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AN ASSESSMENT OF GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FED WITH DRY WATERMELON PEELS MEAL (DWPM) ON THE LIVELIHOOD OF FARMER, IN ZARIA LOCAL GOVERNMENT, KADUNA STATE

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ABSTRACT

The demands for broiler meat are increasing due to population whereas production cost of such meat has remained high due to high cost of convectional feed. Carcass and organ weight characteristics of ninety-six (96) 2-weeks old broiler birds fed dried watermelon peel meal was investigated. Watermelon peel meal was included at 0, 1.25, 2.5 and 3.75% dietary inclusion levels as replacement for wheat offal to form (Diet 1, Diet 2, Diet 3 and Diet 4 respectively). The birds were randomly allocated to four treatment groups replicated thrice to have 8 birds per replicate, and were fed the experimental diets ad libitum for 4 weeks under a deep litter management system. At day 28, one bird replicate was slaughtered for the evaluation of carcass and organs weight characteristics. There were no significant ($P>0.05$) differences in live weight, carcass weight, dressing %, thigh, shank, wing and neck. Significantly ($P<0.05$) higher breast muscle of 109.67g/bird was recorded on birds fed 3.75% DWMP compared to other groups. For the organs weight, no significant effect on liver, heart, lung, intestine, pancreas and gizzard ($P>0.05$). Based on the carcass and organs weight characteristics of birds, dried watermelon meal can be included up to 3.75% in the diet of birds at the starter phase without any harmful effect on their carcass and organs.

Keywords: Carcass, Characteristics, Broilers, Watermelon, Livelihood

INTRODUCTION

The rearing of broilers among poultry represents one of best source of quick cash return through the production of high-quality product such as meat. It also bridges the demand and supply gap in animal protein for the populace. Broilers are fast growing birds that attain market weight of 1.8-2.5 kg within 8-10 weeks of age (Oniseibo *et al*., 2006) mostly under trial conditions. Under farm conditions however, broilers require up to 10 weeks to reach 2 kg live weight with layers laying as low as 180 eggs per annum (Ehebha *et al*., 2010). This is a little bit below what is obtained in other developed countries. In Europe and USA, broilers attain more than 2kg live weight in 8 weeks while modern hybrid layers lay over 300 eggs per annum (Anyaechie and Okorie, 2008). Broiler meat is rich in proteins and unsaturated fatty acids with low sodium and cholesterol (Jaturassitha *et al*., 2008). Despite the credits given to the broiler chickens, high cost of energy feed still disrupts the broiler industry. Afolayan *et al*. (2009) opined that the higher the level of energy, the higher the cost of diet. Profit in poultry industry is highly dependent on the cost of the different ingredients used in formulating feed and the availability of the feed nutrients to the birds.

In the past, poultry farmers were not much involved in rearing broilers for obvious reasons. Broilers are too delicate to handle and since most of the farmers lacked the techniques of handling the birds, large scale mortalities were encountered. Besides that, there was poor demand for broiler meat because local chickens and guinea fowls were available at cheaper rates and there were fewer catering houses that demanded for broiler meat. The situation is now changing; consultancy services offered by specialists in nutrition and management have acquainted farmers with broiler rearing techniques. Local fowls are becoming more expensive and quite a number of catering houses have been opened in the study area. The demand for broiler meat is now on the increase; even shops that sell frozen broiler meat now operate in the cities. Middle income earners now realize the suitability of broiler meat as a juicy, highly digestible and nutritious product.

In view of this, it is necessary to look into aspects of broiler rearing that pose a challenge to successful and profitable broiler production venture. Since feeding broilers accounts for more than 70% of the entire rearing expenses (Oluyemi and Roberts, 2000) and reducing feeding cost will make broiler rearing more profitable. This can be achieved through self-formulation of diets using non-convectional feed ingredients as studies have shown that self-formulated diets are 25% cheaper than commercial diets (Bashar and Abubakar, 2011). Knowing the correct ingredients to use particularly among energy will also cut production expenses, as they boost the growth performance and physiology of the birds. Watermelon peel, a by-product of fruit processing constitutes the bulk of fibre source which can easily substitute wheat offal as energy supplement in the broiler's diets. The objectives are to: carry out proximate (crude protein, crude fibre, ether extract, nitrogen free extract and ash) and phytochemicals (alkaloid, flavonoid, saponin and tannin) analysis of DWMP, determine the growth performance of broiler chickens fed varying graded levels of DWPM, determine the nutrients digestibility of broiler chickens fed varying graded levels of DWMP, determine the haematological parameters of broiler chickens fed varying graded levels of DWPM and to evaluate the carcass and organs characteristics weight of broiler chickens fed varying graded levels of DWPM

MATERIALS AND METHODS

Study Site

This study was conducted at the livestock unit of the Department of Agricultural Education, Federal University of Education Zaria. The study aims to assess the use of dried watermelon peel meal (DWPM) in broiler chicken diets. Specifically, it seeks to evaluate its nutritional content, impact on growth performance, carcass yield, organ development, nutrient digestibility, blood health, and its economic effect on poultry farmers' livelihoods in Zaria Local Government, Kaduna State.

