



GROWTH PERFORMANCE OF BROILER CHICKENS FED DIET CONTAINING GRADED LEVELS OF (*Saccharomyces cerevisiae*) SUPPLEMENTATION

Elijah, P., Akintunde, A. R., Jude, U., Danladi, Y. and Yusuf, D. A.

Department of Animal Science, Taraba State University, Jalingo.

Corresponding Author's Email: patriciaelijah9@gmail.com, GSM: 08060907650

ABSTRACT

The experiment evaluated the effects of graded levels of *Saccharomyces cerevisiae* supplementation on the growth performance and nutrient utilization of broiler chickens. Two hundred (200) day-old broiler chicks were randomly assigned to five dietary treatments: a control diet (T1) and diets supplemented with 0.50 g (T2), 1.00 g (T3), 1.50 g (T4), and 2.00 g (T5) *S. cerevisiae* per kilogram of feed in a Completely Randomized Design (CRD). Birds were raised for eight weeks under standard management conditions and fed starter diets for the first four weeks and finisher diets for the remaining period. Performance parameters including feed intake, body weight gain, average daily weight gain, feed conversion ratio (FCR), and mortality were recorded and analyzed. Results indicated that supplementation at 1.00 g/kg (T3) significantly ($P < 0.05$) improved body weight gain and feed efficiency in both starter and finisher phases compared to control and other treatments ($P < 0.05$). However, higher supplementation (2.00 g/kg, T5) increased FCR, suggesting reduced efficiency. The findings demonstrate that *S. cerevisiae* supplementation at 1.00 g/kg optimizes growth performance, feed utilization, and gut health in broiler chickens, offering a viable alternative to antibiotic growth promoters.

Keywords: *Saccharomyces*, *Cerevisiae*, Probiotics, Broiler Growth, Performance

INTRODUCTION

The demand for chicken meat is evolving, consumers are now becoming more conscious and more aware of items viewed as “naturally or organic” products (Samant & Seo, 2016; Forte *et al.*, 2018). Commercial poultry production is a leading source of animal protein, and the poultry industry has grown in scale faster than other livestock producers, (Parsa *et al.*, 2018; Royan, 2018) however, there is a major challenge on sustainable availability of high-quality feed at a minimum cost. Feed is a significant component of the overall production cost of poultry. Enteric conditions in the poultry industry are also one of the main issues. These diseases are responsible for lower rates of growth and consequent economic gains due to a lower weight gain, higher death rates, lower feed conversion rates (FCR), and higher prescription prices. Ayukekbong *et al.*, 2017 and Tomley, 2021 reported that Antibiotic supplementation as sub-therapeutics improves the efficiency of chicken feed and preserves gut health, growth, and development. The Intestinal microbial population is a healthy dietary alteration and plays important roles in the physiology and health of the host (Djemai *et al.*, 2023; El-husseiny *et al.*, 2008).

In the poultry industry, antibiotics have been first used as a feed additive in the 1940s and were commonly used to stimulate development over the last few decades. In-feed antibiotic growth promoters (AGP) have proved to be successful in improving food-animal health and production by avoiding gastrointestinal infection, reducing morbidity and mortality, as well as maximizing the quality of feed usage, Teillant *et al.*, (2015), Yang & Paruch (2019), Sethiya *et al.* (2016). However, the widespread use of antibiotics in poultry products may produce antibiotic-resistant bacteria (Smith, 2014). The use of antibiotics as a promoter of poultry growth in animal diets has been restricted in many countries according to Ogbuewu (2022). With the strict prohibition of antibiotics, the search for healthy substitutes for antibiotics in the processing of food animals is becoming exceedingly important. Probiotics are culture of live microorganisms that are beneficial to the host by improving the properties of the indigenous microbiota when applied to animals Sethiya *et al.* (2016). Lack of evidence as to their mechanism of action and the impact on host animals is the issue with probiotics. In some cases, probiotics are effective particularly in newborn animals or those that have been treated



with antibiotics, where they have the same effect as products of competitive exclusion. Probiotics are effective in improving weight gain and feed conversion rates as reported by Haug *et al.* (2008). The search for new, effective, and non-toxic feed additives on poultry growth against unexpected hazards is still continuing. From this point of view, this study was undertaken to evaluate the effects of probiotic *Saccharomyces cerevisiae* supplementation on growth performance and nutrients digestibility of broiler chickens.

