DIETARY INCLUSION OF DIRECT FED MICROBE ON THE GROWTH PERFORMANCE OF BROILER BIRDS

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Abstract
A study was conducted using one hundred and twenty day-old Ross 308 broiler chicks to evaluate the dietary inclusion of direct fed microbes on the growth performance. The birds were obtained from a reputable hatchery and randomly assigned to four dietary treatments, each with three replicate of ten birds. The treatments were T1, T2, T3 and T4, the levels of inclusion of direct fed microbes (DFM) were 0%, 2.5%, 5.0% and 7.5% respectively. The birds were assigned to these diets, feed and water was given *ad libitum* throughout the duration of the experiment which lasted for 56 days. The experimental design was Completely Randomized Design (CRD). Data were collected daily and weekly to show the growth performance of the broilers. The results show that the growth performance of the broiler chicken fed diet containing different level of direct fed microbes did not differ significantly (P>0.05) in initial weight, final weight, daily weight gain, daily feed intake and feed conversion ratio at the 0%, 2.5%, 5.0% and 7.5% respectively. From the result it could be concluded that birds fed diet 2 performed better as they compete favourably with the control.

Keywords: Direct Fed Microbe, Growth Performance and Broiler birds

Introduction

The ultimate aim of any livestock industry is the attainment of sustainable livestock production in the shortest time possible in order to produce animal protein with minimum cost (Doumba, 2002). Feed additives have been the major intervention used to improve performance and profitability of commercial poultry enterprise (Mandel *et al*., 2000). Antimicrobials have been used as feed supplement for more than 50 years in poultry feed to enhance the growth performance and to prevent diseases in poultry. However, in recent year, great concern has arisen about the use of antibiotics as supplement at sub-therapeutic level in poultry feed due to emergence of multiple drug resistant bacteria (Wray and Davies, 2000). As a consequence, it has become necessary to develop alternatives using either beneficial micro-organsims or non-digestible ingredients that enhance microbial growth. A probiotic is a culture of a single bacteria strain, or mixture of different strains, that can be fed to an animal to improve some aspect of its health (Griggs and Jacob, 2005). Probiotics are also referred to as direct fed microbes (DFM). On the other hand, a prebiotic was defined as non-digestible food ingredient that beneficially affects the host, selectively stimulating the growth or activity, or both, of one or a limited number of bacteria in the colon (Gibson and Roberfroid, 1995).

Therefore, the use of probiotics otherwise known as direct fed microbes (DFM) (Ashayerzadeh *et al*., 2011) is one of the approaches that has a potential to replace antibiotics as a result of the direct fed microbe ability to prevent internal colonization of entero-pathogenic enzymes, stimulate intestinal immunity of birds and also reduce stress in animals (Fuller, 2000). The advantages of using probiotics over the tradition antibiotics are: no withdrawal time, no residual effect and no causes of microbial mutation (Ghally and Abd El-Latif, 2007). Probiotics have been defined as a live microorganism when administered through the digestive tract has a positive impact on the host health through its direct nutritional effect (Banday and Risam, 2000). Also, according to FAO/WHO (2002), probiotics is seen as "live microorganisms which when administered in adequate amount confer a benefit to the host health". The probiotics is a product that contains a dynastic vital microorganism with enough number to have an ability to change a number of flora (formation of colonies) inside the host which alters hygienic imported trails in the host (Schrezenmier and Vrese, 2001).

The research for safe and natural alternative that will be effective on animal growth and free from harmful side effects on consumer health which eventually reduce over-dependence on the use of antibiotics (growth promoters) has led to the investigation of dietary inclusion of direct fed microbes on the growth performance of broiler birds.

Materials and Methods

Experimental Site

The experiment was conducted at the poultry unit of the teaching and research farm of Michael Okpara University of Agriculture Umudike, Abia State. The area is located on latitude 05^{o}27 North, longitude 07^{o}32 East, with an altitude of 123m above sea level. Umudike has an ambient temperature of 22^{o}C – 36^{o}C with annual rainfall of 2177mm and relative humidity of above 50-90% (2010).

Test Material

The microbes used in this study were L. acidophilus, *Bifidobacterium thermophilus* and *Enterococcus faecium* which are mainly beneficial bacteria

Experimental Birds and Management

A total of one hundred and twenty (120) Ross broiler strain chicks were used. They were divided into four (4) treatments, with each treatment containing thirty (30) birds. Each treatment as replicated three (3) times while each replicate contained ten birds. A week before the birds were introduced, the poultry house was fumigated, washed, disinfected and allowed to dry for seven days. The birds were vaccinated against Newcastle disease (NCD 1/0). They were also given anti-stress preparations to enable the chicks recover from stress they may have passed through during transportations from the hatchery to the site of the experiment. Infections bursa disease vaccine was administered at the 10th and 28th day respectively. Antibiotics and anti-coccidial drug recommended by a veterinarian was also administered as at when due. Heat and light was supplied to the birds with the aid of kerosene stove and lamps respectively. The litter was always replaced with wet to discourage the growth of pathogens. Biosecurity and other important routine management practices were observed. The feeding trial lasted for eight weeks (56 days). Feed and clean water was given *ad libitum* to the birds.

