Nigerian J. Anim. Sci. 2018, 20 (4): 384-391

A comparative study of feeding three sources of yeast on performance of broiler chicks

Daramola, S.T [1]; Bawa, G.S [1] and Omage, J.J [2]

Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria.

Corresponding Author: susandaramola@yahoo.com ; gidsbawa@yahoo.com

Target audience: Poultry farmers, Extension workers and Researchers.

Abstract

Proximate analysis and biological studies were conducted to evaluate the performance of broiler chickens fed diets containing three sources of yeast. Brewer`s yeast slurry, local alcoholic yeast (BKT) and Bakers' yeast were assayed for their proximate composition, metabolizable energy, calcium and phosphorus contents. Generally, the proximate composition of Dried brewer`s yeast slurry was similar to that of baker`s yeast but was slightly higher (P< 0.05) than local alcoholic yeast (BKT). Baker`s yeast contained more calcium and phosphorus (3.42 % and 4.34 %) than dried brewer`s yeast slurry (0.16% and 1.24%) and Burukutu yeast (0.08 % and 0.26 %). In the starter phase, a total of one hundred and ninety two – day old broiler chicks were used to compare the nutritive value of dried brewer`s yeast slurry , Burukutu (BKT) yeast and Baker`s yeast in a complete randomized design. The birds were fed 23 % CP diets in which yeast products were fixed at 0.8 %, while the control diet contained 0 % yeast which was fed throughout the 28 day's experimental period. The growth trial showed no significant (P>0.05) difference across the dietary treatments in terms of final weight, feed intake, feed conversion ratio, protein efficiency ratio and the cost per Kg gain. It was concluded that in view of the high protein and fairly balanced amino acid profile of yeast products, yeast can be used as a growth promoter in broiler chickens diets.

Keywords: Dried brewer`s yeast slurry, Baking yeast, local alcoholic yeast (Burukutu yeast), performance, broiler chicks.

Description of Problem

Feed additives such as antibiotics, probiotics, prebiotics and coccidiostats are being used in the poultry industry for different purposes to improve performance, maintain health in poultry and decrease mortality rate (1, 2). Constraints on the use of antibiotics globally, would require an alternative to antibiotics for improved growth performance in broilers. These alternatives will need to meet consumers demand as natural products and maintain high standards of health expected in poultry meat and eggs. Increased public concern over the development and spread of antibiotic resistance and its residual effects in poultry products has led to alternative additives in chicken diets (3). In recent years, the use of yeast products in poultry industry has effectively increased weight gain and feed to gain ratio (4, 5). Probiotics such as yeast are natural growth boosters that can replace antibiotics in non-nutritive uses in poultry production and boost immunity (6).

The yeast cell wall is a rich source of complex carbohydrates (46% glucan and 43%

mannan) that could play an important role in gut micro flora, improved immunity and meat quality (7). (8) indicated that the use of mannan oligosaccharide, derived from the *Saccharomyces cerevisiae* cell walls in broiler chicken diet reduced colonization by enteropathogenic bacteria.

Several feeding trials reported by (9) and (10) have indicated that supplementation of 0.3-0.5% yeast *Saccharomyces cerevisiae* in broiler starter and finisher diets was effective in improving growth and feed efficiency. In another research 0.6-0.9 brewer`s yeast was more effective in broiler diets (11, 12 and 13). In another experiment, when 0.5 and 1% yeast was added in the finishing diet, average daily gain and conversion index were better (12). On the contrary (14) reported improved performance of broiler chickens fed 1.5% level of inclusion of brewer`s yeast (*Sacchromyces cerevisiae*) in the diet. According to reports by (15) when varying levels of brewer's yeast slurry ranging from 0-1.0 % birds fed 0.8% had the optimum level of growth performance. In addition to the use of Brewer's yeast, there are other yeast sources such as Baker's yeast and local beer (Burukutu) yeast whose potentials in poultry diets are yet to be exploited.

Therefore the objective of this study was to determine the effects of feeding dried brewer`s yeast slurry, baking yeast and local alcoholic yeast (Burukutu yeast - BKT) on the growth performance of broiler chicks based on the optimum level of performance obtained from an earlier research conducted.

