

(RESEARCH ARTICLE)



## Performance and carcass characteristics of broiler finisher fed diets containing water hyacinth meal as a replacement for wheat offal

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### Abstract

This study was conducted to evaluate the performance and carcass characteristics of broilers finisher fed diets containing water hyacinth meal as a replacement for wheat offal at various inclusion levels. Ninety broiler finisher were used for this study which were allotted equally into three dietary treatments such that Treatment 1 served as the Control without inclusion of water hyacinth meal; Treatment 2 had inclusion of 5% water hyacinth meal and Treatment 3 were served the inclusion of 10% water hyacinth as a replacement for wheat offal respectively in a Completely Randomized Design. Data were collected on performance and carcass characteristics of the chicken, the data were subjected to analysis of variance using SAS. Result revealed that there was no significantly difference ( $p>0.05$ ) in the initial weight, final weight, total weight gain and average daily weight gain among the control and water hyacinth meal diets. However, there were significant ( $p<0.05$ ) differences in the feed intake, average daily feed intake and the feed conversion ratio of the experimental birds. There was no significant differences ( $p>0.05$ ) of the treatments on carcass characteristics of the chicken except in the weight of the head and shank of the chicken. Based on the result obtained, it is therefore concluded that inclusion of water hyacinth meal up to 10% as a replacement for wheat offal in broiler finisher diet did not have effect on growth performance as well as carcass characteristics. Thus it is recommended that further studies could be conducted on increasing the inclusion levels of water hyacinth meal as supplementary diet or replacement of wheat offal in broiler production

**Keywords:** Broiler chicken; Characteristics; Meal; Performance; Water hyacinth

### 1 Introduction

Poultry industry, more specifically, the broiler industry plays a key role in the delivery of high quality protein and lipids to the world population. Per capita consumption of chicken meat of both developed and underdeveloped nations increased greatly. The popularity of poultry birds in Nigeria is noteworthy and can be attributed to the numerous benefits associated with poultry production and other value chain [6]. Broiler are fast growing birds which reach market weight of 1.8 to 2.5kg in about 8 to 12 weeks of age because of their ability to produce good body conformation[8]. Broiler chickens (*Gallus gallus domesticus*) are a gallinaceous domesticated fowl, bred and raised specifically for meat production [12]. Most commercial broilers reach slaughter-weight at approximately 14weeks of age.

Feed cost accounts for the greatest proportion of broiler productions variable costs [11], having a direct impact on farm productivity, and therefore, on its profitability. Production efficiency is significantly and negatively affected when feed nutritional levels are lower than the broilers requirements. On the other hand, supplying diets with nutrient levels above the requirements improves live performance, but may result in economic losses due the higher cost of those diets restriction. Although *ad libitum* feeding is necessary for fast growing broiler chickens to meet their maximum growth potential, it has led to more frequent occurrences of metabolic and skeletal disorders and increased fat deposition [19].

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Research on non-conventional feed ingredients (NCF) for poultry has been ongoing over the past decades. Such studies are aimed at finding low-cost, readily available feed ingredients that have less direct nutritional significance to man as a way of addressing the exorbitant hike in the cost of feed ingredients for poultry.

Water hyacinth, *Eichhornia crassipes* (Martius) Solms-Laubach, is a free floating aquatic weed species with broad leaves and beautiful, purple or lilac-blue, lily-like lavender flowers [5]. Water hyacinths are considered as nuisance species because they multiply rapidly and clog lakes, rivers and ponds. The thick mats formed under favourable conditions often obstruct fishing, shipping and irrigation and are hard to eradicate. Great efforts are being made to contain water hyacinths but, on the other hand, attempts are being made to find practical uses for the large biomass that is available. It offers the potential for use as fodder for domestic animals, as fish feed, for the production of biogas and for the removal of heavy metals and phenols from polluted waters [16].

Water hyacinth was reported to have good effect in non-ruminants, as it was found that in pig, the use of concentrate can be reduced to 60% by using water hyacinth in diet [15]. Water hyacinth in duck diets, at (15%) gave higher daily feed intake, egg quality compared to the unsupplemented control diet [10]. However, there is paucity of information on use of water hyacinth in the diets of broiler chicken. Thus, this study was designed to evaluate the Performance and carcass characteristics of broiler finisher fed diets containing water hyacinth meal as a replacement for wheat offal.