Experimental Diets

The experimental diet contained the adequate level of nutrients for broilers as recommended by the National Research Council (1994). The test-ingredient, direct fed microbes was supplied from United States of America (USA). Four experimental diets were formulated with direct fed microbes. The composition of the experimental diets is shown in Table 1 and 2 below.

The treatment are as follows:

T1 = 0% (control)
T2 = 2.5% inclusion level
T3 = 5% inclusion level
T4 = 7.5% inclusion level

Table 1: Percentage composition of broiler starter diets supplemented with direct for microbes

Ingredients	T1	T2	T3	T4
Maize (yellow)	50.00	50.00	50.00	50.00
Soya bean meal	25.00	25.00	25.00	25.00
Wheat offal	8.00	8.00	8.00	8.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	10.00	10.00	10.00	10.00
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Vit./mineral premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
DFM (%)	0.00	2.50	5.00	7.50
Crude protein	22.95	22.93	22.91	22.89
ME (Kcal/kg)	2945	2930	2945	2950

DFM: Direct fed microbes

Experimental Design

The experimental design used was completely randomized design (CRD). The statistical model for completely randomized design in given below:

Yij = μ+Ti+ eij

Where

Yij = single observation

μ = overall mean

Ti = effect of the treatment

Eij = experimental error

Table 2: Percentage composition of broiler finisher diet supplemented with direct fed microbes

Ingredients	T1	T2	T3	T4
Maize (yellow)	52.00	52.00	52.00	52.00
Soya bean meal	20.00	20.00	20.00	20.00
Wheat offal	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	11.00	11.00	11.00	11.00
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Vt/mineral premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
DFM (%)	0.00	2.50	5.00	7.50
Crude protein	20.86	20.53	20.34	20.22
ME (Kcal/kg)	3050	3062	3068	3071

DFM: Direct fed microbes

Data Collection

The initial body weights of the birds were measured at the beginning of the experiment and subsequently on a weekly basis. The body weight of the birds were measured weekly while left-over feed in each replicate was weighed in the morning before feeding the birds. The parameters that were measured include: Daily feed intake (DFI), Feed conversion ratio (FCR), Average daily feed intake and Body weight gain (BWG)

Results and Discussion

The growth performance of broiler chicken fed diets containing different levels of direct fed microbes is presented in Table 3. No significant differences (P>0.05) were observed in initial weight, final weight, daily weight gain, daily feed intake (DFI) and feed conversion ratio (FCR) at the 0%, 2.5%, 5% and 7.5% levels of the direct fed microbes (DFM) based diets.

Table 3: Growth performance of broiler chicken fed diet containing different levels of direct fed microbes

Parameter	T1 0%	T2 2.5%	T3 5%	T4 7.5%	SEM
Initial weight (g)	50.00	50.00	50.00	50.00	50.00
Final weight (g)	2700.00	2466.67	2566.67	2566.67	77.97
Daily weight gain (g/day)	47.32	43.15	44.94	44.94	1.39
Daily feed intake (g/day)	164.62	190.30	176.67	182.45	4.56
Feed conversion ratio	3.49	4.53	3.93	4.08	0.19

Means did not differ significantly at P>0.05; SEM = Standard error of the mean

The direct fed microbes based diets performed similarly to the control diet. Considering the seemingly higher feed intake of the diets containing DFM which was associated with equally a seemingly higher FCR, it can be deduced that either the level at which the DFM was included in the diets was probably not sufficient or that the interaction of the species making up the probiotics did not meet suitable conditions to effect a significant change in the growth performance in broiler chicken. The intestinal tracts of newly hatched chicken are basically sterile i.e. containing no microorganisms. Through feeding, microbes gradually colonize the gastro-intestine tract (GIT) forming a stable microbe consortium overtime. Studies have shown that it takes 2-4 weeks for a stable microbe consortium to form in the GIT of chicken (Ashayerzadeh *et al*., 2011).

