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Evaluation of Performance Traits and Economy of Production of Broiler Starter and Finisher Chickens Fed with Self-Formulated and Four Different Commercial Feeds

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Abstract
An experiment was conducted to evaluate performance traits and economy of production of broiler starters and finishers chickens fed with self-formulated and four different commercial feeds. A total of one hundred day old broilers chicks were randomly allotted into five (5) treatments that contained two replicates with 10 broilers each. The replicates were distributed using Completely Randomize Design (CRD). At starting phase of the experiment, Final live weight was significantly ($p<0.05$) ranged from 845.00g and 1290.00g, weight gain $p<0.05$ ranged from 793.00g to 1248.00g, feed intake varied from 1960.00g to 2205.45g, feed conversion ratio (FCR) $p<0.05$ varied from 1.59 to 2.51, mortality ranged from 0.00% to 20% while cost of feed/kg ranged from 334.00 to 459.40₦/kg, cost of feed consumed was between 662.40-899.64₦/kg, cost of feed consumed/weight gain ranged between 279.89 to ₦467.97. At finishing phase of the experiment, final weight gain $p<0.05$ varied between 2650.00g and 3700.00g, weight gain $p<0.05$ revealed between 1765.00g and 2410.00g. FCR showed values between 1.50 and 1.18, zero mortality was recorded while cost of feed/kg showed non-significantly ($p>0.05$) different values from 320.00 to 448.40, cost of feed consumed were $p<0.05$ ranged from 985.60g to 1272.98g/kg, cost of feed consumed/weight gain varied between ₦670.70 and ₦944.72. From outcome of this finding, it could be concluded that self-formulated and four different commercial feeds procured in Igbo-ora town performed better at both phases of the studies. Based on FCR from this finding, both T4 and T5 commercial feeds are recommended for broilers at starting and finishing phases for utmost profit.

Keywords: Broiler chickens, performance traits, economy of production, self-formulated and commercial feeds

Introduction

Poultry is one of the most important sectors of livestock that provides cheapest animal protein (nutritious egg and meat) for human consumption within shortest period of time. Meat is an excellent source of high quality and readily digestible protein and can play a significant role in alleviating the nutritional status of the people. The consumption of meat in developing countries grew by 70 MMT from 26 MMT during last five years. This increasing trend will continue due to increase in population, higher income and health consciousness of the people. Nigerians requires a logical solution like increasing the production and consumption of poultry. Available statistics indicate that Nigeria is one of the countries where the protein intake of the people ranks among the lowest. It is estimated that on the average, Nigerians consume only about 7g of animal protein on a daily basis, as against the minimum requirement of 28g/head/day recommended by FAO Uchegbu *et al.* (2007). Modern poultry production was introduced in Nigeria in the late 50's (Ahaotu *et al.,* 2017a) when it became apparent that the expansion of cattle could not progress at a satisfactory rate to cope with the increasing demand for meat. This has resulted to the expansion of poultry which is estimated to be 133 million - consisting of about 123 million local fowls and 10 million exotic poultry (Onwukwe., 1994). Although, the poultry industry has been well established in Nigeria, production has been low compared to the production report in the temperate countries. The causes of low production include

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management factors of which nutrition is perhaps the most critical. In these regards, the poultry feed manufacturers carry a major responsibility in ensuring that feeds meet the nutritional requirements of the birds (Ahaotu *et al.*, 2017b). Commercial feed production of any significant nature in Nigeria did not start until about 1963 when the Ministries of Agriculture and Natural Resources of the then regions produced feed on a very small scale.

Materials and Methods

Experimental site. The experiment was carried out at the Teaching and Research Farm, Oyo State College of Agriculture and Technology Igbo-ora, Nigeria. Latitude 7^0.43N, Longitude 3^0.28E and elevation of 140M above sea level. The average minimum temperature is above 21.5^0C and maximum average temperature is about 32.5^0C.

Experimental diets

One experimental feed was formulated and was compared with four different commercial feeds obtained from a reputable commercial feed retailer in Igbo-ora, Ibarapa Central Local Government, area and were designed as treatment one (T_1), T_2, T_3, T_4 and T_5. Formulated diet was control (T1) while four different commercial feeds were arranged in T_2, T_3, T_4 and T_5 respectively. Nutrients compositions of the experimental feed are shown in the Table 1 and 2 below.

