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# Effects of Cassava-Based Feed on Growth and Physical Performance of Broilers

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***ABSTRACT***

*The study was carried out to assess the effects of cassava-based feed on the growth and physical performance of broilers. Fifty-one (51) day-old broiler chicks were used for the experiment. The birds were divided into two experimental groups; the first group had 25 chicks, and the second group had 26 chicks and was allotted two dietary treatments. Treatment A contained 50% cassava, 50% leaf meal, 50% maize, and 50% fresh soya bean, while Treatment B contained 100% cassava root meal and 100% cassava leaf meal. At the end of the eight-week experiment, Treatment B (birds fed 100% cassava root meal and cassava leaf meal, referred to as CSV/FM – Cassava Stem/Root meal and Fish Meal) had comparably lower mortality of 3 birds than Treatment A, which recorded 17 mortality cases. Treatment B also has a comparably higher body weight and mean weight gain than birds in Treatment A. The birds fed in Treatment B were observably more agile and more active, with comparatively excellent eating rate. The choice of cassava as an alternative to feed components follows that cassava is relatively cheaper, most commonly available in Southern Nigeria, than other routinely used feed supplements such as maize. Thus, to reduce the cost and high demand for conventional feedstuffs, especially maize, as a significant source of energy in poultry nutrition, up to 100% cassava, combined with fish meal as a common ingredient, can be used to replace maize and fresh soya bean in broiler chickens' diets. When properly processed, cassava root meal can replace maize (as an energy source), and cassava leaf meal can partially replace soybean meal (as a protein source) in livestock diets, particularly for broilers and fish. Thus, up to 100% cassava could replace maize in broiler chicken diets to reduce the feed cost.*



***Keywords:***
*Broiler, cassava, feed, growth, poultry.*

## 1. Introduction

The quality of the broiler chicken meat mainly depends on the quality of the diets fed to live birds. Market surveys have shown that the cost of poultry feed is high, which has resulted in a high cost of poultry products (Karangiya et al., 2016; Nalle et al., 2018). Feed intake by broiler chickens is a function of the amount of feed eaten and the nutrient levels in the diet (Ahiwe et al., 2018). Animal feeds form a greater part (70-80%) of the variable chicken production costs (Louw et al., 2011). Therefore, successful broiler production depends upon supplying the birds with a feed of the highest achievable quality regarding ingredients used, processing procedures applied, and the form in which the diet is presented to broilers (Ahiwe et al., 2018). The poultry industry consists of two main sectors, namely egg and meat production. Eggs are produced commercially, and broiler meat production is mainly based on subsistence farming. Neither the egg nor the meat production levels realized in Nigeria can satisfy local demand. As a result, Nigeria is a net importer of eggs and chicken meat, mainly from South Africa and Brazil. Chicken production in Nigeria is limited by the scarcity and high cost of components used in manufacturing feeds and a lack of chicken breeding skills, among others. Producers with access to alternative feeds that are cheaper and locally available often tend to have economic advantages due to lower production costs (Nader, 2006). It is, therefore, advisable to identify possible ways to reduce the high costs of chicken feeds, and one of them could be to replace conventional feed ingredients with cheaper yet equally efficient alternatives. This may be achieved by using locally available non-conventional feedstuffs such as cassava products, which are significant components of chicken diets.

The high cost of conventional feedstuffs, such as maize, soybean, millet, wheat, and groundnut cake, has been reported to be responsible. This is because of the competition between humans, industry, and animals for most conventional feedstuffs, such as maize (Bakare et al., 2021; Muleta, 2024).

