

## Growth Comparison and Feed Content Analysis of Broiler Chickens for selected commercial and self-formulated

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### Abstract

*The present state of commercial feed industry and proliferation of new commercial feed brands and with promises of improved growth response of using one feed brand over another with other advantages as single phase feed, feed response index will be considered given that animal have different nutritional requirement at different stage of growth. On a weekly basic, based on the various phases, a combination feeding strategy based on the matching of feed to animal feeding phase by combining different feed category is essential for maximum gain for the raising period. a total of 250 Arbor Acres birds were used, the experiment followed a completely randomized design, with five treatments replicated four times, each replicate consisting of 12 birds. and weight recorded on a weekly basics, also feed samples were analysed for proximate composition for comparison with values on feed bag label to account difference in performance between nutrient dense or professional commercial feed to conventional commercial feed. The result showed that combination feeding of T4- Professional two feeding phase feed, T1- Professional Single Phase feed, T4, T2- Professional two phase feed, T5-Conventional Commercial feed, and T4 again consecutively in weeks was optimum and feed did not significantly differ for parameter as crude protein except for T1 and for fat and fibre content except for T2 and T4, showing difference in performnace might be due to certain content of feed or processing method.*

**Keyword:** proximate, broiler, growth response, nutritional, commercial feed

Running title: Growth Comparison and Feed Content Analysis for Broiler Chickens



## Comparaison de Croissance et Analyse du Contenu Alimentaire des Poulets de Chair Sélectionnés Commerciaux et Auto-Formules

### Résumé

*L'état actuel de l'industrie des aliments pour animaux commerciaux et la prolifération de nouvelles marques d'aliments commerciaux et avec les promesses d'une réponse de croissance améliorée en utilisant une marque d'aliment plutôt qu'une autre avec d'autres avantages comme l'aliment monophasé, l'indice de réponse alimentaire sera pris en compte étant donné que les animaux ont des besoins nutritionnels différents à chaque fois différents stades de croissance. Sur une base hebdomadaire, basée sur les différentes phases, une stratégie d'alimentation combinée basée sur l'adéquation de l'aliment à la phase d'alimentation de l'animal en combinant différentes catégories d'aliments est essentielle pour un gain maximum pendant la période d'élevage. Un total de 250 oiseaux d'Arbor Acres ont été utilisés, l'expérience a suivi un plan complètement randomisé, avec cinq traitements répétés quatre fois, chaque répétition étant composée de 12 oiseaux et le poids enregistré sur une base hebdomadaire, des échantillons d'aliments ont également été analysés*

*pour déterminer leur composition immédiate afin de les comparer aux valeurs figurant sur l'étiquette du sac d'aliments afin de tenir compte de la différence de performance entre les aliments commerciaux riches en nutriments ou professionnels et les aliments commerciaux conventionnels. Le résultat a montré que l'alimentation combinée de l'aliment biphase professionnel T4, de l'aliment professionnel monophasé T1, de l'aliment biphase professionnel T4, de l'aliment biphase professionnel T5, de l'aliment commercial conventionnel T5 et du T4 à nouveau consécutivement pendant des semaines était optimale et que l'alimentation n'avait pas d'effet significatif différent pour les paramètres tels que les protéines brutes, à l'exception de T1, et pour la teneur en matières grasses et en fibres, à l'exception de T2 et T4, la différence de performance pouvant être due à un certain contenu de l'aliment ou à une méthode de transformation.*

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**Mot-clé :** proche, poulet de chair, réponse de croissance, nutritionnel, aliment commercial

### **Introduction**

In Nigeria, the agriculture sector's contribution to GDP rose to 19.9% in the 2020-21 fiscal year, an increase from 17.8% the previous year. This marks the first time since 2003-04 that the sector has reached the 20% threshold. The recent trend in the animal feed industry shows a general interest in different animal feeds types, performance, the performance of animal fed this type, and actual impact. Despite the economic downturn caused by the pandemic, agriculture was the only sector to see positive growth of 3.4% at constant prices in 2020-21. According to data from Statista and Downto Earth, livestock production specifically saw a 0.13% increase in its contribution to GDP in Q2 of 2021, indicating the vast potential of the industry. Livestock contributes just 8% of the sector as a whole, showing room for growth in the subsector as compared to crop production (Statista, 2021). Poultry production outnumbers all other forms of livestock in Nigeria, therefore it is no surprise that it is found all around the country (Adeyemo and Onikoyi, 2012).

