

Use of Spent Brewers' Yeast (*Saccharomyces cerevisiae*) in Feeds to Replace Soya Bean on Performance, Carcass Characteristics and Internal Organs of Broiler Chickens

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Abstract: Spent brewers' yeast (*Saccharomyces cerevisiae*) which is a good source of protein, amino acids, vitamins, crude fibre and metabolizable energy remains underutilized in spite of its several advantages. Spent brewer's yeast was used to formulate poultry feed replacing soya bean in graded levels and used in broiler chicken production. **Objective:** To investigate the effect of spent brewers' yeast on growth performance, carcass characteristics and internal organs of broiler chickens. **Methods:** Two hundred 14 day old "sayed" broiler chickens were used to determine the growth performance and carcass characteristics as well as internal organs fed the formulated feeds. 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. 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 across all the treatments but were not significantly ($P > 0.05$) affected by dietary treatment. Similarly, growth rate and feed conversion ratio were not significantly affected by dietary treatment ($P > 0.05$). Average daily feed intake was however significantly affected ($p < 0.05$). Carcass yield showed that live weight, plucked weight, dressing percentage, breast, wings and caeca were not significantly ($P > 0.05$) affected by the dietary treatment. However, thigh, abdominal fat, drumstick and back were significantly affected ($P < 0.05$). The percentage weight of the internal organs were not significantly ($P > 0.05$) affected by the dietary treatments except small intestine which was significantly affected ($P < 0.0$). **Conclusion:** The results showed that spent brewers' yeast can be used to replace soya bean up to the levels tested providing protein without adverse effect on growth performance, carcass characteristics and internal organs of broiler chickens.

[Chollom PF, Okojokwu OJ, Egbere OJ, Ikeji FN, Yisa AG, Doma UD, Agbo EB. **Use of Spent Brewers' Yeast (*Saccharomyces cerevisiae*) in Feeds to Replace Soya Bean on Performance, Carcass Characteristics and Internal Organs of Broiler Chickens.** *Researcher* 2017;9(6):40-44]. ISSN 1553-9865 (print); ISSN 2163-8950 (online). <http://www.sciencepub.net/researcher>. 7. doi:[10.7537/marsrsj090617.07](https://doi.org/10.7537/marsrsj090617.07).

Key words: Spent Brewers' yeast, *Saccharomyces cerevisiae*, Broiler, Carcass, Soya bean, formulated feeds.

1. Introduction

Water The poultry industry in Nigeria has continued to be unstable as a result of high cost of feeds and feeding with low quality feeds. Feed alone accounts for up to 75% of the total cost of production (Kekeocha, 1984; Ubosi and Sekuna, 2000). Adequate nutrition is one of the major inputs necessary for all the full expression of the genetic potential of poultry and prevention of stress. For a diet to be adequate, it must supply the essential nutrients not only in sufficient quantities but also in the right proportions. Diets should therefore be formulated to promote the desired intake of all nutrients and to improve growth rate at a reasonable cost. Less expenditure in terms of feeds and maximum growth rate means more income from the poultry thereby alleviating poverty in both the rural and urban settings. The research for incorporating unconventional protein feed stuffs in

poultry feed in order to reduce the cost of feed and maximize the returns from poultry farming is an on-going research (Nanzeen, 1995; Anyachie and Madubuike, 2007; Yisa, 2013).

According to Anyachie and Madubuike (2007), the scarcity and prohibitive cost of conventional feed sources aggravated by stiff competition between human and livestock for these feeds as well as insufficient emphasis on production had resulted in the evaluation of alternative and cheap agro industrial products as sources of feeds ingredients. Some workers (Kwari *et al.*, 2003; Okah *et al.*, 2007) had stressed the need for utilization of alternative feed ingredients far removed from human and industrial interests. Olusanya *et al.*, (2007) deduced that acute shortage of meat protein has been one of the major nutritional problems facing African countries. The demand for meat outstrips the supply in all African

countries south of the Sahara. To boost production therefore, the issue of cheap, available feed ingredients must be sourced. The products being evaluated include palm kernel cake, cotton seed cake, rice bran, dried brewers' grains and maize cobs and spent brewers' yeast.