To reduce the production cost of broiler chicks and other farm animals, cheaper alternative feedstuffs are being sought to replace the expensive conventional ones. For instance, Shaahu and Tiough (2019) successfully substituted maize with graded levels of sweet potato Vine-Cassava composite meal on growth performance, nutrient digestibility, carcass characteristics, and economics of production of wanted rabbits. This has also led to the adopting of several cassava byproducts, such as cassava leaf, peel, sieve, chaff, and flour. Tiough et al. (2016**)** replaced maize with cassava root-forage composite meals to improve the performance and economy of the production of weaned rabbits. Bhuiyan and Iji (2015) found a comparatively instrumental energy value of cassava products in broiler chicken diets with or without enzyme supplementation. As also confirmed by Ogbuewu & Mbajiorgu (2023), cassava is a tuber crop that grows abundantly in the tropics, and its products are classified as energy or protein feed resources based on their protein and energy levels. Habib et al. (2021) described Cassava (*Manihot esculenta*) as one of the most important food crops in Western and Eastern parts of Equatorial region, in particular, in Western province of Bahr Elghazal Region in the Republic of Sudan, and further highlighted that Cassava has a comparatively higher amylopectin level which means that the digestible starch may be higher in cassava compared with other familiar starch sources fed to poultry. The comparative importance of cassava as a trending alternative feed supplement and ingredient in modern poultry feed also follows the prolific nature of cassava production, with world annual cassava production said to have increased by approximately 100 million tonnes since 2000 (Habib et al., 2021). More so, Cock & Connor (2021) further described cassava as a robust crop well suited to extreme weather conditions; now covering 26.3 Mha worldwide with an average yield of 11t fresh tubers per ha; and noted that although once renowned as a crop of subsistence agriculture, cassava is now firmly placed in commercial agriculture as fresh and starch-based food, animal fodder, and industrial starch products.

The identified challenges of adopting cassava byproducts, such as dustiness, high levels of cyanide, and low crude protein, have been overcome by soaking, drying, frying, peeling, pressing, and adding oil where necessary. These processes help to reduce cyanide to a tolerable level. In this study, the variety of tropical Manihot species used was sweet variety (TMS) 30572, which is very low in cyanide, below 100 ppm, and regarded as non-toxic. Two cassava by-products, cassava leaf meal (CLM) and cassava sieviate meal (CSM), were mixed 50% each by weight to produce a composite feedstuff known as cassava sieviate leaf meal (CSLM). CSLM has 8.50% crude protein, which was used to replace maize in broiler chicks' diets at the starter and finisher phases up to 45%. It has been reported that the fastest means of meeting the protein gap in Nigeria is through table egg and broiler meat (Alikwe & Nodu, 2013). There is a need for urgent steps to be taken to meet the increasing protein needs. Protein needs in Africa are expected to increase following an increase in population. To promote efficient animal production, this study aims to achieve the following objectives:

i. Determine the proximate composition of a cassava-based diet.
ii. Determine the comparative growth performance of broilers fed a cassava-based diet.
iii. Identify other observable physical effects of feed intake and mortality rate.
iv. Make fact-based recommendations for solutions to the scarcity and high cost of components used in manufacturing boiler feeds.

## 2. Materials and Methods

### *2.1 Experimental Site and Duration*

The experiment was conducted in the Animal Farm of the Federal Polytechnic Ekowe. The Polytechnic farm is situated in the coastal area of Ekowe community in the Southern Ijaw Local Government Area of Bayelsa State, Nigeria. The duration of the experiment was eight (8) weeks.

### *2.2 Experimental Housing*

The birds were kept in a closed house in the east-west direction of the farm, making the long axis face North and South winds. The house was first cleaned using water and detergent. The drinkers and feeders were also washed and disinfected three days before the arrival of the birds, and they were cleaned daily throughout the experiment. The house was divided into 2 Pens to accommodate a total of 51 chicks used for the experiment, where one pen contained twenty-five chicks, and the second pen contained twenty-six chicks. Three (3) plastic feeders and three (3) plastic drinkers were used in each pen for the experiment.

### *2.3 Preparation of Cassava Meal*

Fresh cassava tubers and leaves were collected from a farm in the Ekowe community in Bayelsa State, Nigeria. The cassava tubers were sun-dried on a concrete floor for 5 days before being packed in bags and stored correctly. Afterward, they were ground in powdery form for easy incorporation and preservation. Whether raw or boiled, cassava tubers are good sources of water and carbohydrates, and the raw leaves are rich in crude fiber, water, and protein (Ekpo & Baridia, 2020; Omoniyi & Cosmas, 2024). The proximate composition of cassava tubers was essentially unaffected by boiling. Other feed ingredients and additives used for the study were obtained from different locations within and outside the Ekowe community.

