COMPARATIVE PERFORMANCE TRAITS OF BROILER CHICKENS FED FINISHER DIETS SUPPLEMENTED WITH YEAST (*SACCHAROMYCES CEREVISIAE*), *LACTOBACILLUS SPOROGENES* AND *LACTOBACILLUS ACIDOPHILUS*

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ABSTRACT

The study was conducted to compare the effect of three probiotics; yeast (Saccharomyces cerevisiae), Lactobacillus sporogenes and Lactobacillus acidophilus fed during finisher phase on the performance of broiler chickens. One hundred and twenty unsexed day old Anak broilers were used for this study. They were maintained ad- libitum for 4 weeks on a starter diet. At the end of the starter phase, the birds were transferred to experimental pens and distributed into four treatment groups (T1-T4) of thirty birds each having similar live weight. The treatments were replicated three times having 10 birds each arranged on completely randomized design (CRD). Birds on T1 (control) had basal feed, those on T2 received 0.5 g of Lactobacillus sporogenes/kg of feed; while those on T3 got 0.8 g of yeast/kg feed and those on T4 received 0.5 g of Lactobacillus acidophilus/kg feed. Data on feed intake, and live weight, carcass yield, internal organs and cost were taken. Results showed that the probiotics did not significantly (P>0.05) influence feed intake but increased live weight gain and better feed conversion ratio (P<0.05) when compared with broilers fed control diet. There were similarities in the liver, spleen and heart weights. The weights of gizzard, digestive tract and spleen relative to live weight of broilers on control diet were significantly higher (P<0.05). Feed cost/bird and feed cost/kg weight gain were higher in birds on control diet compared to those on diets supplemented with L. sporongenes, S. cerevisiae and L. acidophilus. A better gross margin/bird (₦776.82) was posted by probiotic groups with S cerevisiae over the other probiotics. It was concluded that the use of S. cerevisiae as a probiotics is preferred to L. sporogenes and L. acidophilus in broilers' diet.

Keywords: Broiler chickens, *Lactobacillus sporogenes, Lactobacillus acidophilus*, Performance, Yeast.

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INTRODUCTION

The level of human consumption of food products of animal origin in Nigeria was estimated at 8g per person per day as against 35g which was noted to be the minimum requirement for developing countries (FAO, 2001). According to Obioha (1992) increasing poultry productivity appeared to be the surest way of closing this protein deficiency gap within the shortest time possible. To do this, nutritionists and experts in animal production had advocated for the inclusion of additives particularly probiotics in compounded feed (O'Keefe, 2005).

A probiotic is defined as a live microbial feed supplement which beneficially affects the host by improving its intestinal microbial balance and promoting performance (Fuller, 1989). The Food and Agricultural Organization defined probiotics as live microorganisms which when consumed in adequate amount, confer health benefits on the host (FAO, 2001). The microorganisms commonly used in animal feed are mainly gram-positive bacteria strains belonging to the genera of *Lactobacillus, Enterococcus, Streptococcus, Bfidobacterium, Pediococcus* and Bacillus and fungal species such as *Saccharomyces cerevisiae* (Starvic *et al.*, 1995).

Nahason *et al.* (1996) carried out an extensive poultry trial using *Lactobacillu*s strain as feed supplement for pullets, and noted increases in feed consumption, live weight gain and egg size. Savage *et al* (1996) discovered that supplementing mannan oligosaccharide (MOS), a cell wall component of yeast in poultry feed resulted in a significant weight gain and improvement of feed conversion. Ezema (2007) supplemented yeast (*Saccharomyces cerevisiae*) in broilers' feed at 0.8g/kg and noted increase in nutrient utilization.

Probiotics had been in use in developed countries for more than half a century; however there is limited published information on its use in developing countries such as Nigeria. This study was therefore designed to compare the effect of yeast (*Saccharomyces cerevisiae*), *Lactobacillus sporogenes* and *Lactobacillus acidophilus* on the performance of broiler chickens at finisher phase.

MATERIALS AND METHODS

Study location: The experiment was carried out at the Teaching and Research Farm of University of Nigeria, Nsukka, in the humid rain forest zone of Nigeria.

Test materials: The probiotics used in this study were *Lactobcillus acidophilus* (45,000 Million CFU), *Lactobacillus sporogenes* (50 million CFU) and yeast (*Saccharomyces cerevisae*). The quality of the yeast (*Saccharomyces cerevisiae*) was determined by culturing on Dextrose Agar for 48 hours and the number of yeast cells per gram was counted using a digital colony counter.

Experimental feeds: A basal starter and finisher diets were formulated as shown in Table 1 below.