Table 1: Some nutritive values of the experimental feed (0-4 weeks)

Ingredient (kg)	T1	T2	T3	T4	T5
Calculated values					
Crude Protein (%)	21.75	22.00	22.00	22.00	21.00
Crude Fat (%)	3.61	5.00	5.00	4.50	4.30
Crude Fibre (%)	2.60	4.30	5.00	5.00	3.90
Energy(kcal/kg)	2934.54	3000.00	3000.00	2950.00	2600.00

Table 2: Some nutritive values of the experimental diet (5-8 weeks)

Ingredient (kg)	T1	T2	T3	T4	T5
Calculated values					
Crude Protein (%)	18.67	19.50	18.00	18.00	17.00
Crude Fat (%)	3.45	5.50	6.00	5.00	4.00
Crude Fibre (%)	3.00	3.00	5.00	5.00	5.00
Energy(kcal/kg)	3100.00	3100.00	3000.00	3150.00	3000.00

Experimental birds, design and management

One hundred day-old broiler chicks were procured from Fidan Farm Limited, Ibadan. The broiler chicks were randomly selected and divided into Five (5) treatments and replicated twice with 10 broilers per replicate. The replicates were distributed using Complete Randomize Design (CRD). The brooding pen was washed, cleaned thoroughly with disinfectant; thereafter, it was fumigated with potassium permanganate and formalin for seven days prior to the arrival of the birds. Proper vaccination and medications were observed as and when due. Birds were managed under a deep liter system of management with wood shaving as bedding materials throughout 8 weeks of the experiment.

Data Collection

The weekly feed intake and body weights were measured with a sensitive weighing scale in the morning prior to feeding and the average weight gain, average feed intake, and feed conversion ratio were calculated. Mortality records were kept throughout the experimental period.

(i) $$\text{Average weight gain} = \frac{\text{final weight} - \text{initial weight}}{\text{total number of birds}}$$

(ii) $$\text{Daily weight gain/bird} = \frac{\text{Average weight gain}}{\text{Number of birds}}$$

(iii) $$\text{Average Feed Intake/bird} = \frac{\text{Feed supplied} - \text{left over feed}}{\text{Total number of birds}}$$

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(v)Feed Conversion Ratio (FCR)
$$= \frac{\text{Feed consumed}}{\text{Weight gain}}$$

(vi) % Mortality $= \frac{\text{Number of dead birds}}{\text{Number of birds stocked}}$

The prevailing market prices of the ingredients and feed per kg at the time of the study was used to calculate the cost of feed per kilogram diet (₦), total cost of feed consumed per bird (₦) and cost of the feed per kilogram weight gain (₦) both for starting and finishing phases.

Statistical analysis

Data obtained were subjected to one-way analysis of variance using SPSS (2020), version 27. Mean value of variance showing significant (P<0.05) differences were separated using Duncan's Multiple Range test of some package.

Results and discussion

Results

Performance traits of the experimental broiler chickens are presented on Table 2. The values obtained were significantly (p>0.005) different across dietary treatments except initial weight at starting and feed intake at finishing phases. The final live weight ranged from 845.00-1290.00g with highest value (1290.00g) recorded on T4 while the lowest (845.00g) was noticed on T1. Final Weight gain (FWG) ranged from 793.00-1248.00g, lowest FWG (793.00g) was observed from T1 while the highest FWG value (1248.00g) was obtained from T4. Feed intake was significantly (p<0.05) similar on T1, T2, T4 and T5. The highest (2205.45g) significant

(i) Cost of 100kg of feed in (₦/kg) = Sum of the cost of each ingredient

(ii) Cost of 1kg of feed in (₦/kg) $= \frac{\text{Cost of 100kg of feed}}{100}$

(iii) Cost of feed consumed/weight gain (₦/kg) = Weight gain in kg X Cost of 1kg of feed