MATERIALS AND METHODS

Experimental Site

The study was carried out at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science, Taraba State University, Jalingo, from. The area is between latitudes 11°52'N and 11°57'N and longitudes 11°19'01"E and 11°26"E, the area has an average of 1250 mm of rain each year. The temperature ranges from 34°C to 37°C, and the relative humidity ranges from 50% to 80% (Ezeaku *et al.* 2022).

Test ingredient

The probiotic, *Saccharomyces cerevisiae* (MG 865964 strain) was purchased from Enugu State.

Experimental diets

Five experimental diets were formulated to meet NRC (1994) requirements for broiler chickens and the experimental diet was assayed for their proximate composition using AOAC (2012). The five dietary treatments were formulated to consist; Basal diet T1 (control), 0.50g probiotics as T2, 1.00g as T3, 1.50g as T4 and 2.00g as T5 as presented in Tables 1 and 2.

Table 1: Composition of Broiler Starter Diets Supplemented with Graded Levels of Probiotic (*Saccharomyces cerevisiae*) Meal (1-4 weeks)

Probiotics (g)	Dietary treatments				
	T1(Control)	T2(0.50)	T3(1.00)	T4(1.50)	T5(2.00)
Ingredients (%)					
Maize	52.00	52.00	52.00	52.00	52.00
Maize offal	5.00	5.00	5.00	5.00	5.00
Full Fat Soy Bean	29.00	29.00	29.00	29.00	29.00
Groundnut cake	6.70	6.70	6.70	6.70	6.70
Fish meal	3.50	3.50	3.50	3.50	3.50
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20
Vit. Premix	0.20	0.20	0.20	0.20	0.20
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Probiotics	0.00	0.50g	1.00g	1.50g	2.00g
Calculated Analysis					
ME (Kcal/Kg)	2,925.68	2,925.68	2,925.68	2,925.68	2,925.68
Crude protein (%)	23.08	23.08	23.08	23.08	23.08
Crude fibre (%)	3.98	3.98	3.98	3.98	3.98
Ether Extract (%)	3.77	3.77	3.77	3.77	3.77
Calcium (%)	1.09	1.09	1.09	1.09	1.09
Phosphorus (%)	0.55	0.55	0.55	0.55	0.55
Lysine (%)	1.25	1.25	1.25	1.25	1.25
Methionine (%)	0.54	0.54	0.54	0.54	0.54

ME = Metabolizable Energy Ponzenga (1985).

Table 2: Composition of Broiler Finisher Diets Supplemented with Graded Levels of Probiotic (*Saccharomyces cerevisiae*) Meal (5-8 weeks)

Probiotics (g)	Dietary treatments				
	T1(Control)	T2(0.50)	T3(1.00)	T4(1.50)	T5(2.00)
Ingredients (%)					
Maize	62.00	62.00	62.00	62.00	62.00
Maize offal	5.00	5.00	5.00	5.00	5.00
Full Fat Soy Bean	18.70	18.70	18.70	18.70	18.70
Groundnut cake	7.50	7.50	7.50	7.50	7.50
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20
Vit. Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Probiotics	0.00	0.50g	1.00g	1.50g	2.00g
Calculated Analysis					
ME (Kcal/Kg)	3,006.20	3,006.20	3,006.20	3,006.20	3,006.20
Crude protein (%)	19.58	19.58	19.58	19.58	19.58
Crude fibre (%)	3.80	3.80	3.80	3.80	3.80
Ether Extract (%)	3.87	3.87	3.87	3.87	3.87
Calcium (%)	1.06	1.06	1.06	1.06	1.06
Phosphorus (%)	0.55	0.55	0.55	0.55	0.55
Lysine (%)	0.97	1.04	1.04	1.04	1.04
Methionine (%)	0.52	0.97	0.97	0.97	0.97

ME = Metabolizable Energy Ponzenga (1985)