In recent years, the poultry industry in Nigeria has seen significant expansion. However, despite this growth, domestic production is still unable to meet even 30% of the country's demand for chicken eggs and meat, so the business has a lot of room to grow. Nigeria produces the most eggs per year and has Africa's second-largest chicken

population (FAO, 2019). Poultry production in Nigeria amounts to up to 350 Mt meat per year (FAO, 2019). With the recent increase in the cost of poultry feed ingredients due to scarcity caused by a rise in insecurity in the major production area, most feed producers are not faithful to maintaining the consistency of their product (Mojeed & Udegbunam, 2021) and recent statistics show that there is a general decline in the use of the conventional and old commercial feed brands for a new one due to the improved performance many of the new commercial brands offer compared to the conventional old brands rendering some brand obsolete and to decline in demand (Abdollahi & Ravindran, 2021).

Commercial feed manufacturing generates an estimated yearly turnover of more than \$400 billion USD around the world. As a result of rising population, urbanization, and citizen purchasing power in many emerging economies, global feed output continues to increase in volume and value in response to rising animal protein demand. And due to increasing environmental awareness of ruminant methane production and the health implication of red meat, poultry along with other modified monogastric production are preferable with poultry giving the highest returns on investment. Poultry production in Nigeria amounts to up to 350 Mt meat per year. (FAO, 2020).

In comparison to what birds feed control diet with the same formulation as the birds fed the

commercial feed showed a significant difference from the control, which should be prove (Obun *et al.*, 2021). Only a few growth phases are mentioned in current poultry recommendations; meat birds are examined in three phases: up to three weeks, three to six weeks, and six to about two months. Grow-out periods, on the other hand, could last anywhere from four to ten weeks, depending on market demand. To improve performance and profit margins, the commercial chicken business is increasingly using phase-feeding systems, knowing that nutritional needs are more dynamic than these basic ideas. When different diets are developed to fit changing needs and costs, dietary protein and amino acid requirements are often reduced over time. (Ravindran, 2013).

The stages of growth for poultry are commonly divided into five phases: pre-starter, starter, grower, finisher, and withdrawal. Withdrawal diets are typically given during the final days of growth and involve the removal of any pharmacological elements as well as a decrease in protein and amino acids. More recently, they have also involved the loss of several vitamins and trace minerals, as well as increased energy use. (Freitas *et al.*, 2011).

The quality of feed produced by mills in Nigeria and used to feed poultry farms is uncertain and may not meet the required standards (Lateef & Gueguim-Kana, 2014). This can have a significant impact on a farm's production, as the quality of feed is reported to be a key determinant of maximum output (FAO, 2013). The poor-quality feed can lower production, while high-quality feed can greatly boost output. The nutritional content of feed may also vary due to the availability and source of ingredients, potentially causing deficiencies in the ration that go unnoticed by farm owners and negatively affect productivity (FAO, 2017, 2011). The purpose of this study is to determine the best feed in terms of weekly performance for what constitutes the optimal gain per week from

descriptive data analysis of the growth data, investigate the feed bag feed nutrient content description with proximate analysis for discrepancies and effect of feed quality on the performance of broiler chicken in terms of body weight gain.

## **Materials and Methods**

### ***Experimental Station***

The study was conducted at the Poultry Unit of the Teaching and Research Farm at Obafemi Awolowo University in Ile-Ife, located in the rainforest zone of southwestern Nigeria. The geographic coordinates are 70 28' 22''N, 40 33' 6' with a temperature range between 21.1 and 31.10C, an average annual rainfall of 1000mm, and relative humidity between 90-95%. The experiment lasted for six (8) weeks.

### ***Animal and Housing***

A total of three two hundred and fifty birds of unsexed Arbor acres broiler chickens were collected at a reputable hatchery in Ile-Ife and were brooded in a cage for 14 days in 20 cages division for all treatments and replicate.

### ***Experimental Diets***

Five dietary treatments consisting of four commercial feed types and a single formulated feed were administered throughout the experiment depending on the feed types some were fed on single phase feeding, some modified single phase, and some on double phase feeding at Zero (0) to three (3) weeks and three (3) to six (6) weeks respectively and were fed *ad libitum*.

