PERFORMANCE AND NUTRIENT DIGESTIBILITY OF BROILER BIRDS FED DIETS CONTAINING YEAST AND INORGANIC COPPER

*** [1]Ogwuegbu, M.C., [2]Oyeagu, C.E., [1]Edeh, H.O., [1]Ani A.O and [1]Okpala, C.R.**

[1]Department of Animal Science, University of Nigeria Nsukka, Nigeria

[2] Department of Livestock and Pasture Science, University of Forte Hare, Private Bag X1314, Alice 5700, South Africa

*Corresponding author

Email: mercy.ogwuegbu@unn.edu.ng; +2347068515325

Abstract

The study was conducted to investigate the response of broiler chicks to varying dietary levels of yeast and inorganic copper as growth promoters. A total of 120 day old Broiler birds were used for the study. The study lasted for eight weeks. The broiler chicks were randomly allocated to four treatment groups and fed diets containing four levels of copper and yeast been at constant level(0g Yeast + 0g Copper, 32.5g Yeast + 25.0g copper, 32.5g Yeast + 37.5g copper and 32.5g Yeast + 50g copper respectively per 25kg of diet.) Each group was replicated three times with 10birds per replicate in a Completely Randomized Design (CRD). The result showed that Significant (P<0.05) differences occurred among treatments in most of the parameters studied. Broiler birds fed 32.5g of yeast + 37.5g of inorganic copper per 25kg of feed performed better in the starter Phase with body weight gain (BWG) of 722.61g, feed conversion ratio(FCR) of 1.27g,cost© of ₦93.54, better CP and CF utilization when compared with other test groups. The result reveals that up to 32.5g of yeast + 37.5g of inorganic copper should be incorporated per 25kg of broiler diets as feed additive, to enhance growth and well-being of broiler birds.

Keywords: Broiler chicks, Yeast, inorganic copper

Introduction

Poultry is one of the most important sources of animal protein for human consumption. In Nigeria, the demand for poultry meat and egg has increased drastically, driven by the increase in population, income growth, and urbanization (Oladeebo *et al.,* 2007). For many years, antibiotic growth promoters (AGP) have been incorporated in the poultry diets due to their favorable effects on growth rate, feed consumption and feed efficiency (Goshen *et al.,* 2012). However, there are increasing concerns that the frequent feeding of AGP is leading to the rise of antibiotics resistance in many pathogenic and opportunistic bacteria (kana *et al.,* 2011). With the growing public concern about bacterial resistance, poultry scientists are researching on the AGP alternatives that can maintain intestinal health balance with antimicrobial properties as well as increased growth. Yeast (*Saccharomyces cerevisiae*) additives could be used as alternatives to the feed antibiotics due to their beneficial performance and health effects on monogastric animals (Dhama *et al.,* 2015). Copper is one of the most critical of the essential trace minerals required by poultry and can maintain proper body functions and obtain the optimal growth performance of poultry (Banks *et al.,* 2004). According to NRC (1994) the requirement for copper in broiler diets is 5-8mg/kg. Higher level of copper in broiler diet increases the intestinal lipase activity in young birds (Luo and Dove 1996) and also improves gut health by decreasing the intestinal crypt depth and lymphocytes leading to a better absorption of nutrients performance. Considering the importance of yeast and copper, the present study was designed to evaluate the potential effects of supplementation of yeast (*Saccharomyces cerevisiae*) and copper as a natural growth promoter on production performance of commercial broiler chicken.

Materials and Methods

The study was carried out at the Department of Animal Science Teaching and Research farm, University of Nigeria, Nsukka. One hundred and twenty (120) day old broilers (Anak strain) were randomly divided into four groups of thirty birds each. The groups were randomly assigned to four experimental diets containing 0g Yeast + 0g Copper, 32.5g Yeast + 25.0g copper, 37.5g Yeast + 25g copper and 50.0g Yeast + 25g copper respectively per 25kg of diet. The percentage of Starter and finisher feeds is shown in table 1. Each treatment was replicated three times with ten birds per replicate placed in a 2.6 x 3m deep litter pens with fresh wood shavings. Feed and water were offered *ad libitum* every morning from 7.00am -8.00am and the birds were properly vaccinated. The proximate analysis was carried out according to the procedure of AOAC (2006). Data collected were subjected to analysis of variance as described for Completely Randomized Design (Steel and Torrie, 1980) and differences between treatment means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