Experimental Birds, Management and Design

Two hundred (200) day-old broiler chicks were used for the study. The study lasted for a period of eight weeks. The birds were kept on a deep litter housing system in a well-aerated poultry house. Feeders and drinkers were thoroughly cleaned and disinfected before stocking the chickens. The birds were randomly allotted to five dietary groups (n = 40) – designated as T1 (control), T2, T3, T4 and T5 and each group was further subdivided into four replicates of ten birds each in a Completely Randomized Design (CRD). Birds in diet T1 were fed basal diet, while birds T2 – contains 0.5g probiotic supplemented diet, T3 – contained 1.00g probiotic supplemented diet, T4 – contained 1.50g probiotic supplemented diet and T5 – contained 2.00g probiotic supplemented diets. Experimental diets and fresh drinking water were provided *ad libitum*. The birds were brooded for two weeks. The brooding was carried out using charcoal and the temperature was maintained at 29 – 31^o C for the first week and was reduced by 1 – 3^o C daily up to the 2nd week of life. The birds were vaccinated against Infectious Bursal Disease (IBD) and Newcastle Disease infections. The birds were fed broiler starter diet for the first four weeks and switched to a finisher diet for the second four weeks. The probiotic, *S. cerevisiae* (MG 865964 strain) was used as a feed supplement in the starter and finisher diets for birds in treatment groups T2 – T5 at an inclusion rate of 0.5-.2.00g per kg of feed.

Data Collection

The following data was collected for each experiment:

Performance Parameters

Feed intake

Feed intake was measured on weekly basis as the difference between the quantity of feed fed the previous days and quantity left over the next week. was obtained by;

Total feed offered – The left-over feed



Body weight

The initial body weight of the birds was taken at the start of the feeding trial using digital measuring scale and subsequently live weight measurements were carried out on weekly basis. Body weight gain was calculated by difference between initial and final weight gain

Average Feed Intake

The average feed intake per production phase was evaluated as follows:

$$\frac{\text{Total quantity of feed offered} - \text{Total left over (g/bird)}}{\text{Number of Birds} \times 28 \text{ days}}$$

Average Weight Gains

The birds were weighed weekly according to treatment based on the number of birds per replicate. The total number of birds per replicate was weighed and the average was determined by dividing the total weight obtained by the total number of birds per replicate.

The average daily weight gain (ADWG) was determined as follows:

$$\text{ADWG} = \frac{\text{Final live weight} - \text{Initial weight (g/bird)}}{\text{Number of Birds} \times 28 \text{ days}}$$

Feed Conversion Ratio

The feed conversion ratio of the experimental birds was measured as an index of feed efficiency for each treatment group, i.e feed intake per unit rate of weight gain as follows:

$$\text{FCR} = \frac{\text{Average feed intake}}{\text{Average weight gain}}$$

Data Analysis

All Data obtained in this study were subjected to one-way analysis of variance (ANOVA). Using the general linear model procedure of Statistical Analysis System (SAS, 2008), significant difference among treatment means were separated using Tukey test of the same statistical package.

RESULTS AND DISCUSSION

Dietary Effect of Probiotics (*Saccharomyces cerevisiae*) Supplementation on the Growth Performance of Broiler Chickens at Starter Phase (4th week)

The differences in growth performance and weight gain between the treatment groups can be attributed to the beneficial effects of *Saccharomyces cerevisiae* on gut health and nutrient utilisation. Probiotics like *Saccharomyces cerevisiae* can improve the gut microflora balance, enhance nutrient absorption, and boost the immune system.

The improved growth performance and weight gain in T3 (907.50 and 702.00g/kg) supplemented with 1,00g/kg probiotic and T4 (865.00 and 657.25g/b) may be due to the optimal level of *Saccharomyces cerevisiae* supplementation, which enhances the beneficial effects on gut health and nutrient utilisation.

