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Effect of different levels of dietary inclusion of *Saccharomyces cerevisiae* on growth performance and hematological parameters in broiler birds

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Abstract

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The effect of different levels of dietary inclusion of *Saccharomyces cerevisiae* on growth performance and hematological parameters in broiler birds were investigated. One hundred and twenty (120) four weeks old broiler birds were used for the experiment. The one hundred and twenty (120) birds were weighed and randomly allocated into four (4) treatment groups (T1, T2, T3 and T4) having thirty (30) birds per treatment. Each treatment was replicated three (3) times with ten (10) birds per replicate. Treatment 1 served as the control and did not contain any *Saccharomyces cerevisiae* supplement, while treatments 2, 3 and 4 contained 0.7, 1.2 and 1.7 g/kg of basal diet respectively of *Saccharomyces cerevisiae* supplement. The experiment lasted four weeks. Results showed that there were no significant ($p > 0.05$) differences among treatments in initial body weight and average daily feed intake while significant ($p < 0.05$) differences among treatments existed in the final body weight, total body weight gain, average daily weight gain, and feed conversion ratio. The study also revealed that there were no significant ($p > 0.05$) differences among treatments in hemoglobin concentration, packed cell volume, red blood cell count, mean corpuscular volume, mean corpuscular hemoglobin,, mean corpuscular hemoglobin concentration, white blood cell count, neutrophil count, lymphocyte count, monocytes count, and eosinophils count Based on the results obtained in this study, it was concluded that any of the treatments (T2, T3 and T4) is recommended to enhance broiler production.

Keywords: Saccharomyces cerevisiae; growth performance; hematological parameters; broilers

Introduction

Poultry because of their fast growth rate, short gestation period, source of meat and egg has been chosen as a very effective way of improving on the protein intake in Nigeria. Broilers have been considered as one of the farm animals that emerge as having unquestionable and high propensity to narrow the existing gap in animal protein consumption in the country. They are known to be fast growing birds and efficient converters of feed to animal protein. To increase animal protein intake in Nigeria, there is urgent need to increase broiler production at household and commercial holdings.

The demand for a higher and safer protein, free of infectious agents is getting increased. This led to increased use of antibiotics for therapeutic, prophylactic and growth promotion purposes. The presence of antibiotic residues in the meat may have deleterious effect on human consumers (Van den Bogaard et al., 2000). Also, the use of antibiotics led to problems such as development of drug resistant bacteria, and imbalance of micro-flora. These brought about

research interest in the possible use of natural products like vitamin supplements, enzymes, probiotics, medicinal plants and herbs for the development of new additives in animal feeding. A popular alternative to the use of antibiotics due to reasons above has been the use of probiotics which has been used in poultry for "competitive /exclusion" of bacterial pathogens (Barrow, 1992). Baker's yeast (*Saccharomyces cerevisiae)* is considered as one of the live microorganism probiotic that is used as feed additive. The positive effects of probiotics on animal can result either from a direct nutritional effect or health effect with probiotics acting as bio-regulators of the intestinal flora and re-enforcing the host natural altitude defenses.

The yeast *Saccharomyces cerevisiae* (SC) has biologically valuable proteins, B-complex, important traces elements and several unique "plus factors". This live microorganism addition to the animal feed has been known to improve the quality of feed and performance of animals (Martin et al., 1989). Higher weight gain and better FCR have been observed in birds fed diet containing *Saccharomyces cerevisiae* (Nawaz et al., 2008). Considering the importance of yeast, the present study was designed to evaluate the potential effect of supplementation of yeast (*Saccharomyces cerevisiae)* on growth performance and haematology in broiler chickens.

Materials and Methods

The study was carried out at the poultry unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka, Enugu State, Nigeria. The study lasted four (4) weeks.

The experimental procedures complied with the provisions of the University of Nigeria, Nsukka Ethical committee on the use of animals for biometric research (2005). One hundred and twenty 4 weeks old commercial chicks were used for the study. The birds were weighed and randomly allocated into four (4) treatment groups having thirty (30) birds per treatment in a completely randomized design. Each treatment was replicated three (3) times with ten (10) birds per replicate. Treatment 1 served as the control and did not contain any *Saccharomyces cerevisiae*, while treatments 2, 3, and 4, contained 0.7, 1.2, and 1.7 g/kg of basal diet. Table 1 shows the percentage composition of the experimental diet. Clean water and feed were provided *ad libitum*. The required drugs and vaccinations were administered appropriately according to the vaccination routine for broilers. The experimental diets were assayed for proximate composition (Table 2) by the method of the Association of Official Analytical Chemist (AOAC, 1990).

