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Utilisation of Dried Yeast as a Source of Lysine in Broiler Feeds

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Abstract: A study was conducted to evaluate the utilization of Dried Yeast (DY) as a source of lysine in broiler feeds. Three feeds, control (0.0% lysine and 0.0% DY), 0.25% Lysine and).25% DY were compounded and tested on 270.0 Ross broiler chicks for 56 days. Data were collected on the proximate, calcium, phosphorus, amino acid composition of the feeds, performance and feed utilization of the broilers. It was observed that substitution of DY for lysine at 0.25% had no significant ($p>0.05$) effect on the proximate, calcium and phosphorus levels of the feeds. The proportion of the amino acids (valine, arginine, leucine, isoleucine and glutamic acids) increased in DY feeds compared to the control. Mean final body weight (1.03±0.12 kg) and body weight gain (0.96±0,11 kg) of DY-fed broilers were significantly ($p<0.05$) higher than (0.90±0.04 kg) and (0.83±0.04 kg) of the control but similar to those of lysine-fed broilers (0.98±0.04 kg) and (0.91±0.04 kg), respectively. The results suggest that dried yeast can be used as a lysine source in broiler feeds.

Key words: Utilization, dried yeast, lysine, broiler feeds

INTRODUCTION

Lysine is one of the essential amino acids that are needed in animal feeds. These amino acids can not be synthesized by the animals in the right amounts required by the animals, a condition that necessitates their supplementation in animal feeds. Amino acids are organic acids which contain one or more amino groups (NH_2). There are 13 essential amino acids for poultry[1]. The essential amino acids are sometimes referred to as indispensable amino acids. Any amino acid present in a protein in the least amount, in relation to the animal's need for that particular amino acid is referred to as limiting amino acid. Lysine is the limiting essential amino acid of maize with tryptophan running a close second[2]. The Biological Value (BV) of a protein depends to a large extent on the amount of the limiting amino present in relation to other essential amino in the protein based on the animal's needs for each of them. A protein which is extremely deficient in one or more of the essential amino acids will have a low biological BV and is described as a protein of low quality.

The level of lysine in natural feed ingredients especially the conventional cereals and legumes, can not meet the nutritional needs of the birds. This is because cereal- legume based feeds are often deficient in lysine. This situation creates the obvious need for synthetic lysine supplementation in every compounded poultry feed. Incidentally, lysine is not manufactured in Nigeria. So, huge sums of foreign exchange is expended annually on the importation of this indispensable amino acid.

Dried Yeast (DY) is among the Single Cell Proteins (SCP) that contains higher levels of lysine than the protein content of bacteria McDonald[3].The authors also stated that Dried Yeast (DY) has the advantage of not containing cellulose, hemicellulose and lignin in its crude fibre. Based on these facts it is thought that DY could be used as a source of lysine to replace the expensive synthetic lysine in poultry feeds. This work was therefore designed to evaluate the effect of substituting synthetic lysine with Dried Yeast (DY) in broiler feeds.

MATERIALS AND METHODS

Feed preparation: Three experimental feeds were prepared and designated T1, T2 and T3, respectively. Diet T1 is the control and it contained neither DY nor synthetic lysine. Diet T2 contained synthetic lysine at 0.25% level but did not contain DY while diet T3 contained DY only at 0.25% level (Table 1). The feeding was done for 8 weeks. Feed and water were given *Ad-libitum*.

Experimental design: The experimental design was Randomized Complete Block (RCB) design. The broilers were divided into 3 experimental groups with 90 birds per group. Each group was in

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Table 1: Composition of lysine and yeast supplemented feeds for broilers (%)

Diets	Yellow Maize	Groundnut cake	Fish meal	Bone meal	Oyster shell	Salt bran	Maize	Methionine	Lysine yeast	Dried	*Premix	Total
1(C)	60.00	29.00	4.00	2.00	4.00	0.25	0.25	0.25	0.25	0.25	0.25	100
2(L)	59.75	29.00	4.00	2.00	4.00	0.25	0.25	0.25	0.25	0.25	0.25	100
3(Y)	59.75	29.00	4.00	2.00	4.00	0.25	0.25	0.25	0.25	0.25	0.25	100

*premix to provide the following per kg:Vit.A, 10,000iu; Vit.D31500 iu; Vit.E, 4.8 iu; Vit.K, 2 mm; Ribof. 3 mg; Pantothenicacid, 6 mg; niacin,15 mg choliine 3 mg; Vit.B12 0.08 mg; Folic acid, 4 mg;Mn, 0.8 mg; Zn, 0.5 mg; $I_2$1.2 mg,Co1.2 mg;Cu,10 mg;Fe,10 mg. C is the control; L is lysine; Y is Yeast feed

Table 1b: Proximate, calcium and phosphorus composition of the experimental feeds

	Dry matter	Crude protein	Ether extract	Ash	Nitrogen free extract	Calcium	Phosphorus
1 control	91.55±0.36	22.70 ±0.51	2.68 ±1.69	17.64 ±1.96	55.06 ±3.80	5.41 ±0.68	0.75 ±0.01
2 lysine	91.81 ±2.36	22.91 ±2.36	1.42 ±0.53	18.06 ±2.91	55.27 ±4.37	5.54 ±0.97	0.70 ±0.03
3 yeast	91.48 ±0.32	22.75 ±1.58	1.91 ±0.40	15.32 ±2.98	57.62 ±2.97	4.10 ±1.59	0.75 ±0.02

a, b: means denoted by the same alphabet in the same row are not significantly different (p>0.05)