### *2.4 Facilities and Equipment*

Poultry facilities and essential equipment such as chicken poultry houses, drinkers/watering troughs, feeding troughs, kerosene-powered stoves, brooms, clean empty sacks, old newspapers, record books, and weighing scales were used during the study.

### *2.5 Procurement, Care, and Management of the Experimental Birds*

A total of fifty-one (51) unsexed one-day-old broiler chicks were purchased from a local company, weighed, and vaccinated to protect birds against Newcastle disease (ND) and Gumboro using BUR706. Gumboro and Lasota's vaccines were offered via drinking water. The birds were divided into two experimental groups; the first group had 25 chicks, and the second group had 26. The birds were offered fresh water and the respective feed types throughout the experimental period.

About one week before the arrival of chicks, all facilities and equipment, including the area, were cleaned and disinfected to eliminate possible disease-causing organisms. The day-old chicks were brooded for up to 14 days. A kerosene Stove was lit up during the day and night to keep the birds warm and encourage all-around feeding by the birds. The pens were closed, especially during the night, to minimize heat loss from the pen. Old newspapers were used as bedding during brooding to avoid damage to the feet and legs of the chicks and as insulators. During brooding, the feeds were put on the newspapers so that the chicks could pick up the feed easily. Feeding troughs were used after brooding to minimize feed wastage. Birds were fed with cassava-based feed and leaf meal every morning and afternoon. Water was also supplied every morning and afternoon. The drinkers/watering troughs were washed before they were used. The floor litters were removed every day during brooding and every seven days for the succeeding days until the termination of the experiment. Proper sanitation was observed throughout the experiment. Vaccination was properly administered following a standard vaccination schedule.

### *2.6 Experimental Design and Data Collection*

The experiment was carried out using a completely randomized design. After sun-drying cassava roots and leaves, they were used to formulate two experimental diets. The birds were randomly assigned to each of the dietary treatments.

The initial body weight of chicks was recorded at the commencement of the experiment. Feed consumption and weight gain were measured weekly. Mortality was also recorded throughout the experimental period.

### *2.7 Data Analysis*

Data were collected and analysed with computer statistical software, the Statistical Package for Social Sciences (SPSS). Using a one-way analysis of variance (ANOVA), treatment means were separated using Duncan's multiple range test to determine if there were any significant differences between treatment means.

#### *2.7.1 Formulation of Feeds*

A trial method was employed for this study to test the effect of cassava-based feed on the growth performance of broiler-fed cassava at 100% ration. The formulated ratio for the broilers is presented in Table 1.

**Table 1.** Formulated Ration for Broilers

| Parameters | Quantity (kg) (For Treatment A) | Quantity (kg) (For Treatment B) |
|---|---|---|
| Cassava tuber | 26.5 | 53 |
| Cassava Leaf | 14.5 | 29 |
| Maize | 26.5 | 0 |
| Soya bean | 14.5 | 0 |
| Fish meal | 12 | 12 |
| Salt | 1.0 | 1.0 |
| Methionine | 0.2 | 0.2 |
| Premix | 0.2 | 0.2 |
| Lysine | 0.2 | 0.2 |
| Toxin Bander | 0.2 | 0.2 |
| P.K.C | 4.2 | 4.2 |

Note: kg = kilogramme; P.K.C: Palm Kernel Cake

Table 1 indicates that cassava tubers and cassava leaves constitute as much as 41 and 82 kg for treatments A and B, respectively. The use of cassava as a feed component in recent years cannot be over-emphasized, following its viability as a suitable alternative for energy and protein ingredients in animal feed. Ekpo & Baridia (2020) recorded that cassava tubers, whether raw or boiled, are good sources of water and carbohydrates, and the raw leaves are rich in crude fiber, water, and protein. Bawa-Boyi et al. (2024) reiterated that Cassava roots are an important food and animal feed source.