(iv) Cost of feed consumed/bird in (₦/kg) = Feed intake in kg X Cost 1kg of feed

(p<0.05) was recorded on T3 while the lowest (1960.00g) was obtained on T1, T4 and T5. Feed conversion ratio (FCR) showed values between 1.59 and 2.51. Highest (2.51) significant (p<0.05) feed conversion ratio was recorded from T1 while the lowest (1.59) was obtained from T4. Mortalities were significantly (p<0.05) similar on T1, T2, T4 and T5 respectively. The highest mortality (20%) was recorded from T3 while those birds on T1, T2, T4 and T5 had no (0.00%) mortality. Significant (p<0.05) differences were observed on cost of feed consumed in ₦/kg and cost of feed consumed/weight gain. The significant (p<0.05) lowest cost (662.40₦/kg) of feed consumed was recorded on broiler starter fed T5 while the highest significant (p<0.05) different (899.64₦/kg) of feed consumed was noticed on broiler fed T1. The higher cost of feed consumed/weight gain (₦467.97) was recorded for broiler fed T4 while the lowest (₦279.89) was noticed on broiler fed T2. No significant (p>0.05) different on cost of feed in ₦/kg.

Table 3: Performance traits and economy of production of broiler starters (0-4weeks)

Parameters	T1	T2	T3	T4	T5	SEM
Initial weight (g)	52.00	52.00	52.00	52.00	52.00	0.00
Final live weight (g)	845.00^{b}	885.00^{b}	975.00^{b}	1290.00^{a}	1195.00^{a}	61.04
Weight gain (g)	793.00^{b}	833.00^{b}	923.00^{b}	1248.00^{a}	1143.00^{a}	62.13
Feed intake (g)	1960.00^{b}	2052.07^{b}	2205.45^{a}	1960.00^{b}	1960.00^{b}	34.84
Feed conversion ratio	2.51^{a}	2.47^{a}	2.40^{a}	1.59^{b}	1.76^{b}	0.14
Mortality (%)	0.00^{b}	5.00^{b}	20.00^{a}	0.00^{b}	0.00^{b}	2.69
Cost of feed/kg	459.00	336.00	334.00	378.00	338.00	15.95
Cost of feed consumed in ₦/kg	899.64^{a}	689.49^{bc}	736.61^{b}	740.88^{b}	662.48^{c}	27.83
Cost of feed consumed/weight gain	363.98^{b}	279.89^{c}	308.28^{bc}	467.97^{a}	386.33^{ab}	23.12

^{a,b,c} Means in a row with different superscripts are significantly different (P<0.05).

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At finishing phase of the experiment, highest (1290.00g) initial weight was observed from broiler fed on T4 but was statistically (p.>0.05) similar with those birds fed T5 while least (885.00g) was noticed from birds fed on T2 but were not significantly (p>0.05) with birds on T1, and T3. Highest (3700.00g) final live weights were obtained from birds fed on T4 and statistical (p>0.05) similarity were observed with birds fed on T3, and T5 while least (2650.00g) significant (p<0.05) different was noticed from birds placed on T2. Weight gain revealed significantly (p<0.05) higher different of 2410.00(g) from T4 while least (1765.00g) was observed from T2. Statistically (p>0.05) similarity were obtained on T1, T3, T4 and T5. Feed conversion ratio showed highest values of 1.76 from birds placed on T2, T2 and T3 were not significantly (p>0.05) different while least (1.16) was observed on T4 but T1 and T5 were statistically (p>0.05) similar with T4. Mortalities were not significantly (p>0.05) different across dietary treatment groups at finishing phase. significantly (p<0.05) influenced cost of feed consumed in g/kg and cost of feed consumed/weight gain were observed. Highest (1272.98g/kg) significant (p<0.05) cost of feed consumed in g/kg was obtained on T1 while least (985.60g/kg) was obtained on T5 but T2, T3 and T4 were statistically similar (p>0.05). Highest (₦944.72) significant (p<0.05) cost of feed consumed/weight gain (₦/g) was obtained from birds fed on T4 while least (670.70₦/kg) was obtained from T2. Broiler finisher placed on T3 recorded highest (3249.93g) non-significant (p>0.050) feed intake while those on T4 and T5 had least (2800.00g). Highest (448.40) non-significant (p>0.05) cost of feed/kg was observed from T1 while least (320.00) was observed from T3.

