GROWTH PERFORMANCE AND HAEMATOLOGICAL PROFILE OF BROILER CHICKENS FED STRAIGHT DIET SUPPLEMENTED WITH BIONIC PREBIOTIC (HILYSES) AND HARDCORE YEAST CELL WALL (IMMUNO WALL)

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ABSTRACT
*This research aimed to examine the impact of dietary supplementation with bionic prebiotic (hilyses) and hardcore yeast cell wall (immuno wall) on the growth performance and haematological indicators of broiler chickens. A total of 120-day-old broiler chickens were acquired from a reputable hatchery and distributed into four experimental diet groups: a control group (0%) and three treatment groups (0.25kg, 0.50kg, and 0.75kg) in a Completely Randomized Design. Data were collected concerning growth performance and haematological indices. The results demonstrated that the inclusion of prebiotics and yeast led to significant improvements in various performance parameters. Notably, birds fed the diet with 0.75kg of supplementation exhibited the highest final weight (2680.75g), followed by the 0.50kg group (2525.45g), while the control group (2407.55g) and the 0.25kg group (2450.00g) had lower final weights. The weight gained per bird showed similar trends, with the 0.75kg group (2638.40g) leading, followed by the 0.50kg and 0.25kg groups, while the control group had the least weight gain (2363.25g). Average daily weight gain and feed intake also revealed enhanced performance in the groups with supplementation. Additionally, the feed conversion ratio demonstrated that birds on the 0.75kg supplementation diet were more efficient at converting feed into body mass. Haematological parameters showed no significant ($p>0.05$) differences among the groups except for white blood cell (WBC) and packed cell volume (PCV). WBC levels increased with higher prebiotic inclusion, and the 0.75kg group had the highest value. PCV values were also significantly higher in the 0.50kg and 0.75kg groups compared to other dietary treatments. The differential white blood cell counts showed no significant impact on lymphocyte, heterophil, monocyte, and eosinophil counts. The percentage of lymphocytes and heterophils, as well as eosinophils, increased with greater prebiotic levels. In **CONCLUSION**, the study found that supplementing broiler diets with prebiotics significantly increased body weight gain and improved feed conversion ratios compared to the control diet. Moreover, the hematological parameters of broiler chickens fed the treatment diets were comparable to those of the control group, suggesting that prebiotics and yeast can be safely included in broiler diets up to 0.75% without adverse effects on haematological parameters.*

Keywords: Broiler chicken, Growth performance, Haematological indices, Bionic prebiotic, Hardcore yeast

INTRODUCTION

The modern intensive poultry production focuses on efficiently raising broiler chickens to market-ready size within six weeks (Onunkwo *et al*., 2023). Feed constitutes a significant portion of production costs and plays a crucial role in maximizing profitability by improving feed efficiency and utilizing the birds' growth potential (Onunkwo *et al*., 2018). With increasing concerns over antibiotic usage and residues in poultry products, alternative feed additives such as probiotics and prebiotics have gained attention.

Probiotics, consisting of beneficial microorganisms, are incorporated into poultry feeds to enhance growth and performance (Beski and Sardary, 2015). Similarly, yeast culture is rich in nutrients and known for its positive effects on digestion and immunity, its being explored as an alternative to antibiotics. These additives work by maintaining intestinal microflora, improving digestion, and stimulating the immune system. Prebiotics, on the other hand, are food ingredients that selectively promote the growth of beneficial gut bacteria (Alkhalf *et al.,* 2010). They are indigestible by the host and serve as substrates for beneficial bacteria, thus improving digestibility and overall performance.

Assessing the growth and haematological indices of broiler chickens fed with these feed supplements provides valuable insights into their health, nutritional status, and response to different physiological conditions. Haematological parameters such as haemoglobin, red blood cells, and white blood cells are crucial indicators of the birds' health and productivity. Given the increasing demand for optimal feed formulations, studies like the one described aim to evaluate the growth and haematological performance of broiler chickens fed with dietary supplements like bionic prebiotics and yeast cell walls.

MATERIALS AND METHODS

This study was carried out in the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, located at about ten kilometers from Umuahia, Abia State. Umudike bears the coordinate of $5°28^1$ North and 7^0 32^1 East and lies at an altitude of 122 meters above sea level (NRCRI, 2023). The experimental design adopted for the study is Completely Randomized Design (CRD) using four treatments with three replicates. Four experimental diets were formulated. The ratio and composition of the diets used is presented in Table 1.

Growth traits of experimental birds were measured weekly. Parameters obtained include the body weight, feed intake and feed conversion ratio.