Materials and Methods

Experimental Site

The study was conducted in 2010 at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, Ahmadu Bello University, Zaria, Kaduna State, within the Northern Guinea Savannah Zone of Nigeria, Latitude 11^0 12^0 N and Longitude 7^0 33`E at an altitude of 610m above sea level (16). The zone has average annual maximum and minimum temperatures of 31.8 ± 3.2◦C and 18.0 ± 3.7◦C, respectively. The monthly average rainfall during the rainy season (May–October) is 148 ± 68.4mm (69.2–231.9mm), while the monthly relative humidity is 71.1 ± 9.7% (17).

Chemical analysis

The proximate composition of the Brewer's yeast Slurry, Baker's yeast and Burukutu yeast were determined at the Biochemical Laboratory, Department of Animal Science, Ahmadu Bello University Zaria. The analyses for each sample were done in triplicates. The Dry Matter (DM) content was determined by the macro Kjeldahl method of A.O.A.C (18) and Crude protein (CP) calculated as N x 6.25. The Ash content was determined as the residue remaining after incinerating the sample at 600 ^{0}C for 3 hours in a muffle furnace. The A.O.A.C (18) methods were employed for the Ether Extract (EE) and crude fiber determinations. The mineral profile were determined using 0.5g wet digested samples of the Brewer's yeast Slurry, Burukutu yeast and baking yeast as described by A.O.A.C (16). Calcium was determined using the Perkin – Elmer (model 403) Atomic Absorption spectrophotometer (AAS). Phosphorus was estimated by the automated procedure which utilizes the reactions between phosphorus and molybdovanadate complex which was measured calorimetrically at 450nm using Technicon Auto – analyzer (19). The metabolizable energy (ME) of the three yeasts samples were estimated using the formula.
ME = 34.06 % CP x 40.82x % EE x 26.91 x % NFE as developed by (20).

Experimental diet

Four experimental diets were formulated such that Diet 1, was the control without yeast,

while diets 2, 3 and 4 had 0.8 % dried brewer's yeast slurry, 0.8 % baking yeast and 0.8 % Burukutu yeast, respectively. The diets were Iso caloric and Iso nitrogenous (23 % CP) and were balanced to meet the protein and energy requirements of young broiler chicks. Ingredients composition of the diets is presented in Table 1.

A total of one hundred and ninety two (192) day- old broiler chicks of Marshall Strain were used in a completely randomized design and were allotted to four groups treatment. There were 48 birds per treatment and each treatment was replicated three times with 16 birds per replicate in a completely randomized design. The birds were kept in a compartment measuring 2m x 3m. Electricity and kerosene stoves were used as main sources of heat for the chicks at the brooding phase. Feed and water were provided *ad libitum*. Feed offered and the left – over on the following day were weighed to determine the feed intake of birds. The birds were weighed at the beginning of the experiment and weekly thereafter. All the necessary vaccinations (intra ocular Lasota and Gumboro vaccines) were administered at the appropriate time. Weight gain, feed intake, feed conversion ratio, cost per gain were calculated. The trial lasted for 28 days (4 weeks).

Statistical Analysis

Data generated from the study were subjected to analysis of variance (ANOVA) using the general linear model procedure of statistical analysis (21) package and the difference between means were separated using the Duncan Multiple Range Test (22). All statistical procedures were used as outlined by (23).

Table 1: Composition of Experimental diets with different types of yeast Products for broiler starter phase

