CARCASS CHARACTERISTICS AND ORGAN WEIGHT OF BROILER CHICKENS FED DIET SUPPLEMENTED WITH BIONIC PREBIOTIC (HILYSES) AND HARDCORE YEAST CELL WALL

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ABSTRACT
The discovery that the use of antibiotic in food animals is fueling the increasing problem of transmitting resistance bacteria from food animals to man has led to the search for an alternative to the use of antibiotics. To this end, the supplementation of broiler chickens' straight diet with Bionic Prebiotic (Hilyses) and Hardcore Yeast Cell Wall (Immuno Wall) on carcass characteristics and organ weight was investigated. The experiment utilized a Completely Randomized Design (CRD) with 120 unsexed day-old chicks randomly allocated into four treatment groups (T1, T2, T3, and T4), each consisted of 30 chicks and replicated three times. Carcass and organ weight was measured and determined at the 8th week. The carcass results obtained indicate significant ($p < 0.05$) differences among the treatment groups for live weight, dressed weight, dressing percentage, thigh, and back cuts. In particular, the live weight of birds that were fed diet 4 (2680.85g) was found to be significantly ($p < 0.05$) higher compared to birds fed diet 3 (2525.55g). On the other hand, birds fed diet 1 (2407.65g) and diet 2 (2450.10g) exhibited the lower live weight values. It is noteworthy that the live weight increased significantly across the dietary treatments as the levels of prebiotic and yeast inclusion in the diets increased. In the context of the poultry industry, a paramount objective is to maximize yield percentage, obtain saleable products, and subsequently enhance the edible portions of the birds. Typically, the incorporation of feed additives has the potential to augment metabolic rates, leading to favourable changes in the size of several internal organs, as evidenced in this study. These findings highlight the potential for enhanced broiler chicken performance and overall health when incorporating these dietary additives.

Keywords: Broiler chicken, carcass yield, organ weight, Bionic prebiotic, Hardcore yeast

INTRODUCTION

One of the major challenges faced by poultry industry in Nigeria is improving efficiency of production (Onunkwo *et al*., 2023). The use of antibiotics as growth promoters (AGPs) in poultry nutrition has been associated with the fast-growing nature of broiler chickens (Mokhtari *et al*., 2015). Although, Onunkwo *et al*. (2018) affirmed that chicken reared with the addition of antibiotics achieved good performance, but their potential side effects became a real public health global concern. Antibiotics lead to drug resistance in bacteria and drug residues in poultry products (Mokhtari *et al*., 2015). Therefore, the wish to reduce the usage of antibiotics in animal production, replacements have been developed, such as probiotics, prebiotics, synbiotics, and herbal medicines (Panda *et al*., 2001). Prebiotics were successfully used in the broiler diet as potential alternatives to antibiotics. Prebiotics is non-digestible food ingredients fermented by intestinal microbiota. It beneficially affects the host by stimulating selectively the growth and/or activity of one or a limited number of bacteria in the colon (Gibson and Roberfroid, 1995). Optimal characteristics of prebiotic was described by Parsa *et al*. (2018): prebiotics should not be hydrolyzed by animal gastrointestinal enzymes, prebiotics cannot be absorbed directly by cells in the gastrointestinal tract, prebiotics selectively enrich one or limited numbers of beneficial bacteria, prebiotics alter the intestinal microbiota and their activities, and prebiotics improve luminal or systemic immunity against pathogen invasion. Several in vivo studies have shown that dietary supplementation of prebiotic had beneficial effects on productive traits and gut health. Prebiotics stimulate the proliferation of beneficial bacteria, inhibit the colonization of pathogenic bacteria, improve nutrient absorption, promote growth rate, and feed utilization efficiency (Parsa *et al*, 2018). There are still conflicting reports on the beneficial effect of yeast inclusion in poultry diets. As far as the literature denotes, the effect of diet

supplemented with Bionic Prebiotic (Hilyses) and Hardcore Yeast Cell Wall (Immuno Wall) on carcass characteristics and organ proportions of broiler chickens still have not been well studied.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit, Teaching and Research farm, Michael Okpara university of Agriculture, Umudike, Abia State. Umudike is located on latitude 05° 21' N and longitude 07° 33' E, with an elevation of about 112m above sea level (Meteorological Station, NRCRI, Umudike, 2023). The study was conducted with a total of one hundred and twenty (120) day old, unsexed chicks which were purchased from a distributor in the study area. The experimental design for the experiment was Completely Randomized Design (CRD). The experiment lasted for the period of 56 days. The chicks were weighed and randomly allotted to four equal treatments groups (T1, T2, T3, and T4) each having 30 chicks. Each treatment was replicated three times of 10 chicks each. Supplementation of prebiotic in the diet (Table 1) commenced on the first day of the experiment. Other management practices including prophylactic medications and vaccinations were carried out.