### ***Treatment Classification of feeds***

#### ***Definition of terms as relating to feed Category***

Professional line refers to a set of newly designed premium feed, that promises improved performance indices such as 2kg size at 6 weeks, examples include breedwell and ultima for professional two phase feed and two face feeding respectively, as there are broiler producer, who uses the later as single phase even with its present finisher phase, hybrid for single phase feed, top feed and capsfeed for conventional broiler feed. Five (5) different feeds will be used classified as:

**Treatment 1:** Professional single phase feeding.

**Treatment 2:** Professional line (nutrient-dense feed); two phase feed.

**Treatment 3:** Formulated feed as seen in table 1

**Treatment 4:** Professional line; two phase feeding.

**Treatment 5:** Conventional commercial Starter and finisher feed.

**Table 1: Gross Composition of Formulated Feed**

Feed ingredients	Starter	Finisher
Maize	57	58.5
Soybean Meal	22	20
Groundnut cake	11.63	10
Wheat offal	0.0	5.0
Fish meal 60% C.P)	5.0	2.0
Bone meal	2.5	2.5
Oyster shell	1.0	1.0
Common salt	0.2	0.2
Premix*	0.3	0.3
Methionine	0.3	0.2
Lysine	0.377	0.3
<b>Total</b>	<b>100 = 100.307</b>	<b>100</b>
<b>Metabolizable Energy (kcal/kg)</b>	<b>2927</b>	<b>2896</b>
<b>Crude Protein (%)</b>	<b>23.59</b>	<b>20.8</b>
<b>Crude Fibre (%)</b>	<b>3.5</b>	<b>3.7</b>

All value for M.E, C.P and C.F are calculated for the feed from the feed composition

#### ***Management of birds and experimental layout***

Two hundred and fifty four birds were brooded for 14 days and were fed the starter phase of each of the commercial feed brands used. The brooding house was washed thoroughly and then fumigated using formalin and potassium permanganate. The wood shavings were spread on the floor and all appliances were positioned. Birds were brooded using charcoal and electric bulbs. After brooding the birds were continued on the finisher's brand of the same commercial feed. The experimental design was a completely randomized design consisting of five treatments replicated four times with 12 birds per replicate. The treatment includes commercial professional, single phase feed brands, commercial professional double phase feed

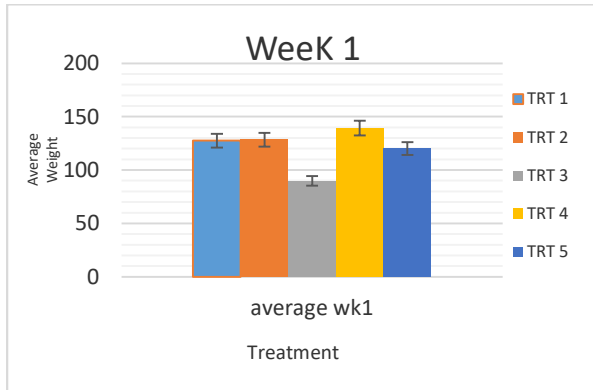
brands, and formulated and conventional commercial feed. The experiment lasted for six weeks. Feed and water were provided *ad libitum*. Vaccination and medication were administered when due (Table 2). Anti-stress was administered before and after vaccination and weighing of birds. The feeders and drinkers were washed regularly and fresh clean water was supplied to the chicks. Litter management was carried out on regular basis. Litter materials were turned to prevent the accumulation of pathogens and the production of ammonia which can adversely affect the birds. The litter was removed and replaced with new ones at the end of each week.

**Data Collection**

Growth performance traits

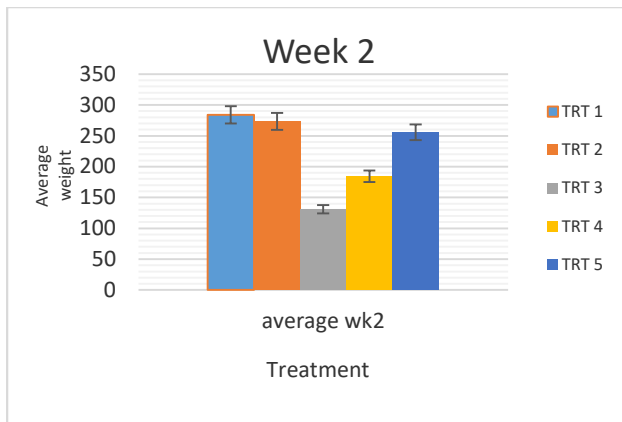
At the start of the trial, birds were weighed, and the body weight change was recorded every week until the end of the experiment. Body weight gain was calculated for each treatment.