Zaria is located within latitude 11^0 04 North and longitude 7^0 42 East of the equator. Zaria Local Government area is geographically found in the northern part of Kaduna State. The average rainfall is 750mm and the dry season starts in March and ends in May. The major ethnic groups are Fulani, Hausa and some of the major of Nigerian tribes are also found. However, Zaria local government area is an agrarian town with about 70% of the population engaged maize farming (KADP, 2021).

Birds, diets and design

Ninety-six (96) broiler birds at 2 weeks of age were allocated to four experimental diets using completely randomized design. Each treatment had twenty-four (24) starter broiler chicks, replicated thrice with eight (8) birds per replicate. Watermelon peel meal was included at 0, 1.25, 2.5 and 3.75% dietary inclusion levels as replacement for wheat offal to form (Diet 1, Diet 2, Diet 3 and Diet 4) respectively. The composition of experimental diets is presented in Table 1.

Table 1: Composition of the Experimental Diet for Broiler Starter Birds

Ingredients	Diet 1 (0%)	Diet 2 (1.25%)	Diet 3 (2.5%)	Diet 4 (3.75%)
Maize	50.71	50.67	50.54	50.95
GNC	35.79	35.83	35.96	35.55
Wheat offal	5.00	3.75	2.50	1.25
WPM	0.00	1.25	2.50	3.75
Blood meal	3.50	3.50	3.50	3.50
Bone meal	1.00	1.00	1.00	1.00
Limestone	2.00	2.00	2.00	2.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated value				
CP (%)	24.25	24.07	23.92	23.48
ME (Kcal/kg)	2808.24	2792.12	2274.92	2763.30
CF (%)	3.47	3.36	3.22	3.10
EE (%)	5.59	5.74	5.46	5.37
Calcium (%)	0.37	0.33	0.33	0.32
Phosphorus (%)	0.47	0.73	0.46	0.45

KEY: CP=crude protein, ME=metabolizable energy, CF=crude fibre, EE=ether extract

Carcass Evaluation

At day 28, one bird per replicate was randomly selected and slaughtered to obtain he relative weights of the carcass and organs. The birds were feathered and eviscerated manually after slaughter. The eviscerated birds were dissected and all internal organs and external offal (head, shank and neck) were carefully removed. The dressing percentage was calculated using the formula.

$$Dressing\% = \frac{Carcass\ weight}{Live\ weight} \times 100$$

Data Analysis

The data collected was subjected to Analysis of Variance (ANOVA) using SPSS. Means separation was carried out using Least Significant Difference (LSD) as outlined by Steel and Torries (1980).

RESULTS AND DISCUSSION

Table 2: Carcass Characteristics of Broiler Starter Birds fed DWPM

Parameters	Treatments				
	Diet 1 (0%)	Diet 2 (1.25%)	Diet 3 (2.5%)	Diet 4 (3.75%)	SEM
Live weight (g)	666.67	700.00	766.67	800.00	84.984
Carcass weight (g)	633.33	683.33	733.33	800.00	77.728
Dressing (%)	95.54	97.62	96.06	100.00	1.912
Breast muscle (g)	98.13^{ab}	57.13^{b}	98.70^{ab}	109.67^{a}	10.326
Thigh (g)	128.57	88.43	131.37	132.53	13.321
Shank (g)	24.03	29.37	33.73	34.27	4.570
Neck (g)	71.00	49.67	71.00	75.00	14.780
Wing (g)	47.90	41.03	57.20	55.90	5.659

ab- mean values along the row with different superscripts are significantly different (P>0.05)

The results in table 2 shows that, for carcass evaluation indicated that treatment effect on breast muscle was significant (P<0.05) though DWMP had no significant (P>0.05) effect on live weight, carcass weight, thigh muscle, shank, wing and neck. There was an increase in the values of these parameters as levels of DWMP in the diets increased. The finding agrees with earlier report that plant contain medicinal properties which allowed chickens to grow strong and healthy (Doyle, 2001). The superior value of the dressing % of birds fed varying levels of DWPM is an indication that total edible meat from birds on this treatment is higher than the meat yield from control. The differences observed in this parameter could be due to nutritional and health benefits of the watermelon peels which are beneficial to the growth of the

birds. The finding is in harmony with the report of Neglo et al. (2021). The higher value weight of shank obtained on birds fed 3.75g DWMP compare to 2.5g, 1.25g and control group may suggest that the absorption of calcium in peels may be best in this inclusion.