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

Ingredients	Treatments (%)			
	1	**2**	**3**	**1**
	0.00	**0.25**	**0.50**	**0.75**
Maize	48.00	48.00	48.00	48.00
Soybean Meal	32.00	32.00	32.00	32.00
Palm Kernel Cake	8.30	8.30	8.30	8.30
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	2.75
Prebiotic	0.00	0.25	0.50	0.75
Premix*	0.25	0.125	0.00	0.00
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Common salt	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
ME (Kcal/kg)	2871.85	2871.85	2871.85	2871.85
Crude Protein (%)	23.17	23.17	23.17	23.17
Calcium (%)	1.20	1.20	1.20	1.11
Phosphorus (%)	0.77	0.77	0.77	0.74
Lysine (%)	0.95	0.95	0.95	0.95
Methionine (%)	0.45	0.45	0.45	0.45

**Vit/Min premix (1kg) contained vitamin A (5000.00IU), vitamin A 3 (1,000,00), vitamin E (16,00mg), vitamin K (800mg), vitamin B1 (1200mg), vitamin B2 (22,000mg), Niacin (22,000mg), calcium pantothenate (4600mg), vitamin B6 (2000mg), vitamin B12 (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), Anti-oxidant (48,00mg).*

At the end of the experiment, three birds (average pen weight) were randomly selected, one from each of the replicates of the treatments. For carcass characteristics, the birds were starved overnight before slaughter, provided with only water to ensure good meat quality. The birds were slaughtered by severing the jugular vein and eviscerated for carcass and internal organ evaluation.

The head, neck, shanks, and viscera organs were removed to determine dressed weight. The cut parts such as breast, thigh, drumstick, wings and back will be weighed and expressed as percentage of dressed weight. Visceral organs such as liver, heart, intestine, kidney, gizzard, pancreas, and spleen were weighed immediately using sensitive scale and expressed as percentage live weight. All data generated were subjected to statistical analysis using analysis of variance (ANOVA) and means that are significantly different were separated using Duncan Multiple Range Test according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

The carcass yield of broiler chickens subjected to the experimental diet supplementing broiler chicken diets with bionic prebiotic (hilyses) and hardcore yeast cell wall is presented in Table 2. The results obtained indicated significant ($p < 0.05$) differences among the treatment groups in terms of live weight, dressed weight, dressing percentage, thigh, and back cuts. It is noteworthy that the live weight increased significantly across the dietary treatments as the levels of prebiotic and yeast inclusion in the diets increased. This notable increase in live weight in diet 4 may be attributed to the beneficial effects of prebiotics, which likely facilitated nutrient digestion, thereby promoting growth. This observation aligns with the findings of Onunkwo *et al*. (2023), who emphasized the essential role of prebiotic supplementation in releasing bound nutrients within the gastrointestinal tract for optimal absorption. It is important to note that the live weight in this study ranged from 2407.55g to 2680.75g, reflecting the variation observed across the dietary treatments. These results underscore the positive impact of dietary prebiotic and yeast inclusion on the live weight of broiler chickens, highlighting their potential as valuable additives to enhance broiler growth and carcass yield. Furthermore, these findings support the notion that prebiotics can contribute to improved nutrient utilization and growth in poultry, as demonstrated by Onunkwo *et al*. (2023).

Dressed weights of birds in this study exhibited significant ($P<0.05$) differences among the various dietary treatments. Specifically, birds that were fed diet 4 had the highest dressed weights, measuring 2263.50g. This observed variation in dressed weights aligns with prior research findings of Onunkwo *et al*. (2014) who reported similar outcomes, reinforcing the significance of our results. The trend of increased dressed weights with higher levels of prebiotic inclusion in the diets suggests a potential relationship between dressing weight and the live weights of broilers receiving the experimental diets. This proposition finds support in the work of Hossain *et al*. (2003), who demonstrated an augmentation in dressing yield with increased live weight in broilers. This study revealed a range of dressed weights, from 1836.10g to 2263.50g, with statistical significance ($P<0.05$) among the treatment groups. These findings are consistent with prior research, underlining the impact of prebiotic inclusion on the dressed weights of broilers.