## 2 Material and methods

### 2.1 Method

The experiment was conducted at Federal College of Animal Health and Production, Ibadan, Nigeria. Ninety (90) day old arbor acre chicks were purchased from a reputable hatchery in Ibadan city, Nigeria. The birds were brooded for 2 weeks and were fed for the first 4 weeks with conventional feeds. The whole plants of water hyacinth were collected from a pond in the same city with its green leaves harvested freshly from the water surface, sun-dried for seven days and then milled to prepare it for water hyacinth meal (WHM). Ninety finisher broiler chicken were randomly selected and allotted into three (3) dietary treatments. The dietary treatments are as follows: T1 (No inclusion of water hyacinth meal), T2 (5% of Water hyacinth meal was used to replace wheat offal) and T3 (10% of water hyacinth meal was used to replace wheat offal) respectively with each treatment replicated three times with 10 birds per replicate to make it thirty birds in a replicate. Various levels of water hyacinth meal were added in each treatment.

The proximate composition of water hyacinth meal (WHM) and the three experimental diets were determined using the procedure of [3]. Fiber composition was determined using the procedure of [18]. For the determination of the anti-nutritional factor in WHM, the method of [13] was used for phytic acid the method of [14] was used for the determination of tannin while oxalate and saponin were determined using the standard procedure [2].

Data were collected on growth performance and carcass characteristics of the chicken. The data collected were subjected to analysis of variance (ANOVA) using [17].

## 3 Results and discussion

The results from chemical analysis of water hyacinth meal shown in Table 1 indicated that water hyacinth meal contains 8.59% of dry matter, 15.95% of crude protein, 1.48 of ether extract, 19.71% of ash, 31.59 of crude fibre and 60.62 of carbohydrate.

**Table 1** Proximate composition of water hyacinth leave meal (*Eichhorniacrassipes*)

| Nutrients        | Concentrate (%) |
|------------------|-----------------|
| Moisture content | 8.59            |
| Crude Protein    | 15.95           |
| Fat              | 1.48            |
| Ash              | 19.71           |
| Crude Fibre      | 31.59           |
| Carbohydrate     | 60.62           |

**Table 2** Performance characteristics of broiler finisher fed diets containing water hyacinth meal

| Parameters             | T1 (0%)              | T2 (5%)              | T3 (10%)             | SEM±  |
|------------------------|----------------------|----------------------|----------------------|-------|
| Initial weight (g/b)   | 516.67               | 536.67               | 530.00               | 18.21 |
| Final weight(g/b)      | 2410.00              | 2363.33              | 2270.00              | 70.74 |
| Total weight gain(g/b) | 1893.33              | 1826.67              | 1740.00              | 70.54 |
| ADWG(g/b/d)            | 67.62                | 65.24                | 62.14                | 6.06  |
| Feed intake(g/b)       | 4242.33 <sup>a</sup> | 3957.67 <sup>b</sup> | 3564.00 <sup>c</sup> | 67.09 |
| ADFI(g/b/d)            | 151.51 <sup>a</sup>  | 141.35 <sup>b</sup>  | 127.29 <sup>c</sup>  | 2.40  |
| FCR                    | 2.24 <sup>a</sup>    | 2.17 <sup>ab</sup>   | 2.05 <sup>b</sup>    | 0.78  |

ab Means along the same row with different superscripts are significantly different ( $p < 0.05$ ); ADWG – Average daily weight gain; ADFI- Average daily feed intake; FCR – Feed conversion Ratio

**Table 3** Effect of water hyacinth on carcass quality of finisher broiler chickens

| Parameters             | T1 (0%)           | T2 (5%)           | T3 (10%)           | SEM±  |
|------------------------|-------------------|-------------------|--------------------|-------|
| Live weight(g)         | 2611.70           | 2311.30           | 2547.00            | 75.56 |
| Plucked weights(%)     | 90.74             | 92.34             | 94.15              | 0.73  |
| Eviscerated weight (%) | 79.00             | 76.81             | 77.49              | 0.68  |
| Carcass weight (%)     | 67.11             | 63.19             | 64.50              | 0.84  |
| Breast weight (%)      | 23.59             | 19.12             | 21.01              | 0.90  |
| Drum stick weight (%)  | 5.12              | 5.61 <sup>f</sup> | 5.47               | 0.09  |
| Thigh weight (%)       | 5.88              | 5.95              | 5.64               | 0.08  |
| Wing weight (%)        | 3.95              | 3.85              | 3.84               | 0.07  |
| Back weight (%)        | 13.45             | 13.35             | 13.39              | 0.30  |
| Neck weight (%)        | 5.58              | 5.56              | 5.82               | 0.10  |
| Head weight (%)        | 2.10 <sup>b</sup> | 2.45 <sup>a</sup> | 2.19 <sup>ab</sup> | 0.06  |
| Shank weight (%)       | 2.02 <sup>b</sup> | 2.45 <sup>a</sup> | 2.18 <sup>ab</sup> | 0.08  |
| Empty gizzard (%)      | 2.03              | 2.67              | 2.44               | 0.14  |
| Liver weight (%)       | 1.90              | 2.04              | 1.85               | 0.10  |
| Lung weight (%)        | 0.47              | 0.62              | 0.58               | 0.03  |
| Spleen weight (%)      | 0.08              | 0.10              | 0.10               | 0.01  |
| Heart weight (%)       | 0.50              | 0.51              | 0.48               | 0.02  |