Li et al. (2024) further emphasized the use of these cassava by-products for animal feed and noted that overall, all varieties of whole-plant cassava had a high feeding value, as reflected by abundant starch, minerals, amino acid, water-soluble carbohydrates, and protein, while having low fiber content and HCN toxicity, as well as excellent ruminal digestibility characteristics, hence could be used as a potential feed resource. However, a high component of cyanide compounds from cassava leaves and skin is a separate problem that limits the use of cassava materials as a substitute for poultry feed; thus, there is a need for methods for removing cyanide compounds from cassava leaves and other parts (Setyawan et al., 2023).

Nonetheless, looking at production economics, Lucena et al. (2023) emphasized that using cassava by-products as feed supplements will reduce the feed cost of poultry production.

On the other hand, soybean meal (SBM) is a high-quality feed ingredient and the most important source of dietary protein for poultry in the US and much of the world (Wedekind et al., 2020).

## 3. Results and Discussion

### *3.1 Proximate Analysis*

The result and discussion of the experimental birds are presented in Table 2 also comparing the group of birds fed 50% of cassava, soya bean and fish meals-CSV/SB/FM (Treatment A) with the group of birds fed 100% cassava and fish meals -

CSV/FM (Treatment B). The comparison is made based on four basic indices: body weight gain, feed intake, growth, performance of the broiler chicks, and mortality rate recorded. The Proximate analysis of cassava-based feed diets is presented in Table 2.

**Table 2.** The Proximate Analysis of Cassava-Based Feed Diets

| Sample Code | %Moisture | %ASH | %Protein | %Lipid | %Fibre | %Dry Matter | %NFE |
|---|---|---|---|---|---|---|---|
| i | 5.86 | 3.76 | 4.32 | 0.54 | 4.20 | 94.14 | 87.18 |
| ii | 5.84 | 3.72 | 4.38 | 0.50 | 4.18 | 94.16 | 87.22 |

Note: Sample Code i: 50% CSV/SB/MM; Sample Code ii: 100% CSV. ASH: NFE-Nitrogen-free-extract (NFE)

According to the result in Table 2, Sample code ii (cassava-based feed diets with 100% CSV/FM) was found to contain a comparatively higher percentage (%) of protein, dry matter, and Nitrogen-free-extract (NFE), which are very vital to broiler growth. As already noted above, cassava tubers, whether raw or boiled, are good sources of water and carbohydrates, and the raw leaves are rich in crude fiber, water, and protein (Ekpo & Baridia, 2020). Raw cassava leaves are rich in crude fiber, water, and protein (Omoniyi & Cosmas, 2024). According to (Lambebo & Deme, 2022), cassava roots are an excellent source of energy, and their leaves are rich in vitamins, minerals, and protein, which could substantially supplement other starchy diets if properly detoxified since they contain some toxic anti-nutritional factors. Proper detoxification involves peeling, soaking/fermentation, cooking, and drying.

### *3.2 Comparison by Mortality Rate Recorded*

Table 3 shows the mortality rate recorded for the two groups of birds: treatments A and B. The mortality record was documented for the eight weeks of the experiment.

Table 3 shows that mortality cases were recorded among birds in Treatment B only in the first week of the experiment. There was no further mortality till the end of the experiment. The mortality rate recorded in week 1 was suspected to result from bones in the fish meal.

**Table 3.** Mortality Rate

| Week | Treatment (A) Mortality | Treatment (B) Mortality |
|---|---|---|
| 1 | 3 | 3 |
| 2 | 6 | 0 |
| 3 | 4 | 0 |
| 4 | 2 | 0 |
| 5 | 1 | 0 |
| 6 | 1 | 0 |
| 7 | 0 | 0 |
| 8 | 0 | 0 |
| **Total mortality** | **17** | **3** |

Source: Primary Data

Thus, at the end of the experiment, the mortality recorded among Treatment B (broiler birds fed 100% cassava tuber and leaf meal) was three (3), which was comparatively lower than that of broilers fed 50% cassava tuber, 50% fresh soya bean, 50% maize meal, 50% leaf meal; which had seventeen (17) mortality cases. Note that the use of '50%' for multiple ingredients in the description of Treatment A are not to be additive across ingredients, implies that each ingredient (cassava root meal, cassava leaf meal, maize, and fresh soybean) contributed equally to the composition of the feed mixture used in Treatment A, based on their proportions relative to the total feed formulation.