	Treatments			
Ingredients (%)	**T_1 (Control)**	**T_2 (Dried BYS)**	**T_3 (Baking yeast)**	**T_4 (Burukutu yeast)**
Maize	36.51	36.28	36.49	36.42
Guinea corn	18.25	18.14	18.24	18.21
Soya bean (Full fat)	15.00	15.00	15.00	15.00
Groundnut cake	25.79	25.33	25.02	25.12
Yeast type	0.00	0.80	0.80	0.80
Bone meal	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50
Premix *	0.25	0.25	0.25	0.25
Methionine +Cysteine	0.10	0.10	0.10	0.10
Lysine	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30
Total %	100	100	100	100
Calculated Analysis				
Metabolizable Energy ME (kcal/kg)	2955	2956	2960	2933
Crude Protein (%)	23.34	23.21	23.30	23.04
Crude Fibre (%)	3.21	3.18	3.17	3.17
Lysine (%)	1.24	1.24	1.25	1.23
Methionine +Cysteine (%)	0.77	0.76	0.77	0.76
Ether Extract (%)	4.76	4.73	4.85	4.71
Calcium (%)	1.32	1.32	1.32	1.32
Available Phosphorus (%)	0.59	0.62	0.64	0.59
Cost/kg of diet (₦)	60.92	63.69	66.06	64.38

* Biomix broiler starter premix supplied the following per kg diet: Vit A, 1,000 I.U; Vit D3, 2000 I.U, Vit. E, 5.0; Vit K, 2mg;VitB1 1.8mg;
Vit B2, 5.5mg; Niacin, 27.5mg; Pantothenic acid, 0.5mg VitB6, 0.30mg; Vit B12, 0.015mg; Folic acid, 0.75mg; Biotin 0.6mg; Choline Chloride,3000mg;
Copper, 3mg; Iodine, 1mg; Iron ,20 mg; Manganese, 40mg; Selenium,0.2mg; Zinc,30mg; Antioxidant, 1.25mg, ME= Metabolizable Energy.

Results and discussion

The results of the proximate composition and amino acid profile of the ^yeast samples are presented in Table 2. Dried brewer`s yeast slurry contained significantly (P< 0.05) higher dry matter (96.31%), crude protein (44.13), crude fibre (0.65%) and ash content percentage (11.11%) compared to baker`s yeast and local alcoholic yeast (Burukutu yeast).

Baker's yeast had a significantly (P < 0.05) higher ether extract (8.77%), calcium (3.42%) and phosphorus (4.34%) percentage than brewer`s yeast and local alcoholic yeast. The nitrogen free extract for Burukutu yeast (58.57) was significantly (P < 0.05) higher than that of brewer`s yeast slurry (36.92 %) and baker`s yeast (38.80 %) .

Dry brewer`s yeast slurry contained significantly (P < 0.05) higher dry matter (96.31 %),crude protein (44.13%), crude fibre (0.65 %) and ash (11.11 %) but decreased Ether extract (7.21 %) and Nitrogen free

extract (36.90%) compared to baker`s yeast and local alcoholic yeast (Burukutu yeast).

The average crude protein content of the different sources of yeast had values ranging from (38.69 - 44.13) which was similar to the reports of (13) and (24) these values were higher than 38 % CP for full fat soyabean as reported by (2) which is a conventional protein feed ingredient. The average crude fibre value for the different yeast products such as dried brewer`s yeast slurry (0.65 %), baker`s yeast (0 %) and local alcoholic yeast (Burukutu yeast) (0 %).The result showed that brewer`s yeast slurry had a low value in terms of crude fibre. The percent crude fibre value of Brewer`s yeast slurry obtained in this study (0.65 %) were lower than the values (2.7 %) reported by (13). The calcium and phosphorus content of dried brewer`s yeast slurry were 0.16 % and 1.24 % respectively which were significantly ($P < 0.05$) lower than the value obtained for baking yeast (3.42 % and 4.34%) respectively. The values obtained in this study were comparable to the findings of (14) they reported the calcium and phosphorus values of yeast supplements (*Saccharomyces cerevisiae*) as (0.12 % and 1.4 %) respectively.

The performance of broiler chicks fed different sources of Yeast (*Saccharomyces* spp) is presented in Table 3 and Figure 1.