Table 1: Ingredient and Nutrient Composition of Experimental Straight Broiler Diet

Ingredients	**T_1 (0.00 %)**	**T_2 (0.25 %)**	**T_3 (0.50 %)**	**T_4 (0.75 %)**
Maize Meal	52.50	52.50	52.50	52.50
Soybean Meal	28.25	28.00	27.50	27.00
Palm Kernel Cake	8.00	8.00	8.00	8.00
Wheat Offal	5.00	5.00	5.00	5.00
Fish Meal	3.00	3.00	3.00	3.00
Bone Meal	3.00	3.00	3.00	3.00
Hilyses	0.00	0.25	0.50	0.75
Premix*	0.25	0.00	0.00	0.00
Immuno wall	0.00	0.25	0.50	0.75
Total	**100**	**100**	**100**	**100**

Vit/Min premix (1kg) contained vitamin A (5000.00IU), vitamin A 3 (1,000,00), vitamin E (16,00mg), vitamin K (800mg), vitamin B_1(1200mg), vitamin B_2 (22,000mg), Niacin (22,000mg), calcium pantothenate (4600mg), vitamin B_6 (2000mg), vitamin B_{12} (10g), folic acid (400mg), Biotin (32mg), cholinv chloride (200,000mg), Manganese (948,000mg), iron (40,000mg), Zinc (32,000mg), Copper (3400mg), Iodine (600mg), Cobalt (120mg), Selenium (48mg), Antioxidant (48,00mg).

Blood was collected aseptically with a sterile syringe and needle between 07:00 and 10:00 hour from the wing vein of each bird. 3 ml of blood sample was collected from each bird and then dispensed into a 7 ml glass vacutainer tube (Agary Pharmaceutical Ltd, Nigeria) containing ethylene diamine tetra acetic acid, an anticoagulant for haematological analyses. The blood samples were placed on ice and taken immediately to the Laboratory for haematological evaluations.

The blood parameters measured are Hb, PCV, total RBC count and its indices mean corpuscular volume (MCV) mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC), and total WBC count and its differentials (heterophils, lymphocytes, monocytes, eosinophils and basophils).

RESULTS AND DISCUSSION

The supplementation of prebiotics and yeast had a notable impact on various performance traits (Table 2), Significant disparities ($p<0.05$) were observed in final weight among the treatment groups. This observed trend of increasing final weight as prebiotic and yeast supplementation levels increased is noteworthy. The substantial increase in final weight associated with diet 4 suggests that prebiotics may have played a pivotal role in enhancing nutrient digestion, thereby promoting growth. This finding aligns with the Conclusions of Onunkwo and Ekine (2020) who asserted that supplementing

prebiotics is crucial for releasing bound nutrients within the gastrointestinal tract, facilitating absorption.

Onunkwo *et al*. (2023) support this perspective, stating that the inclusion of yeast cells in diets improves both bird growth performance and digestibility while reducing nutrient excretion into the environment.

The findings from this study indicate variations in average daily weight gain among the different dietary groups of birds. The inclusion of prebiotic and yeast supplements in the diet had a positive impact on daily weight gain. This observation aligns with previous studies conducted by Onunkwo *et al.* (2019) and Onunkwo *et al*. (2021), who also reported that dietary supplementation with prebiotics led to improved body weight in broilers compared to control groups. Importantly, both studies noted that the improvements in body weight were more pronounced at higher levels of supplementation. Yeast, being a living microorganism, can exert beneficial effects on broiler health when administered through the digestive tract, primarily due to its nutritional properties (Campbell., 2013).

Remarkably, the data from this study demonstrated that birds fed diet 4 exhibited a lower feed intake. This outcome suggests that these birds displayed enhanced feed efficiency, as they were able to convert the provided feeds into weight gain within a shorter timeframe. Therefore, the observed variations in daily feed intake among the treatment diets may be attributed, at least in part, to differences in palatability, as suggested by previous research (Onunkwo and Ekine, 2020).

The findings in this study point to notable improvements in bodyweight gain, as evidenced by the feed conversion ratio (FCR) analysis. Specifically, it was observed that birds on diet 4 (with an FCR of 2.37) outperformed their counterparts in terms of feed-to-body mass conversion during the rearing period. The promotion of beneficial bacteria growth in the gastrointestinal tract (GIT) through the combination of a prebiotic and yeast cells was found to be particularly effective in this study. This outcome aligns with the broader scientific literature, which suggests that improvements in feed efficiency can be attributed to the stimulated growth of beneficial microflora in the GIT resulting from dietary prebiotic supplementation (Onunkwo *et al*., 2019).

