Effect of Baker's Yeast (*Sachharomyces Cerevisiae)* In Water on Blood Haematological Indices of Broiler Chickens

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ABSTRACT

A total of 150 day-old Anak broiler chicks (mixed sexes) were used to determine the effect of yeast (Sachharomyces cerevisiae) as water additive on the performance and haematological indices of broiler chickens. This study was conducted at the Teaching and Research Poultry Farm of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. The feeding trial involved 150 broilers with three replications of 10 birds each. The experiment was the determination of the effect of yeast in feed on the performance and haematological indices of broiler finisher chickens. Five graded levels (0, 0.5, 1.0, 1.5 and 2.0 g of yeast in water were investigated. The experimental design was completely randomised design (CRD). Results showed that the inclusion level of yeast in feed should not exceed 1.5 g per litre of water to enhance growth performance and haematological indices.

Keywords: Baker's yeast, probiotic, performance, haematological indices and inclusion level

INTRODUCTION

Yeast (*Saccharomyces cerevisiae*), a probiotic and a fermenter could be used to improve feed quality and or enhance feed nutrient utilization of broilers. Baker's yeast (*Saccharomyces cerevisiae)* is readily available and cheap. It is also rich in B-complex vitamins, amino acids, and minerals, particularly chromium (Pelicia *et al*., 2010). The polysaccharides content of a typical yeast extract is 30-60 % and 15-30% β-glucans and mannans, respectively, 15- 30% protein and 5-20% lipids, and a small chitin, (Eurasyp, 2010). *Saccharomyces cerevisiae* is considered one of the live microorganisms that when administerd through the digestive tract have a positive impact on the host health through its direct nutritional effects (Patterson and Burkholder, 2003). Yeast boosts immune level resulting in a better protection against infections (Panda *et al*., 2000). The benefits of *Saccharomyces cerevisiae* to the immune system and on coccidial infection have been reported by Gao *et al*. (2009). Osweiler *et al*. (2010) had reported that yeast gave beneficial effect following an exposure to aflatoxin. Likewise, Jeannine *et al.* (2012) and Silva *et al.* (2012) had reported its beneficial effect on Newcastle disease.

Reference values for haemoglobin (Hb), packed cell volume (PVC) and mean cell volume (MCV) have been given as 6.0 – 13.0g/100ml, 29 – 38% and 840.27 – 1630.56µm^3 (Nworgu, 2007). Mean cell haemoglobin (MCH) was given as 32.30 – 60.10pg and mean cell haemoglobin concentration (MCHC) as 27.35 – 45.51% (Nowaczewski and Kontecka, 2012). Red blood cell (RBC) and white blood cell (WBC) were given as 1.0 – 3.0(x10^3/mm^3) and 1.09 – 9.06 (x10^6/mm^6) respectively (Mitruka and Rawnsky, 1977). Blood total protein values of birds fed on 0.4% (3.82), 0.8% (3.65), and 1.2% yeast (3.97) were lower than the control (4.16), (Saadi and Nagla, 2010). Shareef and Al-Dabbagh (2009) recorded no reduction in total white blood cells, heterophils, lymphocytes, monocytes, eosinocytes and basophils. Blood plasma showed an improvement (P<0.05) in total protein, albumin, globulin

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when birds were fed with dietary yeast (Kwsar and El-Latif, 2007).). Serum globulin and albumin were lowered in the aflatoxin fed-hens but was partially restored with the addition of yeast culture residue (YCR). The data demonstrated that YCR may enhance the performance of broiler breeder hens that are provided feed contaminated with AF (Stanley *et al*., 2004). According to Paryad and Mahmoudi (2008), feeding rations containing 1.5 and 2% yeast reduced (P< 0.05) plasma cholesterol and triglycerides concentration with increased (P<0.05) plasma high density lipoprotein (HDL) level. Chicks fed 1.5% Saccharomyces cerevisiae had higher (P<0.05) total plasma protein, albumin and globulin concentrations. High blood protein level has also been linked to certain bone marrow diseases (Mayor, 2010). However, haematological parameters are affected by diurnal fluctuations or changed in daily physical and metabolic activities (Piccione *et al.* 2005).