In this study, an examination of various carcass parameters revealed not statistically significant ($p > 0.05$) differences among the experimental groups. The measurements encompassed several key anatomical features, including drumstick, breast muscle, wings, neck, head, and shank. The percentage values obtained for these parameters were as follows: drumstick ranged from 34.68% to 36.92%, breast muscle ranged from 45.31% to 46.43%, wings ranged from 24.68% to 25.71%, neck ranged from 16.48% to 17.21%, head ranged from 7.22% to 7.81%, and shank ranged from 12.25% to 12.81%. The lack of significant differences in these carcass parameters across the dietary treatments implies that there were no discernible influences of foreign substances in the experimental diets that could have adversely impacted nutrient metabolism. It is worth noting that breast muscles, thighs, and drumsticks constitute the most economically valuable segments of the broiler carcass, providing the largest proportion of edible meat (Onunkwo *et al.*, 2020).

Table 2: Carcass yield of Broiler Chickens supplemented with prebiotic (hilyses) and hardcore yeast cell.

Parameters	T1	T2	T3	T4	S.E.M
Live weight (g/bird)	2407.65^{c}	2450.10^{c}	2525.55^{b}	2680.85^{a}	25.80
Dressed weight (g/bird)	1836.10^{c}	2108.75^{b}	2170.78^{b}	2263.50^{a}	15.94
Dressing (%)	76.87^{b}	86.50^{a}	85.50^{a}	84.10^{a}	4.61
Drumstick (%)	35.65	36.71	34.58	36.82	0.29
Thigh (%)	33.72^{b}	32.88^{b}	37.75^{a}	37.10^{a}	5.10
Breast (%)	46.32	45.21	46.10	46.33	1.95
Back cut (%)	34.72^{c}	34.50^{c}	38.75^{b}	41.55^{a}	3.53
Wings (%)	25.61	24.58	25.60	24.76	0.44
Neck (%)	16.38	17.11	16.76	16.85	0.32
Head (%)	7.71	7.12	7.21	7.55	0.21
Shank (%)	Ee	12.21	12.15	12.43	0.12

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

The internal organ of broiler chickens subjected to the experimental diet supplementing broiler chicken diets with prebiotics and yeast is presented in Table 3. The study found that incorporating prebiotics and yeast into the diets led to a significant reduction in the relative weight of the intestines compared to the control group. This aligns with previous research suggesting that antibiotics, commonly used as growth promoters, can thin the intestinal wall, leading to decreased intestine weight. Moreover, the proportion of abdominal fat relative to carcass weight significantly increased in the control group compared to birds on experimental diets enriched with prebiotics. This outcome is consistent with prior studies indicating that prebiotic-rich diets can reduce abdominal fat mass. Additionally, the relative gizzard weights were notably higher in birds on experimental diets, suggesting improved growth stimulation, nutrient digestion, and absorption. These findings corroborate previous research highlighting the positive effects of prebiotics on avian physiology.
However, the analysis did not reveal statistically significant differences in other physiological parameters such as the proventriculus, kidneys, spleen, and lungs among the experimental groups. This suggests that the inclusion of prebiotics and yeast supplements in the diet does not compromise the immunity of the birds. The study indicates that the dietary interventions did not induce metabolic stress or toxicity, but instead promoted healthy organ growth. Overall, the experimental diets contributed to improved performance in the birds compared to those fed the control diet.

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

Parameters %	T1	T2	T3	T4	S.E.M
Intestine	5.17[a]	4.50[b]	4.42[b]	4.14[c]	0.27
Proventriculus	0.54	0.61	0.62	0.48	0.02
Abdominal fat	0.63[a]	0.56[b]	0.50[c]	0.50[c]	0.94
Kidney	0.45	0.46	0.26	0.37	0.02
Gizzard	1.99[c]	2.11[a]	2.08[b]	2.19[a]	0.55
Spleen	0.16	0.12	0.11	0.13	0.01
Heart	0.62	0.54	0.66	0.44	0.03
Liver	1.85	1.95	1.97	1.78	0.04
Lungs	0.59	0.61	0.57	0.59	0.02
Crop	0.77	0.76	0.70	0.70	0.04

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

CONCLUSION

The findings of this study clearly demonstrated the favourable performance of the treatment diets across all parameters examined within the context of carcass and organ yield in broiler chickens. This study has underscored the superior carcass yield achieved by the birds fed the trial diets when compared to those on the control diet. Specifically, it was evident that 0.75% inclusion of prebiotics and yeast cells, yielded outstanding carcass production and elicited a more robust immune response than both the other trial diets and the control diet. These findings highlight the potential for enhanced broiler chicken performance and overall health when incorporating these dietary additives.

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