Table 3: Performance traits and economy of production of broiler finishers (5-8weeks):

Parameters	T1	T2	T3	T4	T5	SEM
Initial weight (%)	845.00^{b}	885.00^{b}	975.00^{b}	1290.00^{a}	1195.00^{a}	61.04
Final live weight (g)	2750.00^{bc}	2650.00^{c}	3250.00^{ab}	3700.00^{a}	3600.00^{a}	150.15
Weight gain (g)	1905.00^{ab}	1765.00^{b}	2275.00^{ab}	2410.00^{a}	2405.00^{a}	102.13
Feed intake (g)	2838.90	3033.26	3249.93	2800.00	2800.00	117.32
Feed conversion ratio	1.50^{b}	1.76^{a}	1.55^{a}	1.16^{b}	1.18^{b}	0.08
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00
Cost of feed/1kg	448.40	380.00	320.00	392.00	352.00	14.29
Cost of feed consumed in g/kg	1272.95^{a}	1150.54^{b}	1119.97^{b}	1097.60^{b}	985.60^{c}	31.48
Cost of feed consume/weight gain(#/g)	854.20^{ab}	670.70^{b}	728.00^{b}	944.72^{a}	846.56^{ab}	37.49

^{a,b,c} Means in a row with different superscripts are significantly different (P<0.05).

Discussion

Significant (P<0.05) differences of final live weight, and weight gain of the broiler starter across dietary treatment groups observed from this study were influenced by both self-formulated and four different commercial feeds examined but birds fed on the treatment four (T4) and treatment five (T5) performed better than the remaining treatments groups. Superior performance birds noticed from T4 and T5 in this finding could be attributed to the nutritional right proportion of the essential nutrients required by the experimental broiler chickens for optimum performance. This study is consistency with Ekeocha *et al.* (2021) who opined significant (p<0.05) different when three commercials feeds were compared on layers performance characteristics and egg qualities parameters. Feed intake revealed is in accord with the findings of Tejbeer *et al*. (2019) who reported significant difference in feed intake of birds fed different commercial feeds. In term of feed conversion ratio (FCR), both birds placed on T4 and T5 had least (best) but excellent FCR was noticed on T4 than T5. Performance observed attest to the good quality of the feeds (T4 and T5). Rama *et al.* (2011) reported that the genetic potential of birds can only be realized in case of adequate nutrient intakes under variable environmental condition. Reduction in overall economy of production is a major goal in the production of broiler birds. As

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shown on Table 3, the cost of producing a kilogram of feed was fluctuating across dietary treatments. But formulated (control) had highest cost of production per kilogram of the feed than four different commercial feeds which did not give specific trend but cheaper than self-formulated feed. The lower cost of feed consumed in ₦/kg from T2 to T5 suggest that four different commercial feeds procured in Igbo-ora were more economically sustainable as poultry feed and can be used to feed broiler starter. Cost of feed consumed /weight gain showed the same pattern with average weight gain, but birds on T4 had better economic value than others.

At the finishing phase of the experiment, broiler chickens showed that final live weight, weight gain and feed conversion ratio (FCR) were significantly ($p<0.05$) influenced by the treatment groups and were in agreement with report of Sanusi *et al.* (2015). Finisher birds fed T4 and T5 had lowest (2800.00g) feed intake but had highest statistically ($p>0.05$) similarity with T1, T2 and T3. FCR were statistically ($p>0.05$) similar with T1, T4 and T5 but T4 had least (best) FCR. Cost of producing a kilogram of feed followed the same pattern with starter phase. Bird fed on T1 had highest cost of feed consumed in g/kg than other treatments, shows that more money was spent on T1 than four different commercial feeds used for the study. But among T2 toT5 (commercial feeds), cost of feed consumed/weight gain on T5 was lesser than T2, T3 and T4. This is of great advantage because feed cost /kg gain is the determinant factor of how much profit poultry producers realized after harvest and sales.

Conclusion

It could be observed that self-formulated feed expensive than four different commercial feeds. The four different commercial feeds procured performed better than self-formulated feed at both phases of the studies. Therefore, any of the four different commercial feeds use for the study at starting and finishing phases can be used.

Recommendation

Based on feed conversion ratio observed from this research both T4 and T5 are recommended for broilers at starting and finishing phases of the experiment in order to produce more acceptable broiler chickens and to get huge profit.

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