Results and Discussion

Table 2 showed the growth performance of broiler birds fed diets containing yeast and inorganic Copper. Most of the parameters measured both at starter and finisher phase differed significantly ($p<0.05$) among the treatments on the (DWG), (FBW), (BWG), (FCR) and (PER). Birds fed diet 3 had a higher ($p<0.05$) Daily weight gain, Final body weight and Body weight gain compared to birds fed diets 2 and 4 but similar ($p>0.05$) to birds fed diet 1 (Control). Copper and yeast inclusion improved the FCR and reduced the feed cost per kg at 37.5g Yeast + 25g copper/ 25 kg diet. The results of Onwurah *et al.,* (2014) and Dat *et al*., (2010) agrees with the result of the present finding that yeast and substitution of inorganic copper improves body weight (BWG), and Feed conversion ratio (FCR). This indicates that yeast could be an alternative to antibiotic-growth promoter in feed for broiler chicken by maintaining normal intestinal micro-flora by competitive exclusion and antagonism altering metabolism by increasing digestive enzyme activity and decreasing bacterial enzyme activity and ammonia production.

Table 3 shows the nutrient digestibility of broiler birds fed diets containing yeast and inorganic copper. There is significantly ($p<0.05$) difference in most of the parameters measured among the treatments. The Crude Fibre, Crude Protein, Ash, of birds fed diet 3 was increased ($p<0.05$) significantly compared with birds fed treatment diets 2 and 4 which had similar ($p>0.05$) CF and CP. The observed positive effect in the nutrient retention is in agreement with the result of Raju *et al*., (2006) and this confirms yeast and copper dietary inclusion increased nutrient digestibility especially that of protein. Also the significant retention value of crude fibre confirms yeast and copper as possessing the ability to degrade fibrous material in poultry feed.

Conclusion

The result of the study showed that up to 37.5g Yeast + 25g copper/ 25kg feed can be included in the broiler diets without any deleterious effect on the growth performance and Nutrient intake and utilization.

Recommendation

It is therefore recommended that yeast and inorganic copper can be used as an effective growth promoter in broiler diets for the improvement of performance and Nutrient utilization.

References

AOAC (2006). Association of Official Analytical Chemist. Official Methods of Analysis (21th edition). Washington D.CUSA.

Banks, K.M., Thompsom, k.l., Rush, J.K., and apple gate, T.J (2014). Effects of copper source on phosphorus retention in broiler chicks and laying hens.*Poultry science* 83:990-996.

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.; Laudadio, 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.

Duncan, D.B., (1955). New Multiple Range Test, Biometrics 11 1-42

Ghosh, T.K., S. Haldar, M.R. Bedford, N. Muthusami, I. Samanta, 2012: Assessment of yeast cell wall as replacements for antibiotic growth promoters in broiler diets: effects on performance, intestinal histo-morphology and humoral immune responses. *J. Anim. Physiol. Anim. Nutr*. 96, 275-284.

Kana, J.R., A. Teguia, B.M. Mungfu, J. Tchoumboue, (2011) Growth performance and carcass characteristics of broiler chickens fed diets supplemented with graded levels of charcoal from maize cob or seed of Canariumschweinfurthii Engl. *Trop. Anim. Health Prod*. 43, 51-56.

Luo, X.G and Dove C.R. (1996). Effect of dietary copper and fat on nutrient utilization, digestive enzyme activities, and tissue mineral levels in weanling pigs *J. Anim Sci.* 1996 Aug;74(8):1888-96.

NRC, (1994). Nutrient Requirements of Poultry, 9th rev. ed. National Academy Press, Washington DC.

Oladeebo J.O, Ambe-Lamidi A.I, Jabaru MO (2007). Resource productivity and returns to scale in poultry egg production in Afijio Local Government Area, Oyo State. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod., Calabar, March 18-2 1 2007. Pp: 399-401.

Onwurah, F.B., Amaefule, K.U. and Ahamefule, F.O. (2014) Effect of baker's yeast (Saccharomyces cerevisiae) inclusion in feed and in drinking water on performance of broiler birds. British *Journal of Applied Science and Technology*.,4 (1): 144-151.