Table 2: Proximate composition of dried brewer`s yeast slurry, Baking yeast and Burukutu yeast

(On as fed basis)

	Yeast type			
Parameters (%)	BYS	Baking Yeast	BKT Yeast	SEM
Dry matter	96.31[a]	94.07[b]	92.88[c]	0.580
Crude protein	44.13[a]	43.77[b]	38.69[c]	0.003
Crude Fibre	0.65[a]	0.00[b]	0.00[b]	0.002
Ether Extract	7.21[b]	8.77[a]	0.89[c]	0.004
Ash	11.11[a]	8.66[b]	1.85[c]	0.004
NFE	36.90[c]	38.80[b]	58.57[a]	0.012
Calcium	0.16[b]	3.42[a]	0.08[c]	0.147
Phosphorus	1.24[b]	4.34[a]	0.26[c]	0.163

[a,,b,c] = Means with different superscripts in the same row are significantly ($P< 0.05$) different
SEM = Standard error of means
LOS = level of significance
NFE = Nitrogen Free Extract
BYS= Brewer`s Yeast Slurry
BKT= Burukutu Yeast (local alcoholic yeast)

Table 3: Performance of Broilers fed different sources of yeast and the control diet at the starter phase (0 – 4 Weeks)

Parameters	Dietary treatments				SEM
	T_1(Control)	T_2 (BYS)	T_3 (Baker`s yeast)	T_4(BKT)	
Initial weight (g/bird/day)	37.50	37.50	37.50	37.50	0
Final weight (g/bird/ day)	544.37	564.63	556.30	544.97	24.89
Daily feed intake (g/bird/day)	38.90	39.66	39.44	38.77	1.59
Daily weight gain (g/bird/day)	18.10	18.82	18.53	18.12	0.89
Feed conversion ratio	2.15	2.11	2.14	2.14	0.05
Protein efficiency ratio	2.02	2.06	2.04	2.03	0.05
Mortality %	14.58[a]	0.00[b]	0.00[b]	4.17[b]	3.46
Cost/kg/gain (₦)	133.72	134.17	141.15	137.99	3.50

[a,b]. =Means with different superscripts in the same row are significantly (P<0.05) different.
SEM = standard Error of Means.