**Results and Discussion**



**Figure 1: First Week Bar Chart Representation**

The chart above shows that the fourth treatment had the highest weight gain in the first week of feeding

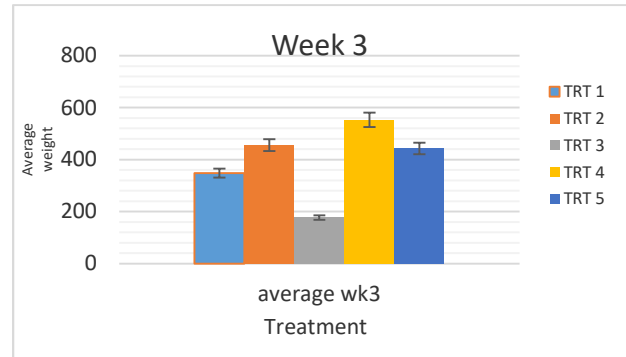


**Figure 2: Second Week Bar Chart Representation**

The chart shows that the First treatment had the highest weight gain in the second week, showing how it is more precise for combination feeding with the previous week result.

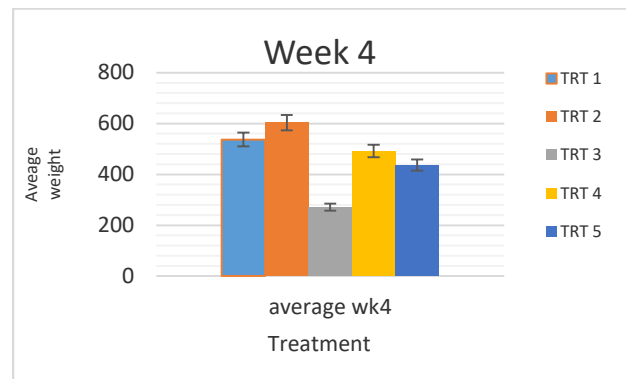
**Chemical Analysis of samples**

The feed samples were analyzed for dry matter, crude protein, ether extract, gross energy, and chromium oxide concentration according to the methodologies outlined by the Association of Official Analytical Chemists (AOAC. 2005).



**Figure 3: Third week Bar Chart Representation**

The fourth treatment had the highest average weight and weight gain as it was below the first which had the highest gain initially. The third chart shows that the combining T4 in week 1, with T1 in week 2 and T4 in week 3.



**Figure 4: Fourth Week Bar Chart Representation**

The Second treatment had the highest average weight in the fourth week, meaning combination feeding of T4, T1, T4, and T2 consecutively in weeks.

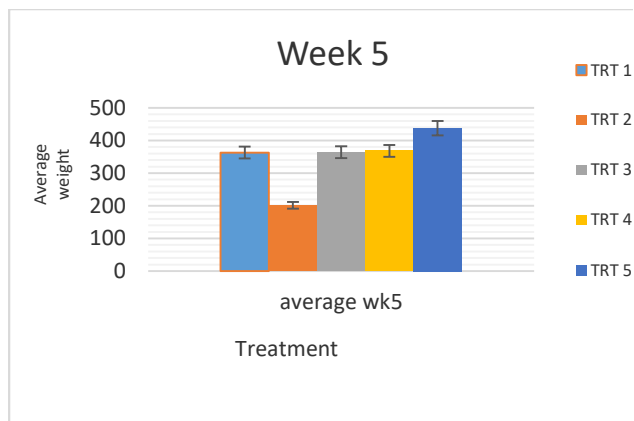


Figure 5: Week 5 Bar Chart Representation

The fifth treatment had the highest average weight in the fifth week, meaning combination feeding of T4, T1, T4, T5, and T4 consecutively in weeks.

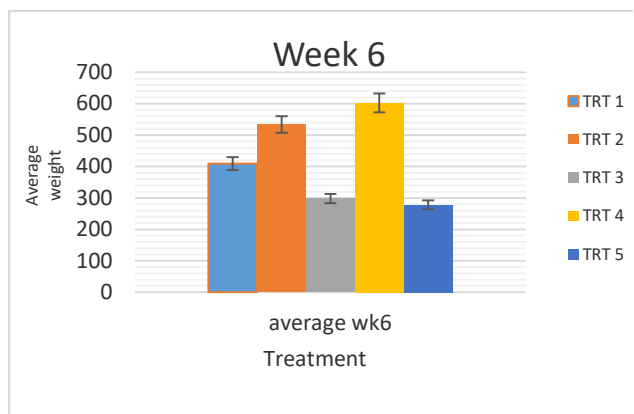


Figure 6: Week 6 Bar Chart Representation

The chart shows that the fourth treatment has the highest average weight in the sixth week, meaning combination feeding of T4, T1, T4, T2, T5, and T4 again consecutively in weeks.