Table 1c: Amino acid composition of poultry feed, yeast, lysine and yeast supplemented feeds

	Amino acids							
Diets	Lysine	Histidine	arginine	Aspartic acid	Threonine	Serine	Glutamic acid	Proline
1 CF	0.08	1.84	4.84	6.20	3.80	1.74	14.55	1.78
2 LF	4.76	2.86	4.41	5.23	4.10	3.36	13.18	2.82
3 YF	5.35	3.30	4.78	6.60	4.05	2.81	12.67	3.28
4 Y	7.20	2.01	5.29	6.89	4.80	1.60	16.63	2.05

	Glysine	Alanine	Cystine	Valine	Methionine	Isoleucine	Leucine	Tyrosine	phenylalanine
1CF	2.66	2.34	1.00	3.20	1.81	4.40	5.91	2.99	3.28
2LF	7.02	4.11	1.29	4.18	2.17	3.25	5.64	2.70	4.30
3YF	6.54	3.85	2.05	3.02	2.50	3.44	6.65	3.23	4.37

CF is control feed, LF is lysine feed, YF is Yeast feed, Y is yeast

3 replicates of 30 birds per replicate using standard methods[4].

Analytical procedures

Proximate and mineral analysis: Proximate analysis of the ground samples was performed using standard methods[5]. The results are shown in Table 1b. Calcium in the samples was determined from a wet nitric acid digest by atomic absorption spectrophotometry but phosphorus was determined colorimetrically using the vanadomolybdate reagent[5]. The results are presented in Table 1b.

Aminoacidanalysis: Portions of the ground samples (0.1 g) werehydrolysedwith 15 mL 6 M HCl for 22 h at 110°C, then filtered and diluted for analysis. This was carried out by the High Performance Liquid Chromatography (HPLC) method of[6] as modified by Mann[7]. The results are indicated in Table 1c.

Data analysis: The data collected were statistically analysed using analysis of variance (ANOVA). Mean separation was done where there were significant ($p<0.05$) differences using Duncan multiple range test[8].

RESULTS

The results (Table 1) show that yeast and lysine inclusion in the feeds did not produce any significant ($p>0.05$) difference in the proximate, calcium and phosphorus composition of the feeds. The results in table 1c indicated that addition of yeast increased the lysine level of the feeds.The results also show that yeast has low amount of alanine but higher levels of valine, arginine, leucine, isoleucine and glutamic acid. The levels of the other amino acids in the yeast, yeast and lysine supplemented feeds are quite comparable.

The performance results of the broilers (Table 2) clearly show that dried yeast supplementation of feeds significantly ($p<0.05$) improved the final body weight of the broilers and them to be higher than those of the control birds. The final body weight of the birds fed yeast supplemented feed was similar to those of the birds fed synthetic lysine supplemented feeds. The body weight gain of the broilers fed yeast or lysine supplemented feedswere greaterthaninthecontrolbirdsinspiteofthe similarities in their level of feed intake.Feed efficiency ratio andprotein efficiency ratio were not significantly different ($p>0.05$) in thethree groups.

DISCUSSION

Table 1c shows that addition of yeast increased the lysine level of the feeds. This increase would have been possible only if dried yeast has an appreciable amount of lysine. The chemical analysis results (Table 1c) indicated that DY has a high lysine level. The result is in agreement with[3] who while comparing the protein quality of single

Table 2: Average performance of broilers fed lysine and yeast supplemented feeds

Diets	Initial body weight (kg)	Final body weight(kg)	Body weight gain (kg)	Feed intake(kg)	Feed conversion ratio	Protein efficiency ratio
1 control	0.07a	0.90a	0.83a	2.45a	2.95a	1.48a
`	±0.00	±0.04	±0.03	±0.08	±0.01	±0.02
2 lysine	0.07a	0.98b	0.91b	2.57a	2.82a	1.54a
	±0.00	±0.04	±0.05	±0.06	±0.02	±1.54
3 yeast	0.07a	1.03b	0.96b	2.77a	2.89a	1.52a

a, b: means denoted by the same alphabet in the same row are not significantly ($p>0.05$) different

cell organisms stated that lysine content of yeast protein is higher than that of bacteria.

The high levels of valine, arginine, leucine, isoleucine and glutamic acid in the DY supplement feeds indicates that yeast inclusion in feeds enriches the feed with these 5 essential amino acids. Yeast can therefore be used to enrich poultry feed with any of these essential amino acids in addition to lysine. The results on the final body weight and weight gain of the birds (Table 2) had proved that Dried Yeast (DY) can be effectively utilized as a source of lysine in broiler feeds and that it can substitute synthetic lysine for optimum performance of birds. The high performance of broilers fed dried yeast compared to the control is an indication that yeast lysine is a readily available source of lysine for poultry. Part of the symptoms of lysine deficiency include weight loss, retarded growth and inadequate energy utilization[3].These manifestations are partly responsible for the poor performance of the broilers fed on the control feed. Usually, lysine level of 0.074% is capable of improving growth and feed efficiency. This level is adequately supplied by dried yeast. It is also possible that the presence of lysine or yeast in the feeds might have improved the Biological Value (BV) of the protein to make thebroilersperformbetter.In addition, yeast is rich in B-vitamins which aid feed digestibility and nutrient absorption. The combination of all these factors would have made the performance of birds fed on yeast and lysine supplemented feeds better.

CONCLUSION

Dried yeast can serve as a source of lysine in poultry feeds. Broilers fed the dried yeast as a source lysine had similar performance with those fed synthetic lysine feeds and were superior to the control feed.

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