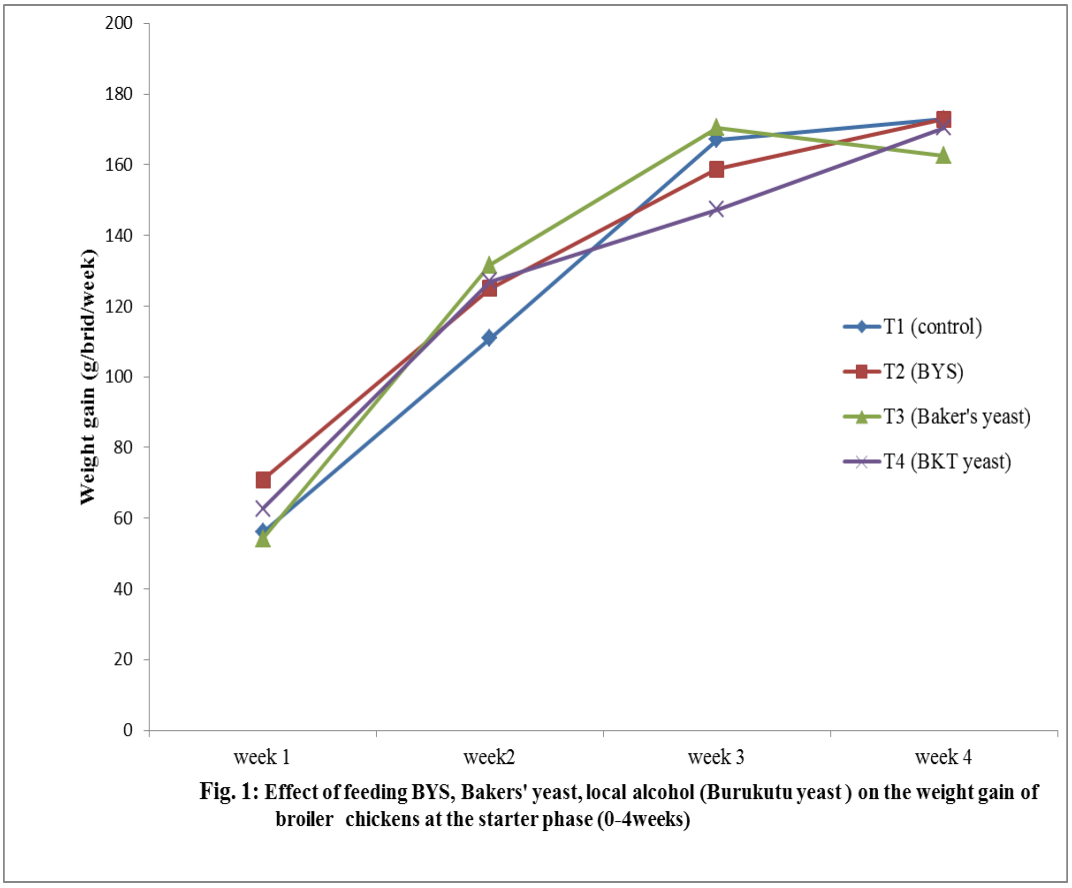

Fig. 1: Effect of feeding BYS, Bakers' yeast, local alcohol (Burukutu yeast) on the weight gain of broiler chickens at the starter phase (0-4weeks)

There were no significant (P > 0.05) differences among broilers in the final live weight, feed intake, weight gain, feed conversion ratio, protein efficiency ratio and cost per unit gain but mortality was higher in birds fed the control diet. The observed non - significant (P 0.05) differences in Table 3 .implies that the response of broiler chickens to the tested yeasts sources were statistically similar.

The dried Brewer's yeast Slurry, Baker`s yeast and Burukutu yeast were of the *Saccharomyces cerevisiae* strain and had comparable proximate compositions (Table 3). This may account for the non- significant differences in the performance of the birds across the treatment groups. The results of this trial tend to suggest that where Brewer's yeast slurry is unavailable or expensive, baker`s yeast and or Burukutu yeast (isolated from local beer) of *Saccharomyces* c*erevisiae* specie can be used as alternative sources.

Conclusion and Applications

The study has demonstrated that:

1. Dried brewer`s yeast slurry has a high protein content and fairly balanced amino acids profile and could be used to enhance the performance of broiler chickens.
2. Where dried brewer`s yeast slurry (BYS) and or local alcoholic yeast (Burukutu yeast -BKT) is unavailable due to logistic problems, the baker`s yeast used mainly in bread baking industry and confectioneries could be used as an alternative yeast source to dry brewer`s yeast slurry to improve growth performance of broiler chicks

Acknowledgements

The authors acknowledge the staff of the Bio - Chemical Laboratory, Animal products and processing Laboratory of the Department of Animal Science, Ahmadu Bello University, Zaria for their contributions in laboratory analysis of samples.

References

1. Yasar, S. and Desen, D.E (2014). Efficacy of a feed probiotic bacteria (Enterococus faecium NCIMB 10415), spore (Bacillus subtilis ATCC PTA-6737) and yeast (Saccharomyces cerevisiae) in Japanese quails. Bulletin *UASVM Animal Science and Biotechnology* 71:51-62.
2. Dhama, K., Latheef, S. K., Mani, S., Abdul Samad, H., Karthik, K., Tiwari, R, Ullah Khan, R. Alagawany, M., Farag, M. R., Alam, G. M., Lauadi, V. and Tufarelli, V (2015). Multiple beneficial applications and modes of action of herbs in poultry health and production-A review, International Journal of Pharmacology 11:152-176.
3. Shen, Y. B., Piaoo, X. S., Wang, L., Liu, P., Yoon, I. and Zhen., Y. G (2009). Effects of yeast culture supplementation on growth performance, intestinal health and immune response of nursery Pigs. *Journal of Animal Science* 87:2614-262.
4. Churchill, R., Mohan, B. and Viswanathan, K (2000). Effect of supplementation of broiler rations with live yeast culture. *Cheiron* 29 (1 – 2)*: 23 – 27.*
5. Nilson A, Peralta J. M. F, miazzo, R.D (2004). Use of Brewer`s yeast (*S. cerevisiae*) to replace Part of the mineral premix in broiler finisher diets. XXII World poultry congress, Istanbul, Turkey.
6. Ezeokeke, C.T. (2008). Effects of prebiotics and probiotics as growth promoters on the local fowl (*Gallus domesticus*). *Nigerian Journal of Animal Production*. 35(2): *162-169.*
7. Reddy, V. R., Rama, S.V, and Panda, A. K (2006).Yeast: Multifunctional feed

Supplement for poultry. In a review of *Poultry International journal.*1:*16-20*.