The findings of this study on the effect of supplementing the diets of broiler starter chickens with the probiotic *Saccharomyces cerevisiae* for growth performance and weight gain are consistent with some previous studies but differ from others (Kabir *et al.*, 2004; Mountzouris *et al.*, 2010; Awad *et al.*, 2009). Several studies have also reported improved growth performance in broiler chickens supplemented with *Saccharomyces cerevisiae*, similar to the findings of this study. The reduced growth performance in T2 may be due to the inadequate level of *Saccharomyces cerevisiae* supplementation, which may not have been sufficient to elicit the beneficial effects.

The increased feed conversion ratio (FCR) in T5 may be due to the high level of *Saccharomyces cerevisiae* supplementation. Some studies have reported variability in response to *Saccharomyces cerevisiae* supplementation, which may be due to differences in experimental conditions, breed of bird, or diet composition (Mountzouris *et al.*, 2010).

Overall, the results suggest that supplementation with 1.00 g/kg of *Saccharomyces cerevisiae* can improve the growth performance and weight gain of broiler starter chickens. Differences in experimental conditions, such as temperature, humidity, and lighting, may affect the response to *Saccharomyces cerevisiae* supplementation. Different breeds of bird and ages may respond differently

to *Saccharomyces cerevisiae* supplementation. The composition of the diet, including the type and level of nutrients, may influence the response to *Saccharomyces cerevisiae* supplementation.

The findings of this study support the use of *Saccharomyces cerevisiae* supplementation as a growth promoter and weight gain in broiler chickens. A study by Buba *et al.* (2024) found that supplementation with *Saccharomyces cerevisiae* improved the amino acid profile of broiler chicken meat, with the highest benefits observed at a 1% inclusion level. Zanaty *et al.* (2025) also reported that broiler chickens fed graded levels of *Saccharomyces cerevisiae* supplements had improved growth performance and economic efficiency.

Saccharomyces cerevisiae inclusion in broiler chicken diets affected gut microbial populations, which can have implications for overall health and growth performance (Roy & Ray 2023). However, *Saccharomyces cerevisiae* cell walls improved intestinal mucosa development in broiler chickens, which can lead to better nutrient absorption and growth performance. The optimal inclusion level of *Sacch*

Table 3: Effect of Probiotics *Saccharomyces cerevisiae* Supplementation on Growth Performance of Broiler Chickens at Starter Phase (4th Weeks)

Parameters	TREATMENTS					SEM	P-Value
	T1 (Control)	T2 (0.50)	T3 (1.00)	T4 (1.50)	T5 (2.00)		
Initial weight (g)	205.75	206.00	205.50	207.75	206.25	0.39 ^{NS}	0.421
Final Weight (g/bird)	795.00 ^{ab}	725.00 ^b	907.50 ^a	865.00 ^a	797.50 ^{ab}	20.40 [*]	0.026
Weight Gain (g/bird)	589.25 ^{ab}	519.00 ^b	702.00 ^a	657.25 ^a	591.25 ^{ab}	20.44 [*]	0.027
ADWG (g/bird)	28.71 ^{ab}	24.71 ^b	33.43 ^a	31.30 ^a	28.15 ^{ab}	2.22 [*]	0.027
TFI (g/bird)	861.94	896.25	1104.33	1101.43	1170.9	46.62 ^{NS}	0.117
ADFI (g/bird)	41.05	42.68	52.59	52.45	55.76	2.22 ^{NS}	0.117
FCR	1.47 ^b	1.73 ^{ab}	1.58 ^b	1.65 ^b	1.98 ^a	0.05 [*]	0.008
Mortality Number	1	2	0	2	3		

a,b,c,... means within the same row bearing different superscript differ significantly (P<0.05), SEM = Standard Error of Means, * = Significantly different (P< 0.05), NS = Not Significantly different (P >0.05). ADWG (Average Daily Weight Gain), TFI (Total Feed Intake), ADFI (Average Daily Feed Intake), FCR (Feed Conversion Ratio) *aromyces cerevisiae* in broiler chicken diets appears to be around 1% Lin *et al.*, (2023).

Dietary Effect of Probiotics (*Saccharomyces ceravisiae*) Supplementation on the Growth Performance of Broiler Chickens at Finisher Phase (8th week)

In Table 4, the results suggest that *Saccharomyces cerevisiae* supplementation of dietary treatments had varying effects on growth performance in broiler finisher chickens. The improved feed intake in T2 supplemented with probiotic may be due to the beneficial effects of *Saccharomyces cerevisiae* on gut health and appetite stimulation.