Table 1. Percentage composition of the experimental ration

Ingredients	Finisher Ration, %
Maize	28.63
Wheat offal	7.16
Palm Kernel Cake	26.74
Soyabean meal	28.97
Fish meal	4
Lysine	0.25
Methionine	0.25
Premix	0.5
Salt	0.5
Oyster shell	3
Total	100.00
Metabolizable energy	2998 Kcal/Kg

Table 2. Proximate Composition of the broiler finisher diet

Components, %	
Dry matter	91.05
Crude protein	20.05
Crude fibre	5.52
Ash	6.13
Ether extract	2.95
Nitrogen-free extract	56.40

The birds were weighed at the beginning of the experiment to determine their initial body weights. Body weights of the birds were recorded on a weekly basis. Daily feed intake was obtained from the difference between the quantity of feed offered and that of the left over from the previous day divided by the number of birds per replicate. Feed conversion ratio (FCR) was then calculated as quantity (gram) of feed consumed per unit (gram) weight gained over the same period.

At the end of the experiment, six birds were randomly selected from each treatment. Five mls of blood was collected from the wing vein of each bird using a sterilized syringe and emptied into sterilized sample bottles containing the anti-coagulant Ethylene Diamine tetra acetic acid (EDTA) for laboratory analysis to determine hematological indices. The packed cell volume (PCV) was determined by the microhematocrit method (Thrall & Weiser, 2002). The haemoglobin concentration (Hb) was determined by the Cyanomethemoglobin method (Higgins et al., 2008). The red blood cell (RBC) and the total white blood cell (WBC) counts were determined by the haemocytometer method (Thrall & Weiser, 2002). Differential White Blood Cell (Leukocyte) Count was determined by Leishman Technique (Thrall & Weiser, 2002). The mean corpuscular volume (MCV), mean corpus-

cular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were calculated using the standard formula (Schalm et al., 1975).

Data collected were subjected to analysis of variance in a completely randomized design as described by Steel and Torrie (1980). Significant differences between treatment means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

Result and Discussion

Growth performance in broiler finisher fed varying dietary levels of *Saccharomyces cerevisiae*

The effects of different levels of dietary inclusion of probiotics (*Saccharomyces cerevisiae)* on growth performance in broiler finisher are shown in Table 3. Significant ($p < 0.05$) differences existed in the final body weight, total body weight gain, average daily weight gain, and FCR while there were no significant ($p > 0.05$) differences among the treatments in initial body weight, and average daily feed intake. Study revealed significantly ($P < 0.05$) higher final body weight, total body weight gain, and average daily weight gain in the birds of treatment group T2, T3 and T4 compared to the control group. Higher ($P < 0.05$) FCR value was recorded for birds in T1.

The result of the present study agrees with Angel et al. (2005) who reported that yeast culture supplementation in the diets of broilers improved body weight gain. The results of the present study also confirmed the previous findings of Santin et al. (2001) and Zhang et al. (2005) who reported that inclusion of SC in the diets of broilers showed better body weight gain. However, the result obtained in this study is in contrast with Adebiyi et al. (2012) who reported that yeast inclusion in broiler diet did not affect body weight gain. Improvement in weight gain may probably be due to improved digestion and absorption of nutrients (Oyofo et al., 1989), perfection in intestinal lumen health and better digestibility of crude protein. The finding of the present study is not compatible with Zhang et al. (2005) and Paryad & Mahmoudi (2008) who reported that baker's yeast (*Saccharomyces cerevisiae*) supplementation in the diets of broilers significantly ($p < 0.05$) increased feed consumption of birds when compared to control group.

The better FCR observed in the current study agrees with Hana et al. (2015), who reported that FCR was better in broilers fed diet supplemented with yeast compared to control. In agreement with the result of present study, Onifade et al. (1999) reported that SC enhanced efficiency of feed utilization. The results of this research are similar to those observed by Paryad & Mahmoudi (2008) who reported that supplementation of yeast culture in the diet of broilers improved body weight and efficiency of feed utilization. On the contrary, Saied et al. (2011) reported that dietary inclusion of SC did not affect FCR. Shareef et al. (2009) reported that better FCR of the birds using the yeast culture may be attributed to the digestion of crude protein, which enhanced growth of the birds resulting in better efficiency of feed utilization. Furthermore, yeast cells as well as metabolites such as organic acids, amino acids, peptide, oligosaccharides, aroma and flavor substances, and probably some unknown growth factors are present in yeast culture which might have produced beneficial performance responses in production (Zhang et al., 2005). The better FCR observed in yeast supplemented group in this study might be due the vital role of yeast in the establishment of favorable microbial environment in the gut which had resulted in better utilization of feed and better absorption of nutrients.