8. Spring, P., Wenk, C., Dawson, K. A, Newman, K..E. (2000). The Effects of Dietary Mannan Oligosaccharides on Caecal Parameters and the Concentration of enteric bacteria in the ceca of Salmonella challenged broiler chicks. *Poultry Science.* 79*: 205-211*.
9. Miazzo, R. D. S., Kraft, E. Moschetti Y. M. Picco. (1994). Levadura de Cerveza (*S. Cerevisiae*) como aditivoen una racion de Parrilleros inciador. *Argentina de Produccion Animal, 14 (supl.1): 1*
10. Miazzo, R. D., Kraft, S. Y Moschetti, E (1995). Dos niveles de levadura de cerveza (*S. Cerevisiae*) comno promoter natural de crecimento en pamilleros. *Argentina de Produccion. Animal.* 15 (2): 662 – 663.
11. Miazzo, R. D., Kraft, S. Y., Picco, M (1997). Crecumento mejerado de parrilleros al adicionar levadura de cerveza (*S. Cerevisiae* - a sus dietas. *Revista Argentina de Produccion. Animal,* 17 (Supl. 1):71.
12. Miazzo, R. D., Kraft, S. Y. Picco, M (1998). Agregado de 0.7% l.e Levadura de cerveza (*S.Cerevisiae*) a unme dreta Parilleros. *Argentina de Produccion Animal,* 18 (Supl.1): 20 – 21.
13. Miazzo, R. D., Peralta, M. F., Picco, M (2000). Dos nivele de Levadura de Cerves (*S. cerevisiae)* una dieta parilleros terminador. *Revista Archive des. Latinoam Produccion. Animal Vol. 8: 2000.*
14. Paryad, A. and Mahmoudi, M (2008). Effect of different levels of supplemental yeast (*Saccharomyces cerevisiae)* on performance, blood constituents and carcass characteristics of broiler chicks. *African* journal *of Agricultural Research.* Vol. 3(12): 835-842.
15. Daramola, S.T., Bawa, G.S., Omage, J.J. and Afolayan, M. (2014) Nutritive value of dried brewer's yeast slurry on the performance of broiler chickens. *Nigerian Journal of Anima Science* 16(2):251-263.
16. Ovimaps, (2010).Ovi location map, ovi earth imagery data; May 20th, 2010.
17. Ayo, J. O., Oladele, S. B., Ngam, S., Fayomi, A. and Afolayan, S. B. (1999). "Diurnal fluctuations in rectal temperature of the Red Sokoto goat during the harmattan season," *Research in Veterinary Science*, vol. 66, no. 1, pp. 7–9.
18. A.O.A.C. Association of Official Analytical Chemists, (1990). Official Method of Analysis of the A.O.A.C. (14th edition).Washington D.C. USA.
19. A.O.A.C.. Association of Official Analytical Chemists (2006). Official Method of Analysis of the A.O.A.C. (W. Horwitz, Editor) Eighteenth Edition, Washington, D.C. USA.
20. Jansen, G. S. (1989). Estimating the Energy Value of Feed Ingredients from Proximate Composition cited in National Research Council (NRC) (1994). National Academy Press,Washington, D.C.
21. Statistical Analysis System (2002). Statistical users guide. SAS Institute Inc. Cary, North Carolina, U.S.A.
22. Duncan, D. B (1955). Multiple Range and multiple F. Test. Biometrics 11:1-14.
23. Steel, R .G. D.. and Torrie, J. H (1980). Principles and Procedures of Statistics, 2nd Edition. MC. Graw-Hill Book Company Inc. New York.
24. Ikurior, S. A. (1995). Preservation of Brewer`s Yeast Slurry by a simple on-farm adaptable technology and its effect on performance of weaner pigs. *Animal Feed Science and Technology* 53 : 353-358.