<sup>a,b</sup> means along the same row with different superscript are significantly different ( $P < 0.05$ )

Table 2 shows the result of the growth performance of the experimental birds. The value obtained shows that there was no significant difference ( $p > 0.05$ ) in the initial weight, final weight, total weight gain and average daily weight gain among the control and WHM diets. However, there were significant ( $p < 0.05$ ) differences in the feed intake, average daily feed intake and the feed conversion ratio of the experimental birds. Birds in Treatment 1 (control) had the highest value in weight gain and average daily weight gain. The result of this study agrees with the result of [1] who assessed the replacement of 5 to 25% of a complete diet with water hyacinth meal as a feed ingredient and showed that increased dietary inclusion levels resulted in decreased weight gain. There was a significant difference in the feed conversion ratio of the broiler chicken with birds in Treatment 1 (control) having the highest value (2.24) of the feed conversion ratio; followed by birds in Treatment 2 while those in Treatment 3 had the least feed conversion ratio. This implies that

increased dietary inclusion levels resulted in decrease in feed conversion ratio of the broiler chicken. Result of this study disagrees with result of [10] who reported increase in feed conversion ratio as dietary inclusion increased when duck were fed with water hyacinth meal. This shows that birds utilized the nutrients present in the diet optimally as the increase in test diet inclusion result in decrease in feed conversion ratio which is a positive response of feed intake.

There were significant differences in feed intake as birds in Treatment 1 had the highest value which is significantly different to birds in other Treatments. This is an indication that feed intake decreases as the dietary inclusion increases. The significant effect of feed intake across the dietary treatment obtains in this study is contradictory to the fact that dietary inclusion of water hyacinth meal showed no effect on voluntary intake of birds. This agrees with earlier work of [4] who opined that inclusion of a fibrous material in feeding trial had an energy dilution effects on feed and consequently increase intake. Also several other reasons have been previously adduced by some authors for variation in feed intake could be as a result of the alteration in texture, taste, colour and odour of the diet [7].

Table 3 shows the carcass characteristics of finisher broiler in various experimental Treatments of the study. The values obtained shows that there was no significant ( $p>0.05$ ) difference in live weight, plucked weight, eviscerated weight and dressed weight of the birds among the Treatments. Also, there was no significant ( $p>0.05$ ) difference in weight of cut-up part (expressed as % of live weight), such as weight of neck, thigh, drum stick, neck, breast, wing, back, heart, liver, spleen, gizzard and lung of the birds. However, there were significant ( $p<0.05$ ) differences in the weight of the head and shank of the birds among the dietary treatments. The carcass characteristics of finisher broiler fed with water hyacinth meal shows that the dressing percentage obtained were in the same range of 63.15-68.40 as obtained by [9]. This weight of the breast, back, wing, thigh, neck and drumstick were not affected significantly ( $p<0.05$ ) by inclusion of water hyacinth meal at 5 and 10 percent in the diet. Apart from the head and shank that were significantly affected ( $p<0.05$ ) by water hyacinth meal inclusion, the height of the other organs was not affected.

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#### 4 Conclusion

Based on the result obtained, it is therefore concluded that inclusion of water hyacinth meal up to 10% as a replacement for wheat offal in broiler finisher diet did not have effect on growth performance as well as carcass characteristics. Thus it is recommended that further studies could be conducted on increasing the inclusion levels of water hyacinth meal as supplementary diet or replacement of wheat offal in broiler production

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#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

The authors declared that there is no conflict of interest on this article

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