The high mortality recorded among birds in Treatment A may be attributed to trypsin inhibitors in fresh soybeans. A report by Wedekind et al. (2020) confirms that soybeans contain anti-nutritional factors (ANF) that reduce or inhibit metabolizable energy, protein, and amino acid (AA) digestibility. The ANF comprises heat-labile (trypsin inhibitors, lectins, goitrogens) and heat-stable (oligosaccharides and phytate) factors. In particular, higher trypsin inhibitor decreases protein, resulting in lower amino acid digestibility in poultry (Chen et al., 2020). Also, in an experiment to determine the effects of gradual differences in trypsin inhibitor activity on the estimation of digestible amino acids in soybean expellers for broiler chickens, Kuenz et al. (2022), trypsin inhibitor activity (TIA) depressed the practical digestibility of every single AA significantly in a straight linear fashion ($P < 0.001$). It highlighted that TIA severely depresses the digestibility of essential and nonessential AA in a straight linear fashion.

As highlighted by Hemetsberger et al. (2021), soybeans are the primary source of protein in today´s livestock diets. However, soybeans require heating to ensure optimal feeding properties and eliminate intrinsic compounds that negatively interfere with the animal's digestive tract. The study by Hemetsberger et al. (2021) also found no observable adverse effect of heat treatment at 120 °C on growth performance, but amino acid digestibility was reduced. More so, Aderibigbe et al. (2020) aptly reported that 'dietary addition of purified trypsin inhibitors (TI) negatively affects nutrient utilization by broiler chickens,' which would affect not only the growth performance of the broilers but also mortality.

Nevertheless, our study did not establish a significant difference in the effect of trypsin inhibitor on the broilers based on various age levels, which could have helped to suggest whether, to some extent, broiler birds could withstand or tolerate the severity of the detrimental effects of trypsin inhibitor at specific age levels. This fact needs to be further investigated.

### *3.3 Comparison by Body Weight*

The birds were weighed respectively for Treatments (A) and (B), and the average body weight collected for eight weeks is recorded in Table 4.

Table 4 shows the average body weight of the birds per week. The overall mean weight was 0.87 kg for Treatment A and 0.91 kg for Treatment B. By comparison, Treatment B; the birds/replicates offered 100% cassava tuber, 100% leaf meal formulated feed (cassava-based feed-100% CSV/FM) showed comparatively more body weight gain, than the birds fed 50% cassava, 50% fresh soya bean 50% maize meal, 50%leaf meal (50% CSV/SB/MM). The comparative effect of cassava meal corroborates the findings of the most recent studies. Ogbuewu et al. (2023) also confirmed the effect of cassava-based meal in promoting the growth and performance of chicken. They reported that cassava root sievate meal (CRSM) was classified as an energy source in chicken feed, whereas cassava leaf meal (CLM) is classified as a protein source. Nutritional analysis indicates cassava roots or tubers are rich in energy but low in crude protein (CP). In contrast, cassava leaves are high in protein, fiber, minerals, vitamins ($B_1$, $B_2$, and C), and carotenoids (Ogbuewu et al., 2023). Besides the significant positives in the effect of cassava tubers, weight gain was compromised at higher inclusion levels of cassava leaf meal in chickens' diets (Bakare et al., 2020). More so, findings by Ehebha & Eguaoje (2018) also indicated that final live weight was significantly higher (2.86kg/bird) among birds fed 20% Sundried cassava peel meal.