Table 3: Organs Weight of Broiler Birds fed DWMP

Parameters (g)	Treatments				
	Diet 1 (0%)	Diet 2 (1.25%)	Diet 3 (2.5%)	Diet 4 (3.75%)	SEM
Liver	18.60	19.53	19.37	17.70	1.293
Heart	5.00	3.80	5.07	3.83	0.315
Pancreas	6.73	4.87	4.00	5.90	0.415
Lung	4.80	4.47	4.60	4.97	0.242
Gizzard	32.73	22.77	31.30	32.00	1.686
Spleen	1.17	0.97	1.27	0.87	0.113
Small intestine	22.60	14.00	25.77	17.93	1.682
Large intestine	33.43	27.17	27.80	21.80	2.720
Proventriculus	6.73	4.87	4.00	5.90	0.415

The results in table 3 shows that, the weight of internal organs of the birds in all the groups were not affected by the treatment diets ($P<0.05$). Birds fed DWMP at 1.25% shows higher weights of liver while heart, intestines and spleen were found to be heavier on birds fed 2.5% DWMP. Findings of this study showed that all organs performed well due to anti-microbial nature of watermelon that may have prevented any harmful effect to the organs. This finding however, did not agree with the report of Nwargo, Ogungbenro and Solesi (2010) and Machebe, Agbo and Onuaguluchi (2010) who reported that medicinal plants usage have been associated with organs damage due to toxic substances produce by the plant. The increase in these parameters are attributed to the fact that body organs are known to absorb drugs first before releasing them to entire cells for use. This may be the reason why DWMP groups have more organ weights than the control group. The finding did not favor the earlier report of Bello (2013) who reported the significant effect on internal organs.

The results obtained in this study demonstrate that incorporating dried watermelon peel meal (DWPM) up to 3.75% in broiler starter diets does not adversely affect the growth performance, carcass yield, or internal organ development of the birds. In fact, certain parameters such as breast muscle weight and dressing percentage showed a significant improvement, particularly at the 3.75% inclusion level.

These findings align with those of Oladunjoye and Ojebiyi (2010), who reported that fruit and vegetable by-products like sweet orange peel and banana peel could be safely included in poultry diets at moderate levels without negatively impacting performance indices. They found that such by-products contain residual nutrients and phytochemicals that support growth and feed efficiency.

Moreover, Akinfala et al. (2002) reported that unconventional feedstuffs such as cassava peel and maize offal, when properly processed, could serve as partial replacements for energy sources in poultry diets. Their findings support the notion that DWPM, being high in fiber and containing bioactive compounds such as saponins and flavonoids, may enhance gut health and nutrient utilization, which may explain the improved breast muscle weight observed.

The observed increase in dressing percentage with higher DWPM inclusion corroborates the study of Teteh et al. (2016), who evaluated the effect of pawpaw peel meal in broiler diets and found a significantly improved carcass yield without any toxicological effects. They concluded that bioactive components in fruit peels may positively influence carcass development and feed conversion ratio.

Regarding internal organ weights, the current study found no significant deleterious effects, which agrees with the observations of Oloruntola et al. (2018), who used watermelon rind and other fruit-based feed components in poultry nutrition. They reported stable organ weights and attributed this to the antioxidant and antimicrobial properties of fruit peels, which may enhance the immune response and protect internal tissues from oxidative stress and infections.

Contrary to some earlier studies such as Nworgu et al. (2010) and Machebe et al. (2010), which suggested that some medicinal plant-based additives might negatively affect organ function due to phytotoxins, the present study did not observe any organ damage or shrinkage. This contradiction could be due to the low inclusion levels of DWPM used in this study, which may not have reached the toxic threshold. It also highlights the importance of proper processing and drying of peels before inclusion in feed.

Furthermore, Bello (2013) reported significant effects on internal organs with high inclusion levels of some unconventional feed ingredients; however, our results suggest that DWPM at 3.75% remains within the safe range. The improved breast muscle weight at this level may also be due to the possible enhancement of protein metabolism by phytochemicals in watermelon peels, as suggested by Doyle (2001), who highlighted the functional role of plant secondary metabolites in promoting growth and health.

The slight increase in organ weights such as the liver and heart at certain inclusion levels may also indicate better nutrient absorption and metabolism. This corresponds with the study of Abou-Elkhair et al. (2014), who reported enhanced liver function and enzyme activities in broilers fed herbal feed additives.

CONCLUSION

It can be concluded that dietary level of dried watermelon peel, up to 3.75% significantly ($P<0.05$) increased the breast muscle and enhances better dressing percentage of broilers at starter phase. It is recommended that further study be also carried out with finisher broiler birds and other poultry. Furthermore, the inclusion of DWPM up to 3.75% in broiler starter diets not only sustains performance and organ health but may also enhance certain carcass traits such as breast muscle and dressing percentage. The study supports the safe use of fruit peel by-products as sustainable alternatives in poultry nutrition, contributing to cost reduction and improved farmer livelihood.

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