Table 2: Growth Performance of Broiler Chickens supplemented with prebiotic (hilyses) and hardcore yeast cell

Parameters	Diet 1	Diet 2	Diet 3	Diet 4	SEM
Initial body weight (g/bird)	44.50	48.30	50.75	42.55	1.65
Final body weight (g/bird)	2407.65^{c}	2450.10^{c}	2525.55^{b}	2680.85^{a}	25.80
Body Weight gained (g/bird)	2363.25^{c}	2401.90^{b}	2474.90^{b}	2638.40^{a}	26.74
Average Daily body Weight Gained (g/bird)	48.32^{c}	49.11^{c}	50.58^{b}	53.94^{a}	3.55
Average Daily feed intake (g/bird)	158.35^{a}	146.25^{a}	128.95^{b}	120.65^{c}	1.76
Feed conversion ratio (FCR)	3.38^{a}	2.98^{b}	2.67^{b}	2.37^{c}	0.06

a,b,c Means across rows with different superscripts differ significantly at P<0.05; S.E.M: Standard Error of the Mean

The findings from this study revealed no significant differences (p>0.05) among the treatment groups (Table 3), except for packed cell volume (PCV) and white blood cell (WBC) count. It is noteworthy that the PCV values recorded in our study fell within the range of 25 to 45 %, which is consistent with the PCV range reported by Mitruka and Rawnsley (1977). This suggests that, despite the observed differences in PCV values among dietary treatments, results obtained are within the established physiological range for PCV in broiler chickens. Based on the findings of this study, it can be deduced that the hematological parameters of broiler chickens fed the treatment diets, which included supplementation of prebiotics and yeast at levels up to 0.75%, exhibited favorable comparability to those of chickens on diet 1 (control). This suggests that the incorporation of prebiotics and yeast into broiler diets at these levels does not elicit any adverse effects on blood quality parameters.

Interestingly, as the levels of prebiotics increased among the treatment groups (Table 4), an increase in the percentages of lymphocytes and heterophils, as well as eosinophils was observed. This elevation in lymphocyte activity is indicative of a heightened humoral immune response in the chickens that were fed diets supplemented with prebiotic and yeast. Moreover, a reduction in circulating monocytes

Table 3: Haematological Indices of Broiler Chickens supplemented with prebiotic (hilyses) and hardcore yeast cell.

Parameters	T1	T2	T3	T4	SEM
Hb (g/dL)	11.83	12.30	11.90	12.15	0.11
PCV (%)	28.77b	31.10a	29.77b	33.77a	1.65
RBC ($X10^6mm^3$)	3.27	3.42	3.56	3.94	0.08
WBC ($X10^3mm^3$)	30.95^c	34.67^b	36.22^b	42.17^a	1.11
MCV (fl)	90.54	93.47	86.85	87.91	0.65
MCH (pg)	37.10	36.84	34.20	31.48	0.07
MCHC (g/dL)	40.91	39.45	39.87	35.88	0.44

[abc] Means within the rows with different superscripts are significantly different (P<0.05); SEM-Standard error of the mean.

was observed in the birds. These results are consistent with the findings reported by Gibson and Roberfroid (1995), who also observed a non-significant effect of prebiotics on the percentages of lymphocytes, eosinophils, and heterophils in their research. Therefore, this study suggests that the inclusion of prebiotic and yeast in the diet of broiler chickens, up to a level of 0.75 kg, did not induce any signs of infection.

Table 4: Differential white blood cell counts of Broiler Chickens supplemented with prebiotic (hilyses) and hardcore yeast cell.

Parameters (%)	T1	T2	T3	T4	SEM
Lymphocytes	50.10	52.77	53.10	55.15	0.04
Heterophils	34.52	36.77	39.43	41.77	0.01
Monocytes	5.10	4.43	4.24	4.10	0.03
Eosinophils	1.43	1.77	2.43	2.43	0.25

[abc] Means within the rows with different superscripts are significantly different (P<0.05); SEM-Standard error of the mean.

CONCLUSION

The supplementation of broiler diets with a prebiotic significantly increased body weight gain (BWG) while improving feed conversion ratio (FCR) in comparison to the control diet. Moreover, when prebiotic supplementation was combined with yeast cell supplementation, it produced an additional beneficial effect on the growth performance of broilers. Also, the blood quality of broiler chickens fed the treatment diets was favorably comparable to that of the control diet. Consequently, based on the findings of these studies, it is suggested that prebiotic and yeast supplementation can be included in broiler diets up to 0.75% without any adverse effects on haematological parameters.

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