MATERIALS AND METHODS

This study was conducted with 150 Anak broiler chicks of one week of age. The chicks were bought from Zartech Farm Limited Ibadan while vaccines, drugs and feed ingredients were bought from GOFON' S Vetrinary Services, Owerri, Imo State. The day-old chicks were brooded and reared (one week for adaptation) on floors spread with wood shavings (before putting them in their respective treatments for another 3 weeks of brooding) – the conventional deep litter house. Water and feed were provided *ad libitum* during the brooding and rearing periods. Brooding pens were prepared by washing with 1% ammonium solution (Kabay, 1997), three days before the arrival of the chicks as the pens have been in use for a long time without proper fumigation. Upon arrival, the chicks were vaccinated with Newcastle Disease Vaccine (NDCV i/o) at day one. Each bird was given two drops of the vaccine through the nostrils. Two weeks after (14 day-old), Gumboro vaccine was administered in their respective pens in drinking water, and Lasota Vaccine was also given during the third week (21 day-old) in their respective pens in drinking water. During the second week the birds were transferred to their respective pens.

The experimental diets were starter and finisher diets formulated to meet the crude protein levels of 22.15 and 20.10% for the starter and finisher diets, respectively and corresponding metabolizable energy levels of 14.45 and 14.67 ME (MJ/kg), respectively (Table 3.1). Treatments were graded levels of yeast at 0.0 g, 0.5 g, 1.0 g, 1.5 g and 2.0 g per Kg feed, and per litre of water; and 0.0g/l^{-1} and kg^{-1}, 0.25 g/l^{-1} and kg^{-1}, 0.5g/l^{-1} and kg^{-1}, 0.75g/l^{-1} and kg^{-1} and kg^{-1} yeast in feed.

Data collected were subjected to T-Statistics using SPSS (2006) tool.

RESULT AND DISCUSSION

Table 1 below shows percentage composition of broiler starter and finisher diets. These feeds compositions meet the requirements for broiler starters and finishers. The energy and protein levels agree with the recommendation of Oluyemi and Robberts (2000).

Vitamin/mineral premix supplying Vitamin A (1500 IU), Vitamin D3 (1600 IU),Riboflavin (9.0mg), Biotin (0.25mg), Pantothenic acid (11.0mg), Vitamin K (3.0mg),Vitamin B2(2.5mg), Vitamin B6 (0.3mg), Vitamin B12 (4.0mg), Nicotinic acid (4.0mg), Iron (5mg), Selenium (0.01mg), Magnesium (10.0mg), Zinc (4.5mg) and Cobalt (0.02mg) / Kg feed.

Broilers fed 0.5 and 1.0 g yeast in water had improved daily weight gain, daily feed intake and final live weight probably as a carry-over effect from the starter phase. However, increasing the inclusion level of yeast could not improve broiler chicken performance indicating that at the finisher phase, the level of yeast in water should be 1.0 g per litre. This result concord with the report of Park *et al*. (2001) that diets with supplemental

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Saccharomyces cerevisiae at 0.025, 0.05 and 0.1% contain beta-glucans that has growth promoting and immune-enhancing effects in broiler chickens.

Table 1. Percentage compositions of broiler starter and finisher diets

Ingredients	*Broiler Starter*	*Broiler Finisher*
Maize	50.00	52.00
Soybean	32.00	29.00
Palm kernel cake	13.10	14.10
Bone meal	4.00	4.00
Sodium chloride	0.25	0.25
Premix (Vitamin/Mineral)	0.25	0.25
Lysine	0.25	0.25
Methionie	0.25	0.25
Total (%)	*100.00*	*100.00*
Calculated Composition		
Crude Protein (%)	22.04	20.56
Metabolizable Energy (MJ/KG)	14.45	14.67
Calcium (%)	1.26	1.20
Phosphorus (%)	0.64	0.66
Lysine (%)	0.63	0.64
Methionine (%)	0.33	0.33

The improved performance of broiler finisher fed yeast could also be attributed to selenium in yeast which influences growth via thyroid hormone status in broiler (He *et al*., 2007). Rutz *et al*. (2006) verified broiler performance improvement when fed yeast extracts and attributed the performance to the beneficial effects of the nucleotides present in yeast extract and to the presence of glucans/mannan/ fructo- oligossaccharides in yeast. Results however, disagree with those of Karaoglu and Durdag (2005), Ayanwale *et al*. (2006), Mohiti *et al*. (2007), Chumpawadee *et al.* (2008), Songsak *et al.* (2010), and Shim and Choi (1997) who reported that yeast had no effect on growth. This result also disagreed with that of Satin *et al*. (2006) that feed intake was significantly ($P<0.05$) reduced with addition of yeast in broiler diet.