Haematological indices in broiler finisher birds fed varying dietary levels of *Saccharomyces cerevisiae*

The effects of different levels of dietary inclusion of *Saccharomyces cerevisiae* on hematological in broiler finisher are shown in Table 4. There were no significant ($p > 0.05$) differences among the treatments in all the hematological parameters studied. The values obtained in the present study for Hb and PCV showed that they were within normal range

Table 3. Growth performance in broiler finisher fed varying dietary levels of *Saccharomyces cerevisiae*

Parameters	T1 (control)	T2 (0.7g/kg)	T3 (1.2g/kg)	T4 (1.7g/kg)	Probability
Initial body weight(kg)	0.89	0.88	0.92	0.88	0.45
Final body weight (kg)	2.56^{b}	3.0^{a}	2.97^{a}	3.05^{a}	0.04
Total Body Weight Gain(kg)	1.67^{b}	2.14^{a}	2.05^{a}	2.17^{a}	0.03
Average. daily weight gain (g)	59.76^{b}	76.31^{a}	73.10^{a}	77.50^{a}	0.05
Average. daily feed intake (g)	167	164	159	167	0.23
Feed conversion ratio	2.84^{a}	2.15^{b}	2.17^{b}	2.18^{b}	0.03

[ab]Means on the same row with different superscript are significantly different ($p < 0.05$)

Table 4. Haematological in broiler finisher birds fed varying dietary levels of *Saccharomyces cerevisiae*

Parameters	T1 (control)	T2 (0.7g/kg)	T3 (1.2g/kg)	T4 (1.7g/kg)	Probability
Hb (g/dl)	11.02	11.72	11.57	10.75	0.81
MCHC(g/dl)	33.23	33.13	33.21	33.25	0.57
MCH(pg)	9.55	9.55	9.86	10.04	0.95
MCV(fl)	2.87	2.88	2.97	3.02	0.95
PCV (%)	33.17	35.17	34.83	32.33	0.82
RBC Count($x10^6$/ µl)	1.16	1.22	1.19	1.07	0.35
Total WBC count(10^3/µl)	9.15	9.82	8.42	8.30	0.75
Neutrophil count (%)	74.17	72.50	69.83	72.50	0.93
Lymphocyte count (%)	21.17	24.50	25.00	24.17	0.93
Monocytes count (%)	3.00	2.67	3.17	2.17	0.21
Eosinophils count (%)	1.33	0.83	1.83	1.00	0.15

of 6.0-13.0 g/dl and 29 – 38% for Hb and PCV, respectively (Nworgu, 2007). Normal hematological values reveal the nutritional status of animal. Thus, the normal values observed in the present study indicate the adequacy of nutrients for the birds. Oladele et al. (2001) reported that lower values of these parameters indicate inadequate nutrition.

The result of the present study agrees with Al-Mansour et al. (2011) who reported no significant ($p > 0.05$) effect in Hb, RBC count, MCV and MCH when broilers were fed diets supplemented with yeast culture as compared to control. Kanwal et al. (2018) reported no significant ($p>0.05$) difference on the values of blood hemoglobin, packed cell volume, differential leukocyte count i.e. heterophils count and lymphocytes count when broilers were fed diets supplemented with yeast culture. However, the result obtained in this study is in contrast with Onifade (1997) who reported that yeast inclusion in the broiler diet affected RBC count, WBC count and PCV.

Conclusion

The study revealed significantly ($p < 0.05$) higher final body weight, total body weight gain, average daily weight gain and lower FCR in the birds of treatment groups compared to the control group. Based on the results obtained in this study, it was concluded that any of the treatments (T2, T3 and T4) is recommended to enhance broiler production.

References

Adebiyi, O. A., Makanjuola, B. A., Bankole, T.O. & Adeyori, A. S. (2012). Yeast culture (*Saccharomyces cerevisae*) supplementation: Effect on the performance and gut morphology of broiler birds. *Global Journal of Science Frontier Research Biological Sciences*, *12 (6),* 25-29.

Al-Mansour, S., Al-Khalf, A., Al-Homidan, I. & Fathi, M. M. (2011). Feed efficiency and blood hematology of broiler chicks given a diet supplemented with yeast culture. *Int. J. Poult. Sci., 10 (8),* 603-607.

Angel, R. R., Dalloul, A. & Doerr, J. (2005). Performance of broiler chickens fed diets supplemented with a direct-fed microbial. *Poultry Science*, *84 (8),* 1222-1231.

AOAC (1990). Official methods of analysis. Association of Official Analytical Chemist, Washington D.C.

Barrow, P. (1992). Probiotics for chicken. In: *Probiotic, the scientific basis*. Chapman and Hall, London, UK, 225-257.

Duncan, D. B. (1955). Multiple Ranges and Multiple F-test. *Biometrics, 11,* 1-42.