The diets containing the direct fed microbes (T2, T3 and T4) were expected to perform better than the control diet (T1) due to the characteristic quality of DFM in enhancing digestion and improving performance in broiler chickens, but this was not the case in this study as the final weight, daily weight gain and feed conversion ratio of the trial diets (T2, T3 and T4) did not perform significantly higher than the control. The non significant difference of the treatment mean values for the growth performance parameters suggests that the DFM can be included up to the 10% level. This however, will depend on its economic value in reducing cost and increasing weight which was not apparent on the result of the growth performance traits in this study. Several researchers reported that feeding DFM had improved the growth performance of broiler chicken (Lee *et al*., 2010). More specifically, Lee *et al*., (2010) demonstrated that the improvements in body weight gain and FCR of broilers fed thepax and yoghurt (contains mainly lactobacilli) were probably due to the lactobacilli present in yoghurt. Those improvements could be ascribed to better nutrient digestion and absorption due to the presence of enzymes derived from lactobacilli. Boostani *et al*., (2010) reported that administration of selected probiotic (FM-B11) to turkeys increased the average daily gain and market body weight, representing an economic alternative to improve turkey production. Torres-Rodriguez *et al* (2007) and Yalcin *et al*., (2013) observed better performance effect of dietary direct-fed microbes (DFM) than antibiotics supplementation in broiler chicken and concluded that DFM could be an alternative to the use of antibiotic growth promoters in broilers diets as regards increased feed intake, improved weight gain and feed efficiency. The present result did not produce significant improvement but at the same time it did not produce any adverse effect on the birds since the trial diets performed similarly to the control diet.

The microbes used in this study were L. acidophilus, Bifidobacterium thermophilus and Enterococcus faecium which are mainly beneficial bacteria. Bacteria are more commonly reported as probiotic than fungi and two genera of bacteria are mostly reported including lactic acid bacteria of the genus Lactobacllus (Bonus *et al*., 2012) and Bifodobacteria (Sato *et al*., 2009). Enterococcus however is among the bacteria including Bacillus, Streptococcus, Lactococcus, Pediocococcus etc that have been reportedly used to a lesser extent in poultry and animal probiotic (Bonus *et al*., 2012). In broiler nutrition, probiotic species belonging to Lactobacillu, Streptococcus, Bacillus, Bifidobacterium, Enterococcus, Aspergillus, Candida, and Saccharomuces have a beneficial effect on broiler performance (Ashayerzadeh *et al*., 2011), modulation of intestinal microflora and pathogen inhibition (Willis *et al*., 2010), intestinal histological changes (Higgins *et al*., 2007) and immunomodulation (Samanya and Yamauchi, 2002).

However, it is important to note that poultry DFM products do not always result in enhanced bird productivity when applied in poultry rearing operations (Matsuzuaki et al., 2007) as observed in this study. As a result, measurements of animal performance as observed in poultry receiving DFM treatment have been met with variable results. Flint and Garner (2015) reported that using 2 commercially available DFM products in chicken did not result in significant differences with respect to body weight gain, feed conversion. The lack of positive effect on body weight gain or FCR in chicken fed DFM has also been reported elsewhere (Ashayerzadeh *et al*., 2011) and in pig (O'dea, 2006). The lack of improved production results in this present study could be due to a multitude of factors, including use of a product that did not deliver sufficient numbers of viable organisms to the animals, use of a product that was improperly manufactured or that contained inappropriate organisms, or impairment of bird performance by infectious agents that were not affected by the DFM product applied. There is also evidence to show that better performance can be achieved by the use of mixture of microorganisms with different species rather than a single microbe species or strain (Shon *et al*., 2005). Despite the use of a mixture of organisms in this study, no significant improvement was observed. Thus, other factors could have affected the result of this study.

Generally, it is hypothesized that the potential benefit of DFM depends upon the microbe species, strain, concentration or dosage, production techniques, storage condition, management practices and environmental conditions among the experiments (Starvic *et al*., 1995). Either one or some of these factors may be responsible for the unimproved result observed in this study.

Conclusion

This study attempted an assessment of the effect of direct fed microbes in improving growth performance of broiler chicken The direct fed microbes used in this study did not produce any significant effect between the control and trial diets in the growth performance of the broiler chicken used in this study. While the findings of this study concurred with most of the findings established by previous researchers, observed disparities may be attributed to differences in the strains, concentrations, dosage, storage, potency, specificity of the probiotics used in this study as well as differences in management, breeds, sex effects and environmental conditions, among others. It is apparent from this study that T2 which revealed the best feed conversion ratio could be considered for adoption by farmers in the diets of broiler chicken. On a general note, the DFM products used in this study could be examined singly or in association with some beneficial fungal microbes such as yeast to see if they can improve the growth performance significantly as well as improve the carcass performance of broiler chicken.

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