

The Effect of Graded Levels of Spent Brewers' Yeast (*Saccharomyces cerevisiae*) on Growth Performance of Broiler Chickens

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Abstract: Background: The rising prices of livestock feeds and the scarcity of conventional proteins and energy concentrates for the formulation of feeds have forced the animal scientists to search for alternative, cheaper and readily available protein and energy sources. **Methods:** Five experimental diets containing 0, 5, 10, 15 and 20% spent brewers' yeast used to replace soya bean were formulated and used to feed broiler chickens for 50 days. Two hundred 14 day old "sayerd" broiler chickens were used to determine the growth performance and economics of broiler fed the formulated feeds. The experiments were in a completely randomized design with the five treatments each replicating four times with 40 birds per treatment and 10 birds per replicate. **Results:** The average live weight of broiler chicken ranged from 1963-2063 g in each dietary group but were not significantly affected by dietary treatment ($p > 0.05$). The average daily feed intake was however significantly affected ($p < 0.05$) by the dietary treatment. Feed cost/kg weight gain was lowest at the 20% level of spent yeast replacement (₦279.92) and highest at the 10% level of replacement (330.87) but was not significantly affected ($p > 0.05$) by the dietary treatments. **Conclusion:** The results showed that spent brewers' yeast can be used to replace soya bean as protein source in broiler feeds with no adverse effect on growth performance resulting in reduced cost of feeds which will then translate in cheaper birds for consumers and a higher profit margin for poultry farmers.

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1. Introduction

The search for alternative sources of local ingredients to produce good quality feeds is an ongoing research in Nigeria. This is because conventional ingredients for animal feeds such as soya beans and maize are also used by humans as food and other industries and this makes them costly (Edema *et al.*, 2005).

The general objective of poultry nutrition is to maximize the economics of production performance of birds. Diets are therefore formulated to provide specific level of nutrients that are needed for optimum performance (Uchegbu *et al.*, 2009). Performance indices looked into include feed conversion ratio, growth rate health of birds and their body conformation. What determines these are the energy, protein and amino acids contents of the diets. Of all feed ingredients protein sources are the most costly in Nigeria. Since broilers are fast growing birds, diets of high energy content promote fast growth and is therefore recommended that their metabolizable energy (ME) contents should not be less than 12.2 MJ/kg (Whitehead, 2002).

It has been reported that feed accounts for not less than 70% of the total cost of production livestock ventures. Therefore, there is the need to focus on

cheaper sources of feed ingredients in order to maximize profits and avoid losses. Spent brewers' yeast is a by-product of the brewery and distillery industries. It contains protein, amino acids and vitamins and can replace soya beans as protein source in the production of good quality poultry feeds. It is cheap and available and humans do not consume it. It is usually dumped into the environment as a waste product. This increases the pollution of water bodies by increasing the biological oxygen demand (BOD). Its use in feed formulation will therefore also serve as a way of its disposal. Yeasts are among the single cell proteins which are good sources of protein, energy, amino acids, vitamins (especially the B-complex vitamins), crude fibre and metabolizable energy (ME) (Brainer *et al.*, 2016). The objective of this study was to assess the effect of graded levels of brewers' yeast as replacement for soya bean in feeds on growth performance of broilers and the economic implication of using these feeds.

2. Material and Methods

Experimental Diets

Five (5) isonootrognous starter and finisher diets were formulated for the study. Diet 1 was the formulated feed control containing 0% spent brewers'

yeast. Diets 2, 3, 4 and 5 contained 5, 10, 15 and 20% spent brewers' yeast respectively, replacing soya bean cakes for starter and finisher feeds. The composition

of the feeds are given in Table 1 based on calculated values.