Table 4: T-test comparison of means from proximate analysis and commercial Feed bag of each feed for crude protein

Nutrient/ Treatment	Crude Protein		P-Value
	Feed label (%)	Proximate Analysis (%)	
T1	18	23.84	0.0238
T2	23	19.18	0.2205
T3	20.8	23.41	0.0532
T4	18	26.91	0.2247
T5	18	22.97	0.0836

Note: T3 – Self formulated, T1, T2, T4 and T5 commercial diets, P< 0.05.

None of the treatment differs significantly for crude protein from the results of proximate analysis except for Treatment 1 which could be due to the actual composition of raw materials used in feed formulation which can vary due to factors such as seasonal fluctuations, sourcing, and quality control. This can lead to discrepancies between the expected composition on feed bags and the actual composition in the feed Ekeocha *et al.*, (2021).

Table 5: T-test comparison of means from proximate analysis and commercial Feed bag of each feed for crude fibre

Nutrient/ Treatment	Crude Fibre		P- Value
	Feed bag (%)	Proximate Analysis (%)	
T1	6	5.57	0.2666
T2	5.5	4.14	0.0467
T3	4.16	1.34	0.1442
T4	5.5	5.17	0.6753
T5	8	5.08	0.0218

Note: T3 – Self formulated, T1, T2, T4 and T5 commercial diets, P< 0.05.

All the treatment did not differ significantly except for Treatment 2 and 5 to proximate analysis results for fat content of feed which could be due to proximate composition analysis methods which can vary in terms of accuracy and precision. Differences in laboratory techniques, equipment, and sample preparation can lead to variations in results in agreement with AOAC (2005)

Table 6: T-test comparison of means from proximate analysis and commercial Feed bag of each feed for crude fibre

Nutrient/ Treatment	Crude Fibre		P- Value
	Feed bag (%)	Proximate Analysis (%)	
T1	3.5	2.63	0.1016
T2	3.0	2.08	0.0311
T3	3.71	3.975	0.7975
T4	5.0	2.13	0.0942
T5	5.0	2.29	0.0200

Note: T3 – Self formulated, T1, T2, T4 and T5 commercial diets, P< 0.05.

Note: T-test is used because the compared value looked for "differences" between means when participants are measured on the same dependent variable under two different conditions.

According to Ofori *et al* (2019), the commercial animal tends to vary widely from the value written on the feed bags for the different nutrients. Paired T-test result for the analysis of the mean of proximate analysis against the value on the commercial feed bag shows that only for treatment 1 was significantly different at 0.05 probability level from the value supplied on the commercial feedbag for crude protein while for crude fat and fibre only Treatment 2 and 5 vary significantly at 0.05 level of significance.

In summary, as most of the nutrient-dense commercial feed with starter and finisher phases outperformed the conventional and formulated feed in performance as expected and on continued usage outperformed the single phase feed due to the increased level of protein in the diet of the feed for single phase feed as Treatment 1 and problem associated with an oversupply of amino acids in the diet, such as an unhealthy condition of bird gut health, due to excessive nutrients, encouraging the proliferation of unhealthy microorganism and their cultivation of the gut, leading reduction in feed utilization due to loss of nutrient to mild diarrhoea and nutrient loss due to spoilage or conversion into a non useful form in the gut while for the feed with different crude protein level, due to starter phase and finisher phase to account for the difference in protein requirement in starter and finisher birds, higher average daily weight gain. due to the above reason which is similar research to that of Okello *et al.* (2021) and Angel *et al.* (2009).

### Conclusion

The results showed that a combination of different feeds used for feeding in different week alternated reflected the most effective feeding regime at different ages of the best and the feed showed different results for the comparison using proximate analysis, inconsistencies could be due

to a number of factors such as variability in raw materials, inaccurate formulation, Analytical Methods and different processing method as extrusion, showing in all feed is not always accurate representation according to feed bag description of its analysis, showing inconsistencies in performance of the birds in line with findings by A.O.A.C. (2005), Sakomura, *et al.*, 2005, Apantaku *et al.*, (2006) and Ekeocha *et al.*, (2021).

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