Table 1: Composition of Experimental Diets

Ingredients (%)	Starter	Finisher
Maize	53.00	52.00
Soya bean meal	30.00	28.00
Palm kernel cake	10.30	15.30
Fish meal	3.00	1.00
Bone meal	3.00	3.00
Table Salt	0.25	0.25
L-Lysine	0.10	0.10
DL-Methionine	0.10	0.10
Premix	0.25	0.25
Total	100.00	100.00
Calculated Nutrient Composition (%)		
Protein	22.05	20.00
Metabolizable energy (KcalME/Kg)	2880	2850
Calcium	1.20	1.05
Phosphorus	0.90	0.80
Lysine	1.10	1.0
Methionine	0.35	0.33

Experimental Birds and Designs: A total of 120 day old Anak broiler chicks were purchased and brooded for three weeks on single formulated starter diet. Prior to their arrival, a brooding pen was carefully prepared by washing, disinfection and fumigation. At the end of the brooding period which lasted for three weeks, the birds were transferred to an open floor pen where they were reared till the fourth week. They were divided into four treatment groups (T1-T4) of 30 birds each at the end of the fourth week which was the starter phase. Each group was further divided into 3 replicates of 10 birds each in a completely randomized design (CRD). All the treatments groups had similar average live weight (866.5±6.5g) of not less than 860g and not more than 873g. This was achieved by adopting the continuous reshuffling method as described by Ndelekwute *et al*. (2014). Each treatment group was assigned to a treatment diet which was formed by adding to basal finisher diet, 0.5g of the *Lactobacillus sporogenes*, 0.8 g of *Saccharomyces cerevisiae* and 0.5g *Lactobacillus acidophilus* per kg of the feed which represented T2, T3 and T4 respectively, while T1 was the control which received the basal diet. The inclusions of bacteria probiotics were as recommended by the manufacturers, while *Sacharomyces cerevisiae* was at its best level of inclusion as recommended by Ezema (2007). Treatment 1 was maintained on the basal diet and served as control. All the birds were fed and watered *ad-libitum* till the end of the experimental period which lasted for 4 weeks. Appropriate vaccinations and preventive medications were carried out.

Data Collection: Data collected were feed intake, live weight, carcass weight and organ weight. Live weight gain and feed intake were used to calculate the feed conversion ratio. Weights of carcass parts and organs were determined by first slaughtering 24 birds (two per replicate) by complete severing of the neck with a sharp knife and removal of feathers (Scott *et al*., 1969). Both the carcass weight and organ weights were expressed as percentage live weight. Economic benefit analysis was carried out according to Ndelekwute *et al* (2013).

Statistical Analysis: At the end of the study, data obtained were subjected to one-way statistical analysis of variance according to Steel and Torrie (1980). Means were compared using Duncan's Multiple Range Tests (Duncan, 1955).

RESULTS AND DISCUSSION

The colony count of the *Saccharomyces cerevisiae* was 4.86 x 10^{10} cfu, which was higher than the colonies of *Lactobacillus acidophilus* (4.5x10^{10} cfu) and *Lactobacillus sporogenes* (5.0 x 10^{7} cfu). Table 2 shows the effect of different probiotics on growth performance of finisher broiler chickens. There was significant difference ($P < 0.05$) in final live weight. Addition of *Saccharomyces cerevisiae* improved growth followed by *Lactobacillus acidophilus* and *Lactobacillus sporongenes*. The high performance observed with broilers on Treatment 3 can be attributed to the relative high colony counts and the higher dose associated with *Saccharomyces cerevisiae* when compared with other probiotics used. The colony count effect could be ascribed to *Lactobacillus acidophilus*. This is in agreement with Jin *et al* (1998) who observed that failure of the expected benefits of some probiotics can be attributed to their low concentration (that is colony forming units – cfu) and the subsequent inability of the strain to colonize or survive in the gastrointestinal tract of the animal host.

The results showed that probiotics investigated did not significantly influence feed intake but increased weight gain and improved feed conversion ratio (FCR) when compared with broilers fed the control diet. Finisher broilers fed feed supplemented with *Saccharomyces cerevisiae* had the best FCR. This corroborates with Samanta and Biswas (1995) who observed that probiotics have no effect on rate of feed consumption in broilers. Goh and Hwang (1999) noted that probiotics promoted weight gain and feed efficiency. This was true because probiotics improve the nutrient status of the animal by enabling more efficient use of the nutrient present in the diet and not by stimulating appetite (Damron, 2009). Moreso, the increased live weight gain and feed efficiency observed in treatment 3 could further be attributed to the beneficial effects of *Saccharomyces cerevisiae* which is a natural rich source of proteins, minerals and B-complex vitamins (Erwin, 1953; Anderson, 1998). Van Leeuwan *et al.* (2005) noted that yeast culture (*Saccharomyces cerevisiae*) has cell wall extract that contains D-glucan and mannan oligosaccharide which are important natural growth promoter for modern livestock and poultry production.