Table 1: Composition of broiler starter and finisher feeds containing graded levels of spent brewers' yeast

Ingredients	Starter					Finisher				
	0 (%)	5 (%)	10 (%)	15 (%)	20 (%)	0 (%)	5 (%)	10 (%)	15 (%)	20 (%)
Maize	42.00	42.00	42.00	42.00	42.00	46.00	46.00	46.00	46.00	46.00
Wheat offal	10.87	10.87	10.87	10.87	10.87	12.82	12.82	12.82	12.82	12.82
Soya bean cake	40.33	35.33	30.33	25.33	20.33	33.88	29.05	24.00	19.00	14.59
Yeast	0.00	5.00	10.00	15.00	20.00	0.00	5.00	10.00	15.00	20.00
Fish meal	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Bone meal	1.50	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.00
Lime stone	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100	100	100	100	100	100
Calculated analysis										
CP (%)	23.00	23.00	23.00	23.00	23.00	21	21	21	21	21
ME (kcal/kg)	2990.54	2989.02	2962.12	2947.86	2972.91	2982.00	2985.00	2958.00	2950.00	2900.00
Ca (%)	1.18	1.18	1.18	1.18	1.18	1.20	1.20	1.20	1.20	1.20
P (%)	1.12	1.12	1.12	1.12	1.12	0.89	0.89	0.89	0.89	0.89

Key: CP = Crude protein; ME = Metabolizable energy; Ca = Calcium; P = Phosphorus

Experimental Birds and Management

Two hundred 2 weeks old "sayer" birds were purchased at Bukuru market in Jos, Plateau State, Nigeria. The birds had been raised together for the first 13 days (adoption period) with a commercial feed (Vital Feed[®]) starter diet. The first dose of vaccine against Gumboro (infectious bursal disease) was administered on the 12th day at the hatchery. On day 14 of the age of birds, there were transported to the experimental site (Abubakar Tafawa Balewa University, Bauchi, Nigeria).

The birds were randomly picked and distributed into already labelled 20 partitions (pens) each measuring 1.4 x 2.2 m which consisted of 5 treatments with each treatment having 40 birds and these were further divided into 4 replicates of 10 birds each in a completely randomized design. Birds were individually weighed and recorded as initial weight in gram.

Isonitrogenous starter and finisher diets were supplied in each pen in an aluminium tube-type feeder. Water was supplied in a plastic 4-litre drinker. On this day the birds were fed with a mixture of 50% normal broiler starter diet (Vital Feed) and 50% experimental starter diet of each graded level as a means of gradually introducing the birds to the experimental diets. The birds were given anti-stress and glucose in their drinking water to tide them from the stress of transportation. An antibiotic (adamacine) was also given to prevent them from being infected by microorganisms which could come from the hatchery

or during transportation. The birds were vaccinated against Newcastle disease on the 21st day of age and against the 2nd dose of Gumboro on the 28th day. The feeds and clean drinking water were provided *ad libitum*. All the birds were subjected to the same experimental and management conditions.

Feeds and water were checked in the mornings, afternoons and nights to ensure continuous supply. Starter diets were fed for the first 25 days after which finisher diets were fed for another 25 days. The experiment lasted for 50 days, 25 days each for starter and finisher phases.

Data Collection and Statistical Analysis

Data were collected on initial body weight and final body weights, weight gain and feed intake. Data on feed intake and weight gain were used to calculate feed conversion ratio (FCR). Feed cost/kg weight gain were calculated based on the prevailing market prices of the feed ingredients at the time of the experiment.

Data collected were subjected to analysis of variance (ANOVA) and the difference among means were compared using Duncan's Multiple Range Test (Steel and Torrie, 1980).

3. Results

The chemical composition of the experimental diets is presented in Tables 1 and 2. The metabolizable energy (ME) values of the feeds ranged from 2947.86 – 2990.54 kcal/kg for starter broiler feeds and 2900 – 2985 kcal/kg for finisher broilers. The crude protein (CP) values for all the diets were 23% for starter diets

and 21% for finisher diets. These values agree with the recommended nutrient requirements which according to Obioha (1992), recommended ME and CP values for starter broilers are 2850 kcal/kg and 22% respectively; while those for finisher are 2900 kcal/kg and 20% respectively. Other researchers such as Aduku (2005) have reported 2800 kcal/kg ME and 3000 kcal/kg ME for starter and finisher feeds of broilers respectively. Generally, nutrients recommended for broiler starter are 2800 - 3000 kcal/kg ME, 22 - 24% CP and 2800 - 3000 kcal/kg ME, 19 - 21% CP for finisher broilers (Sacakli *et al.*, 2013). Therefore, the ME and CP of the formulated feeds met the recommended values for both starter and finisher feeds.