Spent brewers' yeast is a relatively good source of protein and has been used in the feeding of pigs, goats and poultry as well as cattle in small amounts by local farmers in Nigeria. The bulk of the brewers' yeast is usually disposed into water bodies posing a major problem and only small quantities are sold to local animal farmers. Their success stories which are not published to create awareness show that they have discovered that spent brewers' yeast has value especially for livestock (Levic *et al.*, 2010). *Saccharomyces cerevisiae* is one of the most widely used commercialized yeasts and has long been fed to animals. It was reported that feeding yeast to chicks improved broiler meat quality, improved weight gain and feed/gain ratio (Nilson *et al.*, 2004).

The objective of this work is to investigate the effect of spent brewers' yeast on growth performance,

carcass characteristics and internal organs of broiler chickens as a potential use in feed production thereby encouraging the development of the poultry industry in Nigeria.

2. Material and Methods

Study Area

Proximate analysis of spent brewers' yeast (*Saccharomyces cerevisiae*)

The following parameters were determined according to analysis of the Association of Official Analytical Chemists, AOAC, (2006).

Experimental Diets

Five (5) isonootrogenous 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 Tables 1 and 2 based on calculated values.

Table 1: Proximate/nutritional composition of spent brewers' yeast (*S. cerevisiae*)

Nutritional parameters	Percentage composition (%)	Reference value*
Crude protein (WM)	38.01	
Moisture	6.20	
Crude fat (WM)	0.79	
Crude fat (DM)	0.84	
Crude fibre	4.31	4.80
Gross energy (kcal/kg)	3722.88	
Metabolizable energy (kcal/kg)	2606.07	2800
Ash	14.53	4.70

WM = wet matter; DM = Dry matter

Table 2: Chemical composition of *S. cerevisiae*, and poultry by-products

Composition	<i>S. cerevisiae</i>	Poultry by-products
Dry matter (%)	93	93
Metabolizable energy (ME)	1990	2650
Crude protein (%)	44.4	55
Crude fat (%)	1	13
Crude fibre (%)	2.7	1.5
Ca	0.12	3
P	1.4	1.7

Experimental Birds and Management

Two hundred 2 weeks old "sayered" 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.

Carcass Studies

At the end of the experiment, five (5) birds per treatment (that is, 1 bird per replicate) having their weights closest to the average of their group were selected for carcass studies. The birds were starved overnight (from 8:00pm), individually weighed early in the morning (7:00am) to get the live weight and then slaughtered. Blood was collected from four randomly selected birds per treatment for the determination of haematological and serum biochemical parameters. According to Bush (1975), samples were collected from the bronchial vein using 5 cm³ disposable syringes and needles (21 gauge). Slaughtered birds were scaled in hot water (about 80°C for one (1) minute), then plucked and eviscerated.

Each eviscerated bird was dressed by removing the neck and the shanks. The dressed chicken (carcass) was weighed and the weight expressed as a percentage of the weight of live bird before slaughter. The carcass yield or dressing percentage was calculated using formula:

$$\text{Carcass yield (\%)} = \frac{\text{Weight of dressed chicken}}{\text{Weight of live chicken}} \times 100$$

The dissection of the carcass was done according to the method described by Hann and Spindler (2002). The cut-up parts (thighs, drumsticks, wings, breast muscle) and abdominal fat were also severed from the carcass. They were individually weighed and expressed as percentage of live weight.

Internal Organs

The internal organs which included liver, heart, kidney, spleen, pancreas and lungs were individually and separately weighed and expressed as percentage of live weight for each bird slaughtered.

3 Results and Discussion

The percentage of dressed carcass to live weight ranged from 78-85% in this study (Table 3). This compared favourably with the range of 66-75% reported by Aduku and Olukosi, (2000), as well as Anuaehie and Madubuike, (2007) and Tuleun and Igba, (2007) for broiler chicken.

In this work, thigh, breast, back, drumstick and abdominal fat were significantly ($P < 0.05$) affected by spent yeast replacement. This agrees with the findings of above authors. Plucked weight, eviscerated weight, wings, caeca, head and legs were not significantly affected by the spent yeast replacement levels. These results could also be due to the genetic makeup of the birds and also possibly good quality of the feed. The result of this study showed that spent brewers' yeast can be included to replace soya beans up to 20% level in broiler diets without any negative effect on growth performance and carcass characteristics.

Except for small intestine where there was significant ($P < 0.05$) difference between graded levels of spent yeast replacement, all others such as liver, heart, kidneys, spleen, pancreas, lungs, large intestine and gizzard were not significantly ($P > 0.05$) affected by the experimental diets. This means that spent yeast replacement did not cause any adverse effect on the internal organs of broiler chickens (Table 4).

