natural products are now receiving attention. In this study, the use of some natural probiotics was investigated, with three substrates serving as culture. The goal is to help farmers easily adopt the innovation from this study.

MATERIALS AND METHODS

A total number of 240 Arbor-Acre Broiler chicks were purchased from a reputable hatchery and transported humanely to Gbaibi Farms, Isan-Ekiti under conducive weather conditions. The location is roughly between latitudes 15° 39′ 15′ and 15° 36′ 19″ N and longitudes 70° 12′ 33″ and 70° 10′ 40″ E at a height of around 544 metres above mean sea level. It is situated in the rainforest agroecological zone, Southwestern district of Nigeria. The birds were brooded together for a period of 14 days following the standard conditions. They were then randomly assigned to five treatments in a completely randomized design containing 48 birds each with 12 birds per replicate. Birds in Treatment 1 were administered with conventional dose of Tetracin®, those in Treatment 2 **had no** Tetracin® nor probiotic while Treatments 3, 4 and 5 respectively had oral probiotic formulations prepared with rice, maize and sorghum correspondingly as substrates. All the birds were provided with iso-caloric and iso-nitrogenous feed in a manner met their nutritional needs, along with clean water. Their average initial body weight was determined as well as weekly weights throughout the experiment's duration. After an eight-week period post arrival and rearing of the chicks, they were placed on fasting metabolism and one bird per replicate (for each treatment) was randomly selected, the final body weight determined and each, humanely sacrificed by severing the jugular vein. Parameters such as bled weight, eviscerated weight, weight of visceral organs were determined for each bird. Meat preparation was done using a wet cooking method. The samples were wrapped in impervious polythene pouches which could not be destroyed by cooking process. In the process, the meat samples were cooked in boiling water for 20 minutes using water bath with no spices added to the meat. The meat was then served to a 20-member taste panel drawn from faculty and students in the Department of Agricultural Technology, Ekiti State Polytechnic, Isan-Ekiti. The trained panelists evaluated the samples for colour, flavour, juiciness, tenderness and general acceptability. The assessment was based on a 9-point hedonic scale. The score was arranged in a descending order with a maximum score of 9 given to extremely like condition while the lowest score of 1 was assigned for the poorest condition. All data obtained were processed and subjected to a one-way analysis of variance (ANOVA) using statistical analysis software (SPSS version 21). Significantly different means were separated using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

The live weight, bled weight and eviscerated weight respectively were significantly ($P<0.05$) higher in Treatments 1 and 5 compared to others (Treatments 2, 3 and 4). As for the primal cuts, breast weight was significantly ($P<0.05$) higher in Treatments 1 (1405g), 2 (1468g) and 5 (1343g) compared to 3 (1063g) and 4 (1197g). Thigh weight was significantly ($P<0.05$) higher in Treatment 3 (637g) than 2 (271g), 4 (425g) and 5 (465g). Drumstick weight was significantly ($P<0.05$) lower in Treatment 2 (335g) than 1 (478g) and 5 (454g).

Table 1: Proximate composition of the Probiotic formulations

Probiotic Substrates/Proximate Fractions	Moisture (%)	Ash (%)	Ether Extract (%)	Crude Fibre (%)	Crude Protein (%)	NFE (%)
Maize	86.50	0.71	0.21	1.38	1.10	10.02
Rice	91.30	0.59	0.37	1.74	1.41	4.57
Sorghum	85.42	0.41	0.65	1.81	2.67	9.01

Note: NFE – Nitrogen Free Extractives

Table 2: Carcass characteristics of broiler chickens

Organ wt./ Treatments	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Live wt (g)	4620^{a}	4150^{c}	4300^{b}	4000^{c}	4480^{a}
Bled wt (g)	4400^{a}	4050^{bc}	4190^{b}	3880^{c}	4330^{a}
Ev. Wt (g)	3870^{a}	3260^{c}	3524^{ab}	3230^{c}	3660^{a}
Breast wt. (g)	1405^{a}	1468^{a}	1063^{c}	1197^{c}	1343^{ab}
Back wt. (g)	662^{a}	550^{b}	604^{ab}	592^{ab}	708^{a}
D/stk. wt (g)	478^{a}	335^{b}	387^{ab}	375^{ab}	454^{a}
Shank wt. (g)	138^{a}	90^{c}	138^{a}	121^{ab}	135^{a}
Thigh wt. (g)	526^{ab}	271^{c}	637^{a}	425^{b}	463^{b}
Wing wt. (g)	306^{ab}	273^{c}	405^{a}	291^{c}	311^{ab}
Head wt. (g)	84^{a}	70^{ab}	82^{a}	85^{a}	90^{a}
Abd. fat (g)	22^{b}	44^{a}	0^{d}	0^{d}	7^{c}

a,b,c,d : Means along the same row with different superscripts differ significantly ($P<0.05$)

Key: Wt – weight, Ev. – Eviscerated, D/stk – Drumstick, Abd. – Abdominal.

Note: Treatment 1 contained Tetracin®, Treatment 2 contained No Tetracin® nor probiotic, Treatment 3 contained Maize based probiotic, Treatment 4 contained Rice based probiotic, Treatment 5 contained Sorghum based probiotic.

Proximate composition revealed that the sorghum based probiotic had the highest protein content (2.67%) while it was least in maize (1.10%). The Nitrogen free extractives fraction was least in rice based probiotic (4.57%) and highest in maize (10.02%). Studies have shown that after probiotics supplementation, non-pathogenic bacteria from probiotics compete with the pathogenic bacteria in gut for nutrients; colonize the intestine, leaving no space for harmful bacteria to occupy or establish; and secrete digestive enzymes (viz. galactosidase, amylase, etc.), which helps in the increased absorption of nutrients and improves the growth performance of animals (Jadhav *et al*. 2015).

CONCLUSION

Based on the growth indices taken as well as primal cuts, it was evident that birds administered sorghum based probiotic fared well compared to those supplied with maize and rice, respectively. In addition, the growth rate compared favourably with diets that had antibiotic inclusion. It is recommended that local substrates be used in formulating probiotics in broiler chickens' diet for easy adoption by farmers as demonstrated in this study.

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