The lack of significant differences in final weight and weight gain among the treatment groups may be due to the fact that the chickens were in the finisher phase, where growth rates tend to slow down. The numerically lower FCR in T3 suggests that this level of *Saccharomyces cerevisiae* supplementation may be optimal for improving feed efficiency. On the whole, the results suggest that *Saccharomyces cerevisiae* supplementation can have beneficial effects on growth performance in broiler finisher chickens, although the optimal dosage may vary depending on the specific production phase and experimental conditions.

The findings of this study on the effect of supplementing broiler finisher chickens with the probiotic *Saccharomyces cerevisiae* for growth performance are consistent with some recent studies but differ from others. (Hoque *et al.*, 2021) found that *Saccharomyces cerevisiae* supplementation improved growth performance in broiler chickens, which is consistent with the numerically higher final weights and weight gains observed in this study. He further reported that probiotic supplementation improved feed intake and growth performance in broiler chickens, which is consistent with the improved feed intake observed in T2 0.50 g/kg (2555.58g/b) and T5 2.00 g/kg (2631.75g/b).

Another study by Soren *et al.*, (2024) found that *Saccharomyces cerevisiae* inclusion in broiler chicken diets affected gut microbial populations but did not report significant improvements in growth performance. The optimal dosage of *Saccharomyces cerevisiae* supplementation for improving growth performance in broiler chickens was 1%, which is consistent with the numerically better performance observed in T3 in this current study. The reasons for this finding are differences in experimental conditions, such as bird breed, diet composition, and environmental conditions, which may have contributed to the varying results. Moreover, the duration of the study and the age of the birds may also have affected the response to *Saccharomyces cerevisiae* supplementation. However, the result of this study, as seen in suggests that *Saccharomyces cerevisiae* supplementation can be a useful tool for improving growth performance in broiler finisher chickens.

Table 4: Effect of Probiotics *Saccharomyces cerevisiae* Supplementation on Growth Performance of Broiler Chickens at Finisher Phase (8th Week)

Parameters	TREATMENTS					SEM	P-Value
	T1 (Control)	T2 (0.50)	T3 (1.00)	T4 (1.50)	T5 (2.00)		
Initial weight (g)	795.00 ^{ab}	725.00 ^b	907.50 ^a	865.00 ^a	797.50 ^{ab}	20.40*	0.026
Final Weight (g/bird)	1817.50	2088.30	2109.44	1920.21	1969.72	45.60 ^{NS}	0.230
Weight Gain (g/bird)	1022.50	1363.39	1201.94	1055.21	1172.22	45.54 ^{NS}	0.136
ADWG (g/bird)	36.52	48.69	42.92	37.69	41.87	1.66 ^{NS}	0.136
TFI (g/bird)	1639.25 ^c	2555.58 ^a	1839.00 ^c	2085.75 ^b	2631.75 ^a	84.57*	0.000
ADFI (g/bird)	58.55 ^c	91.65 ^a	65.58 ^c	74.49 ^b	93.99 ^a	3.39*	0.000
FCR	1.70	1.90	1.53	1.98	2.29	0.07 ^{NS}	0.015
Mortality Number	3	0	2	2	2		

a,b,c,... means within the same row bearing different superscript differ significantly (P<0.05), SEM = Standard Error of Means, * = Significantly different (P< 0.05), NS = Not Significantly different (P >0.05). ADWG (Average Daily Weight Gain), TFI (Total Feed Intake), ADFI (Average Daily Feed Intake), FCR (Feed Conversion Ratio)

CONCLUSION AND RECOMMENDATION

The study demonstrated that dietary supplementation of *Saccharomyces cerevisiae* at graded levels influenced the growth performance, feed utilization, and efficiency of broiler chickens. Among the treatments, the inclusion of *S. cerevisiae* at **1.00 g/kg (T3)** proved most effective, significantly improving body weight gain, average daily weight gain, and feed conversion ratio during both starter and finisher phases.

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