The result shown in Table 4 indicates that liver ranged from 1.97 – 2.40 with the highest (2.40) being at 10% spent yeast level. The lowest (1.97) was at 0% spent yeast replacement. Heart ranged from 0.40 – 0.50. It was highest (0.50) at 5% spent yeast level and lowest (0.40) at 0% spent yeast level. Kidneys ranged from 0.23 – 0.31. The highest was 0.31 at 10% spent yeast level and the lowest (0.23) was at 0 and 15% spent yeast levels. Spleen ranged from 0.08 – 0.13. The highest (0.13) was at 10% spent yeast level and the lowest (0.08) was at 5% spent yeast level. Pancreas ranged from 0.23 – 0.36, the highest (0.36) being at 0% level of spent yeast replacement. The lowest was 0.23 at 5% spent yeast. Lungs ranged from 0.48 – 0.70. The highest (0.70) was at 10% spent yeast level while the lowest (0.48) was at 0% level of spent yeast. Small intestine ranged from 4.58 – 6.83. The highest (6.83) was at 5% spent yeast level while the lowest (4.58) was at 10% spent yeast level. Large intestine ranged from 0.16 – 0.29. The highest (0.29) was at 20% level of spent yeast replacement and the lowest (0.16) was at 0% spent yeast level. Gizzard

ranged from 1.56 – 1.93. The highest (1.93) was at 0% spent yeast level while the lowest (1.56) was at 15% spent yeast level.

Table 3: Mean carcass yield of broiler chickens fed with experimental diets containing graded levels of spent brewers' yeast (*Saccharomyces cerevisiae*) at 50 days

Parameter	Level of spent yeast replacement (%)					P-value
	0	5	10	15	20	
Live weight (g)	2000.00	1962.50	1800.00	1950.00	2025.00	0.830
Plucked weight (g)	1914.20	1862.50	1700.00	1887.50	1900.00	0.838
Eviscerated weight (g)	1687.50	1625.00	1612.50	1662.50	1762.50	0.935
Dressing percentage	79.88	78.39	84.87	83.11	77.79	0.288
Thigh (% of life weight)	12.36	10.09	10.86	10.75	9.97	0.001
Breast (% of life weight)	20.83	21.90	22.20	22.65	19.00	0.641
Back (% of life weight)	12.72	13.68	15.61	16.01	15.16	0.002
Wings (% of life weight)	7.80	8.38	8.15	7.98	7.21	0.148
Drumsticks (% of life weight)	9.52	10.37	10.49	10.14	9.07	0.043
Abdominal fat (% of life weight)	0.55	0.61	1.47	1.63	1.87	0.003
Caeca (% of life weight)	0.64	0.65	0.98	0.95	0.89	0.063
Head (% of life weight)	2.82	2.80	2.92	2.26	2.56	0.217
Leg (% of life weight)	4.30	3.64	3.84	3.69	3.45	0.428

Table 4: Percentage mean weight of internal organs (giblet) parameters of broiler chickens fed on feeds containing graded levels of spent brewers' yeast (*Saccharomyces cerevisiae*) at 50 days

Parameter	Level of spent yeast replacement (%)					P-value
	0	5	10	15	20	
Average Live weight (g)	2000.00	1962.50	1800.00	1950.00	2025.00	0.830
Liver	1.97	2.38	2.40	2.01	2.22	0.279
Heart	0.40	0.50	0.49	0.44	0.43	0.726
Kidneys	0.23	0.24	0.31	0.23	0.29	0.584
Spleen	0.12	0.08	0.13	0.12	0.11	0.474
Pancreas	0.36	0.23	0.28	0.26	0.29	0.370
Lungs	0.48	0.50	0.70	0.48	0.64	0.360
Small intestine	6.45	4.83	4.58	6.40	6.29	0.013
Large intestine	0.19	0.16	0.28	0.20	0.29	0.124
Gizzard	1.93	1.80	1.81	1.56	1.60	0.200
NB: Live weight (g)	2000.00	1962.50	1800.00	1950.00	2025.00	0.830

4. Conclusion

Spent brewers' yeast can replace soya bean in formulation of broiler feeds as protein source for growth performance, carcass characteristics and internal organs of birds. Its use as feed ingredient should be encouraged where breweries are situated especially in Nigeria. It also has the advantage of lower costs of feeds when used up to this level therefore its use will provide cheaper birds for consumers, and improve profits for poultry farmers.

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6/4/2017