Raju, M.V.L.N., Reddy, V.R Rama Rao S.V. and. Panda, A.K (2006). Yeast: A multifunctional feed supplement for poultry. A review of the benefits of yeast in poultry diets. Poult. Int., 45: 16-21.

Steel, R.G.D., and Torrie, J.H.N (1980). Principles and Procedures of statictics. A biometric Approach(2nd ed.). McGraw-Hill Publishers , New York.

Table 1: Percentage compositions of the experimental diets

Ingredients (%) Diets	**Starter(kg)**	**Finisher(kg)**
Maize	40.00	43.00
Soybean meal	33.6	22.00
Groundnut cake	24.00	16.00
Palm kernel cake	10.40	16.00
Fish meal	3.00	2.00
Fixed ingredients*	13.00	13.00
TOTAL	100	100
Calculated Composition:		
Crude protein (%)	23.36	20.12
Energy(Mcal/kg ME)	2.87	2.93
Crude fibre(%)	4.91	4.39

Fixed ingredients: 8% wheat offal, 4% bone meal, 0.25% iodized salt, 0.25% Vit-min Premix, 0.25% methionine, 0.25 lysine.

Table 2: Growth performance of broiler birds fed diets containing yeast and inorganic Copper

Treatments*	**T1**	**T2**	**T3**	**T4**	**SEM**
Parameters					
Daily Performance					
Daily feed intake (g)	58.97	58.49	58.32	58.87	0.07
Daily weight gain (g)	48.05^{b}	47.58^{b}	54.51^{a}	49.23^{b}	0.05
Starter Phase					
Total feed intake (g)	953.61^{a}	928.33^{ab}	920.42^{b}	945.69^{ab}	5.36
Initial body weight (g)	570.01	565.87	569.62	573.97	17.29
Final body weight (g)	1155.20^{b}	1133.20^{b}	1292.20^{a}	1107.50^{c}	10.16
Body weight gain (g)	585.16^{b}	567.37^{b}	722.61^{a}	533.50^{b}	23.47
Feed conversion ratio	1.63^{b}	1.64^{b}	1.27^{c}	1.77^{a}	0.07
Protein efficiency ratio	0.82^{ab}	0.89^{a}	0.83^{ab}	0.79^{b}	0.01
Finisher Phase					
Total feed intake (g)	2348.82	2347.08	2345.40	2350.94	8.67
Final body weight (g)	2691.00^{c}	2664.30^{c}	3052.70^{a}	2756.70^{b}	25.59
Body weight gain (g)	1535.80^{c}	1531.10^{c}	1760.50^{a}	1649.20^{b}	42.67
Feed conversion ratio	1.53^{a}	1.53^{a}	1.33^{c}	1.43^{b}	0.03
Protein efficiency ratio	1.25^{a}	1.22^{ab}	1.25^{a}	1.20^{b}	0.01
Feed cost per kg (₦)	98.47^{a}	99.78^{a}	93.54^{b}	96.18^{a}	1.26

Table 3: Nutrient Digestibility of broiler birds fed diets containing inorganic copper and yeast.

Treatment	**T1**	**T2**	**T3**	**T4**	**SEM**
Parameters					
Starter					
Moisture	35.22	35.98	36.00	35.88	0.03
Crude Fibre	14.44^{c}	21.82^{b}	29.12^{a}	22.50^{b}	0.01
Ash	16.00^{a}	17.37^{a}	13.26^{b}	16.67^{a}	0.02
Crude fat	56.67	54.55	59.54	58.33	0.31
Crude protein	55.61^{b}	58.01^{b}	68.77^{a}	47.64^{c}	0.28
Finisher					
Moisture	18.00	19.17	17.35	18.36	0.01
Crude Fibre	11.10^{c}	18.61^{b}	26.81^{a}	20.54^{b}	0.11
Ash	26.11^{ab}	25.38^{ab}	27.81^{a}	29.85^{a}	0.04
Crude fat	60.29	58.33	57.50	62.52	0.05
Crude protein	53.31^{c}	69.18^{b}	84.95^{a}	62.09^{b}	0.08