The haematological indices of broilers fed graded levels of yeast in water (Table 3) showed that Hb (9.70 – 11.13 g/100ml) and PCV (29.07-33.40%) were within normal range of 6.0 – 13.0 g/100ml and 29 – 38% for Hb and PCV, respectively (Nworgu, 2007). MCV was within the range of 840.27 – 1630.56µm^3 (Nworgu, 2007). MCH fell within the range of 32.30 – 60.10 (pg) as reported by Nowaczewski and Kontecka (2012). RBC was higher than the range of 1.0-3.0 (x10^3/mm^3) reported by Mitruka and Rawnsky (1977), except birds fed 0.5 g yeast.

These indices could have contributed to the better performance of the broilers at both phases. WBC of broilers fed yeast in water was lower than the range 1.09-9.06 x10^6/mm^6 reported by Mitruka and Rawnsky (1977). The broilers given the control treatment may have produced more WBC to fight infection suggesting that yeast could have contributed in the enhancement

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of immune system of broilers. MCHC was within the range of 27.35 – 45.51% (Nowaczewski and Kontecka, 2012).

Table 2. Performance of broiler finisher fed graded levels of baker's yeast in water (5 – 8 weeks)

Parameters	*Graded levels of Yeast (g/l)*					*SEM*
	0.0	*0.5*	*1.0*	*1.5*	*2.0*	
Initial Live weight (g)	538.89^{b}	611.11^{a}	594.44^{ab}	583.33^{ab}	547.22^{b}	10.26
Final Live weight (g)	1957.0^{b}	2182.66^{a}	2152.33^{a}	1986.00^{b}	1906.67^{b}	33.53
Daily Weight Gain (g)	50.67^{abc}	56.13^{a}	55.64^{ab}	50.10^{bc}	48.55^{c}	1.04
Daily Feed Intake (g)	114.54^{c}	123.30^{a}	120.64^{ab}	116.00^{bc}	116.17^{bc}	1.03
Feed Conversion Ratio	2.27	2.20	2.17	2.32	2.39	0.04
Daily Protein Intake (g)	23.02^{c}	24.78^{a}	24.25^{ab}	23.32^{bc}	23.35^{bc}	0.21
Protein Efficiency Ratio	2.20	2.26	2.30	2.15	2.08	0.04

a, b, c: Means within the same rows with the same are not significantly (P>0.05) different.
SEM = Standard error of mean. Av = average.

The results agreed with that of Shareef and Al-Dabbagh (2009) that there was no reduction in total white blood cells and mean cell haemoglobin concentration with supplemental yeast fed to broilers. This implied that yeast could enhance red blood cells, haemoglobin concentration, packed cell volume, mean cell volume and mean cell haemoglobin production.

Table 3. Effect of graded levels of baker's yeast fed in water on haematological indices

Parameters	*Graded levels of Yeast (g/l)*					*SEM*
	0.0	*0.5*	*1.0*	*1.5*	*2.0*	
Hb (g/100ml)	10.13^{b}	10.23^{b}	11.13^{a}	10.20^{b}	9.7^{b}	0.18
PCV(%)	30.33^{b}	30.70^{b}	33.40^{a}	30.60^{b}	29.07^{b}	0.55
MCV(μm^3)	959.93^{bc}	1111.34^{a}	1054.28^{ab}	857.76^{c}	961.01^{bc}	58.04
WBC($x10^6/mm^6$)	9.10	8.23	8.07	8.47	8.13	0.13
RBC($x10^3/mm^3$)	3.17^{ab}	2.77^{b}	3.20^{ab}	3.57^{a}	3.03^{b}	0.11
MCH(pg)	32.04^{bc}	37.04^{a}	35.14^{ab}	28.59^{c}	32.07^{bc}	1.95
MCHC(%)	33.40	33.33	33.33	33.33	33.37	0.07

a, b, c: Means within the same rows with the same are not significantly (P>0.05)
SEM = Standard error of mean, Hb = Haemoglobin, PCV = Packed cell volume,
MCV = Mean cell volume, WBC = White blood cell, RBC = Red blood cell, MCH = Mean cell haemoglobin, MCHC = Mean cell haemoglobin concentration

CONCLUSION

Baker's yeast could be used to supplement broiler chicken performance and haematological indices. This is because yeast inclusion improved performance without compromising the haematological indices of broiler chickens.

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