Table 2: Effect of probiotics on performance of finisher broiler chickens

Parameters	T1	T2	T3	T4	SEM
Initial live weight (g/bird)	860	863	863	873	30.28
Final live weight (g/bird)	1814[d]	2000[c]	2200[a]	2100[b]	60.00
Daily gain (g)	34.07[d]	40.61[c]	47.75[a]	43.82[b]	3.81
Daily Feed intake (g/bird)	161.43	154.26	150.71	167.86	26
Feed conversion ratio (FCR)	4.74[a]	3.80[b]	3.16[c]	3.83[b]	0.05
Mortality (%)	0.00	0.00	0.00	0.00	0.00

abcd.Means along the row with different superscript are significantly (P<0.05) different. T1 = Control, T2 = L. *sporongenes*, T3 = S. *cerevisiae*, T4 = *Lactobacillus acidophilus*

It was noted that only broilers fed diet containing *Saccharomyces cerevisiae* had a higher significant carcass weight (dressing percentage) when compared with other groups. The significant improvement in the carcass weight of the broilers could be attributed to a better microbial environment in the gut and availability of nutrients for muscle development (Panda *et al*, 2000).

The broilers in treatment 2 had the highest weight of intestines, gizzard and spleen compared to all the other treatments. This is corroborated by research done by Celik *et al.* (2007) who reported that supplementing probiotics in poultry feed increased the weight of the gizzard and intestines. However no significant difference was noticed in the weight of the heart as they were.

Table 3: Effect of Probiotics on carcass and Internal organs of Finisher broiler chicken (%)

Parameters	T1	T2	T3	T4	SEM
Dressing Percentage	70.10[b]	74.18[ab]	76.84[a]	73.47[ab]	5.70
Gizzard	1.54[b]	2.30[a]	1.44[b]	1.43[b]	0.08
Liver	1.93[ab]	2.47[a]	1.94[ab]	1.76[b]	0.60
Heart	0.45	0.46	0.47	0.37	0.10
Spleen	0.12	0.18	0.14	0.12	0.02
Intestine	8.54[b]	12.13[a]	8.26[b]	7.91[b]	3.0

ab.Means along the row with different superscript are significantly (P<0.05) different. T1 = Control; T2 = L. *sporongenes*, T3 = *Saccharomyces cerevisiae*, T4 = *Lactobacillus acidophilus.*

The cost of feed required to produce a whole chicken and a kilogram live weight were cheapest in broilers that consumed *Saccharomyces cerevisae* and most costly in control broilers. The gross margin was higher in probiotic groups. This improved profit margin in supplemented groups especially with the use of *Saccharomyces cerevisiae* resulted from higher live weight. This is in conformity with the reports of Tamilvanan *et al.* (2003) who observed that the feed cost/kg live weight gain was less in probiotics fed broilers.

Table 4: Cost Benefit of using Probiotics on Finisher broiler chickens

Parameters	T1	T2	T3	T4	SEM
Cost/kg feed (₦)	76.00	76.00	76.00	76.00	-
Feed cost/bird (₦)	360.02[a]	332.46[c]	323.18[d]	343.52[b]	7.58
Feed cost/Kg live weight (₦)	189.79[a]	166.23[ab]	146.90[c]	177.44[ab]	19.01
Feed cost/Kg weight gain (₦)	360.24	288.80	240.16	291.08	-
Revenue/bird (₦)	905[d]	1000[c]	1100[a]	1050[ab]	85.80
Gross Margin/bird (₦)	561.48[c]	667.54[b]	776.82[a]	689.98[b]	104.50

abc.Means along the row with different superscript are significantly (P<0.05) different. T1 = Control, T2 = L. *sporongenes*, T3 = S. *cerevisiae*, T4 = L. *acidophilus*.

CONCLUSION

- Inclusion of yeast, *Lactobacillus sporogenes* and *Lactobacillus acidophilus* as probiotics in broiler finisher diets promotes their growth better than those on control diet without probiotics.
- Yeast was a better growth promoter than *Lactobacillus sporogenes* and *Lactobacillus acidophilus* as probiotics as it gave a better live weight that increased the profit margin.
- Incorporating yeast in broiler feeds could enable the farmer to minimize cost and maximize profit.

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