Hana, S. E., Tyfor, T., Iman, M. H., El Nasri, M. & Mukhtar, A. M. (2015). Study of different levels of yeast on performance values and immune response in broiler chicken. *Research Journal of Animal and Veterinary Sciences*, *8 (1),* 1-5.

Higgins, T., Beutler, E. & Doumas, B. T. (2008). Measurement of haemoglobin in blood. In: Tietz fundamentals of clinical chemistry. Saunders Elsevier, Missouri, 514 – 515.

Kanwal, R., Abdur, R. & Mubarik, M. (2018). Effect of dietary supplementation of different levels of *saccharomyces cerevisiae* on growth performance and hematology in broiler. *Indian Journal Animal Research*, *52 (1),* 1-6.

Martin, S. A., Nisbest, B. J. & Dean, R. G. (1989). Influence of a commercial yeast supplement on the in vitro Ruminal fermentation. *Nutritional Reports International*, *40 (2),* 395-403.

Nawaz, H., Naseem, M. A., Yaqoob, M., Ahmad, F. & Yousaf, M. (2008). Effect of dry yeast (*Saccharomyces cerevisiae*) on live performance and carcass characteristics of broiler chicks. *Indian Journal of Animal Sciences, 78 (2),* 117-120.

Nworgu, D. (2007). Performance and some blood chemistry indices of broiler chicken served fluted pumpkin (*Telferia occidentalis*) leaves extract supplement. *Journal of American-Eurasian Agricultural and Environmental Science*, *2 (1),* 90-98.

Oladele, S. B., Ayo, J. O., Esievo, K. A. N. & Ogundipe, S. O. (2001). Seasonal and sex variations in packed cell volume, hemoglobin total protein of indigenous duck in Zaria Nigeria. *Journal of Tropical Bioscience*, *1 (1),* 84-88.

Onifade, A. A. (1997). Growth performance, carcass characteris-

tics, organ measurements and haematology of broiler chicken fed a high fibre diet supplemented with antibiotics or dietary yeast. *Die Nahrung*, *41 (6),* 370-374.

Onifade, A. A., Obiyan, R. I., Onipede, E., Adejumo, D. O., Abu, O. A. & Babatunde, G. M. (1999). Assessment of the effects of supplementing rabbit diets with a culture of *Saccharomyces cerevisiae* using growth performance, blood composition and clinical enzyme activities. *Animal Feed Science and Technology*, *77 (1-2),* 25-32.

Oyofo, B. A., DeLoach, J. R., Corrier, D. E., Norman, J. O., Ziprin, R. L. & Molenhauer, H. H. (1989). Prevention of *Salmonella typhimurium* colonization of broilers with D-mannose. *Poultry Science, 68(10),* 1357-1360.

Prayad, A. & 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, 3 (12),* 835-842.

Saied, J. M., Al-Jabary, Q. H. & Thalij, K. M. (2011). Effect of dietary supplement yeast culture on production performance and hematological parameters in broiler chicks. *International Journal of Poultry Science*, *10 (5),* 376-380.

Santin, E., Maiorka, A., Macari, M., Grecco, M., Sanchezi, J. C., Okada, T. M. & Myasaka, A. M. (2001). Performance and intestinal mucosa development of broiler chickens fed diets containing *Saccharomyces cerevisiae* cell wall. *Journal of Applied Poultry Research*, *10,* 236-244.

Schalm, O. W., Jain, N. C. & Carol, E. J. (1975). Veterinary hematology. Lea and Febringer*,* Philadelphia, USA.

Shareef, A. M. & Al-Dabbagh, A. S. A. (2009). Effect of probiotic (*Saccharomyces cerevisiae*) on performance of broiler chicks. *Iraqi Journal of Veterinary Science*, *23 (1),* 23-29.

Steel, R. G. D. & Torrie, J. H. (1980). Principles and procedures of statistics. A biometric approach. McGraw-Hill Publishers, New York.

Thrall, M. A. & Weiser, M. G. (2000). Haematology. In: Laboratory procedures for veterinary technicians. Mosby Inc., Missouri, 29–74.

Van den Bogaard, A. E., London, N. & Stoberringh, E. E. (2000). Antimicrobial resistance in pig faecal samples from The Netherlands (five abattoirs) and Sweden. *Journal of Antimicrobial Chemotherapy*, *45 (5),* 663-71.

Zhang, A. W., Lee, B. D., Lee, K. W., Song, K. B., An, G. H. & Lee, C. H. (2005). Effects of yeast (*Saccharomyces cerevisiae*) cell components on growth performance, meat quality, and ileal mucosa development of broiler chicks. *Poultry Science*, *84 (7),* 1015–1021.

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