**Table 4.** Average Body Weight per Week (kg)

| Week | Treatment (A) | Treatment (B) |
|---|---|---|
| 1 | 0.20 | 0.17 |
| 2 | 0.28 | 0.31 |
| 3 | 0.43 | 0.42 |
| 4 | 0.61 | 0.52 |
| 5 | 0.98 | 0.82 |
| 6 | 1.23 | 1.42 |
| 7 | 1.49 | 1.66 |
| 8 | 1.72 | 1.94 |
| **Overall Mean Weight Gain** | **0.87** | **0.91** |

Source: Primary Data

***3.4 Comparison by feed intake:*** *Feed consumption and cumulative feed consumption per treatment/replicate*

The feed consumption per replicate was determined, and cumulative feed consumption was calculated for eight weeks; that is, the total feed consumed by the birds per week. The result is shown in Table 5.

**Table 5.** Feed consumption per replicate

| Week | Average Feed consumed per replicate (kg) | | Cumulative feed consumed per replicate (kg) | |
|---|---|---|---|---|
| | Treatment (A) | Treatment (B) | Treatment (A) | Treatment (B) |
| 1 | 0.822 | 1.022 | 0.685 | 0.786 |
| 2 | 0.7 | 0.888 | 0.636 | 0.74 |
| 3 | 1.1 | 1.5 | 0.647 | 0.967 |
| 4 | 1.32 | 1.75 | 0.819 | 0.833 |
| 5 | 1.34 | 1.78 | 0.623 | 0.741 |
| 6 | 0.945 | 0.948 | 0.410 | 0.351 |
| 7 | 1.215 | 1.222 | 0.934 | 0.872 |
| 8 | 1.217 | 1.225 | 0.936 | 0.816 |
| **Total** | **8.659** | **10.335** | | |
| **Average** | **1.082** | **1.292** | | |

Source: Primary Data

The result in Table 5 shows that for both Treatment A and Treatment B, Total feed consumption for both treatments increased significantly at the starter phase because of the light that was provided during the night period but slightly decreased at the finisher phase, probably as a result of unavailability of light which could have been provided to encourage all-round feeding during the night period.

The birds were fed with 50% (CSV/SB/MM) and 100% (CSV/FM), respectively, during the first week, with feeds given *ad libitum* (unrestricted access to feed). The feed intake was weighed for the second 2 weeks during the experiment. Moreover, they were given 1kg of feed daily/nightly per week, monitoring their eating rate daily and nightly. It was shown that the birds fed 100% (CSV/FM) could finish their feed as given during the day/night period. While the ones fed 50% CSV/SB/MM could not meet the 1kg of feed given to them. In the third week, 1.5kg of feed was recorded, and in the fourth week, 1.7kg of feed was recorded; by observation, it was seen that the birds were unable to finish 2kg given to them, probably because of the light that was cut out after 21 days that light was provided. The eating rate of the birds fed 100%(CSV/FM) was recorded (or rated) comparatively as *"Excellent"*, while the ones fed 50 %(CSV/SB/MM) were recorded as *"Fair"* during the duration of the experiment.