Performance of Experimental Birds

Data on the performance of the experimental birds are shown in Table 2. The total feed intake ranged from 5247 - 5956 g/b. The lowest which was 5247 g/b was at 20% while the highest which was 5956 g/b was at spent yeast level of 50%. There was significant difference between the feed treatments ($p < 0.05$). The results showed that spent brewers' yeast increased feed intake over the control at 5 - 15%

replacement and then began to decrease as the spent yeast level increased to 20%. This agrees with the observations that higher levels of yeast affected palatability and lower feed intake by birds (Paryad and Mahmaudi, 2008). This could be the reason for the lower weight gain at 20% yeast level.

Growth of broilers

Highest final weight, total feed intake, average daily weight gain and average daily feed intake were highest at 5% level of spent brewers' yeast replacement (2063 g, 5956 g, 37 g and 119 g respectively). Each of these parameters was lowest at 20% spent yeast replacement (1963 g, 5247 g, 35 g and 105 g respectively) (Table 2). Except for total feed and average daily feed intake which were significantly different ($p = 0.49$), all other parameters in all the dietary treatments were not significantly different ($p > 0.05$). Similar results were obtained by Paryad and Mahmaudi (2008) who reported that inclusion of *S. cerevisiae* at 1.5% level in broiler ration improved body weight, feed intake and feed conversion ratio. In this study, 5% spent brewers' yeast replacement gave the best growth parameters.

Table 2: Performance parameters of broiler chickens raised on feeds containing graded levels of spent brewers' yeast at 50 days

Growth parameters	Levels of spent yeast replacement (%)					ANOVA	p-value
	0	5	10	15	20		
Initial weight (g)(at 14 days)	231.80	233.93	242.00	241.95	226.15		0.853
Mean final weight (g) (at day 50)	2020.00	2062.50	1982.80	1987.50	1962.50		0.609
Mean total weight gain (g)	1788.20	1828.60	1745.60	1745.60	1836.30		0.628
Average daily weight gain (g)	35.77	36.57	34.91	34.91	34.91		0.627
Total feed intake (g)	5276.34	5956.38	5953.63	5955.88	5247.13		0.049*
Average daily feed intake (g)	105.53	119.13	119.07	119.12	105.48		0.049*
Feed conversion ratio	2.96	3.27	3.42	3.42	3.05		0.099
Feed cost/kg weight gain (₦)	301.89	324.82	330.87	320.79	279.92		0.093

Feed conversion ratio for broiler

The range for feed conversion ratio was 2.96 - 3.42. The lowest (2.96) was at 0% spent yeast replacement level (control) while the highest was 3.42 at 10 and 15% levels. This implies that feeds with no yeast and higher level of 20% are slightly better utilized than those at 10 - 15% spent yeast replacement. However, there was no significant difference between the treatments ($p > 0.05$) and no clear explanation for this trend.

Feed cost

The results showed that the cheapest formulated feed was at 20% spent brewers' yeast replacement (₦279.92). Diet at 10% replacement level had the highest feed cost (₦330.87). This makes replacement

of spent brewers' yeast at 20% level the most economical.

Conclusion

In view of the results obtained in the study, it can be concluded that spent brewers' yeast can be used to replace soya bean in broiler chicken production as a source of protein. In terms of economics of production, it is cheaper to use spent brewers' yeast but it has to be up to a minimum of 20% level to bring down the cost of feeds. The use of spent brewers' yeast will therefore meet the nutritional requirements of birds without any adverse effects on performance parameters with the added advantage of reducing cost of feeds translating to cheaper birds and higher profit margins for poultry farmers.

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