Feed intake of 100% cassava tuber and leaf meal (Treatment B) was significantly higher than that of birds fed 50% cassava tuber, 50% fresh soya bean, 50% maize meal, and 50% leaf meal. The average feed consumption (AFC) for the 8 weeks was 1.082 kg for Treatment A and 1.292 kg for Treatment B. The variation in feed energy digestibility, as inferred from their eating rate, could be related to the presence of dietary fiber. This finding corroborates the assumption that cassava-based meals may increase feed intake by chickens but tends to deviate from the report by Melesse et al. (2018), which 'indicates that inclusion of cassava leaf meal significantly affected the feed intake of the chickens being lower in chickens reared in two of the treatment diets with a high level of cassava leaf inclusion. Thus, it could be expected that the cassava leaf might hurt feed intake, thereby depressing the growth performance of the broilers, which does not corroborate with most recent studies. This could be attributed to the unpalatable taste and the dustiness of the cassava leaf meal, which might have inhibited the birds from consuming adequate quantities (Melesse et al., 2018). More so, Cassava leaves are protein-rich but contain anti-nutritional factors like cyanogenic glycosides, and high crude fiber content reduces digestibility in chicks. Hence, proper processing is essential to reduce toxicity and improve digestibility (Ogbuewu & Mbajiorgu, 2023). According to Bakare et al. (2020), the effects of the inclusion level of cassava leaf meal in the diets of chickens on several visits to the feeder and drinker was significant ($P < 0.05$), with the duration of each visit to the feeder increased ($P < 0.05$) with inclusion level of CLM in diets of chickens. However, time spent by chickens on the drinker decreased with the inclusion level of CLM in diets ($P < 0.05$). Again, findings by Chang'a (2020) also confirmed feed intake to be highest in broiler chickens fed diets with medium cassava levels at 1 to 24 d and 1 to 35 d of age. Overall, it is evident that while most studies confirm the positive effect of cassava-based feeds on increasing feed intake in broilers, it is also noteworthy that bird feed intake can decrease cassava components beyond certain combination levels. For instance, Nsa et al. (2019) reported that weight gain, feed intake, and feed Conversion ratio values were significantly ($P<0.05$) depressed as the level of replacement of maize with cassava root meal exceeded 25%. Chang'a *et al.* (2020) noted that although broiler performance was depressed by high levels of cassava inclusion, it was not affected by low levels, which was further improved by enzyme supplementation.

### *3.5 Comparison of Growth and Physical Performance of Broiler Chicks*

Growth performance of broiler chicks: During the experiment and at the end of the study, it was recorded that the growth rate and performance of broilers fed 100% cassava-based feed were better compared to the other groups fed 50% cassava tuber. Cassava-based meals are a source of energy (Habib et al., 2021). The birds were growing fast, and their performance was comparatively good; they were smart, there was no dullness or lying down, and no weakness of the legs. However, for the birds that were fed 50% fresh soya bean and maize meal, it was observed that they were unable to move around because of the weakness of the legs, they were always lying down and had stunted growth, and also their performance was dull, and they were not active. According to the study of Olukosi et al. (2008), the performance of birds is evidence of more efficient energy utilization in these diets due to improvements in nutrient and energy availability, according to the findings of Boekholt et al. (1994), who reported that when protein is not limited in the diets of broilers, extra energy available in the diets is used for both fat and protein accumulation. Burn et al. (1990) reported that up to 66.7% of maize in broiler diets can be replaced by cassava meal without adversely affecting the growth performance of broilers. Significant differences existed between the two treatments in growth performance. Treatment B, which had 100% cassava tuber and cassava leaf meal, had a significantly higher performance compared to treatment A, which contained 50% cassava tuber, 50% fresh soya bean, 50% maize meal, 50% leaf meal, which were most times unable to move around because of the weakness of the legs, and have stunted growth. Also, their performance was dull; they were not active. Despite the varying reports about the effects of cassava as a feed supplement, cassava-based feeds have been recommended as a valuable alternative source of energy and protein in chicken feeds. Yadav et al. (2019) emphasized that cassava meal such as cassava root chips (CRC) can be used to replace conventional energy feedstuff (like corn) up to 25 and 37.5% in starter and finisher diets, respectively, as the use of CRC in diets may benefit broiler chickens' production by reducing feed costs and contribute to improving gut health. Habib et al. *(*2021) concluded that using cassava roots as a source of energy for up to 40% of broiler diets had no significant effect on the hematological and chemical composition of blood for broiler chickens. Also, 25% of cassava roots in diets enhanced crude protein and fat digestibility.

## 4. Conclusion

This study explored cost-effective alternatives for broiler feed by examining cassava-based diets. The results indicate that cassava tuber and leaf, combined with fish meal, can replace expensive ingredients like maize and soybean without compromising chicken growth. However, bird mortalities due to bone fragments in fish meal highlight a safety concern. Further research is needed to determine optimal ratios and long-term impacts, supporting sustainable poultry farming and food security.

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