**A PROPOSAL ON**

**PERFORMANCE AND GUT MICROBIAL LOAD OF CHICKEN FED DIET CONTAINNG CASSAVA-PEEL-GRITS-MORINGA-LEAF BLEND AS REPLACEMENT FOR MAIZE**

**BY**

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**CHAPTER ONE**

1. **Introduction**

Poultry is the most abundant livestock species that account for more than 90% of the total bird‘s population of the world (Biswas *et al.* 2011) and contributes significantly to income and employment among people of Africa (Yami *et al* 1995). The increase in the demand for food is due to a rise in human population (Godfray *et al.,* 2010). Due to its potential role to provide food and livelihood securities, poultry production, especially broiler production, are expected to meet the critical shortage in animal protein needed by Africa (Hatab *et al.,* 2019 ).

Feeds and feeding are integral part of poultry production that account for about 70-75% of the cost of production and at the same time dictates the production strength and quality based on the observed feeding regime and feeding quality. In most developing countries, the major sources of protein in commercial poultry production are fishmeal (FM) and Soya bean cakes. Thus, there is a need to look for non-conventional, cheap, locally available and less competitive plant protein sources as alternative protein sources for feed formulation in poultry diets. The use of leguminous multipurpose trees and shrubs has been suggested to be a viable alternative source of proteins, vitamins and minerals for poultry feeding (Church *et al* 1991). Research has shown that Moringa oleifera is a promising protein source for inclusion in poultry diets at low levels (Chiseva *et al* 2006).

Moringa plant scientifically referred to as *Moringa oleifera* (genus Moringa and family Moringaceae) originates from Asia and is well distributed in Africa (Francis *et al.,* 2005). *Moringa oleifera* possess multiple advantages, because different parts of the tree (leaves, fruits, immature pods and flowers) are edibles and forms part of the traditional diets in many tropical and sub-tropical countries (Siddhuraju *et al* 2003; Anhwange *et al.,* 2004).

In addition to their nutritive effects, many of these plants can also produce physiological effects in the animal that are of interest in maintaining the performance, well-being and health. One interesting source of protein is the leaf meal of tropical legumes and non-legumes, among them *M. oleifera* with its various primary and secondary components and due to its multiple advantages with nutritive and medicinal properties (Santos *et al.,* 2015). Adding the fresh or dried leaves to animal feed can improve performance and contributes significantly in fighting nutritional deficiencies in tropical countries (Bhargave *et al.,* 2015). There are several studies relating to the effects of *M. oleifera* leaves meals as a substitute to established protein resources in diets in poultry production.

Cassava peel is one of such by product emanating from industrial processing of cassava into industrial starch which offers a tremendous potential as a cheap and alternative feedstuff to maize. It however contains hydrogen cyanide that has shown go be toxic to livestock and could limit its usage in the raw state as feed for livestock. Furthermore, animal protein content in the diet of most Nigerians is very low because the animal production level has not been able to meet the animal protein needs of the populace (Oyenuga, *et al.,*1968)

* 1. **Justification**

The combination of *Moringa oleifera* and cassava provides a balanced diet rich in essential nutrients. Moringa is high in proteins, vitamins, and minerals, while cassava serves as a good source of carbohydrates. This nutritional synergy can enhance growth performance and overall health in broilers (Olugbemi, *et al*. *2010*). *Moringa oleifera* possesses antimicrobial properties that can help lower the microbial load in the gastrointestinal tract of broilers. Studies have shown that the inclusion of moringa in poultry diets can inhibit the growth of harmful bacteria, leading to improved gut health and nutrient absorption.

There is detailed information on utilizing of cassava-peel-grits-moringa-leaf blend (CPMLB) on performance, immunity and microbial load of broiler and dual-purpose chicken and this necessitate the study.

**1.2 Objectives of the study**

**1.2.1 Broad objective**

To determine the performance fed diet containing cassava-peel-grits-moringa-leaf blend (CPMLB) on microbial load and immunity of broiler and dual purpose chicken.

**1.2.2 Specific objectives**

i. To determine the performance of broiler and dual purpose chicken on cassava-peel-grits-moringa-leaf blend (CPMLB)

ii. To evaluate the gut microbial identification of broiler and dual purpose chickens fed the experimental diet

iii. To determine the gut microbial population of broiler and dual purpose chickens fed cassava-peel-grits-moringa-leaf blend (CPMLB) as replacement for maize.

**CHAPTER TWO**

**2.0 Literature review**

**2.1 Broiler production in Nigeria**

Broiler chickens have been selectively bred for generations, with selection for conventional broilers focused on a small range of traits including faster and bigger muscle growth for meat production. There is a range of breeds of broiler chickens, from fast growing breeds which can reach the target weight of 1.5–3 kg in around 30 days, to slower growing breeds which reach the same weight in a longer period, up to 70 or 80 days (Torrey *et al*. [Citation2021](https://www.tandfonline.com/doi/full/10.1080/00439339.2023.2264824)).

**2.1.1 Feeding in broiler meat production**

Over 70% of the expenses associated with chicken meat production are attributed to feed costs. Therefore, the utilization of high-quality feed becomes crucial to enhance birds’ performance, thereby improving feed efficiency, and subsequently, the overall performance and profitability of broiler chicken farming. The advent of modern PC feed definition tools has made achieving precise nutritional goals a feasible objective, allowing different limitations to be examined, such as the nutritive nature of feed and feed fixing, as well as budgetary factors Blas CD *et al* 2020.

**2.1.2 Broiler nutriment requirement**

Broilers require a balanced diet to support their rapid growth and development. The nutritional requirements of broiler vary depending on their age, weight, and sex, as well as environmental factors such as temperature and humidity Oladokun *et al* 2012.

**2.1.3 The dual purpose**

Dual-purpose chickens are bred to be both good layers and produce acceptable meat. They offer the advantage of versatility, making them ideal for smallholder farmers who need a combination of eggs and meat. One of the most well-known dual-purpose breeds in Nigeria is the Rhode Island Red (RIR).

**2.15 Challenges of poultry in Nigeria**

While poultry production holds a prominent position in the livestock industry, it is not exempt from challenges. The complexities and obstacles associated with poultry production in Nigeria are formidable and should not be underestimated. The industry's output pace has slowed as a result of these issues. Rabana *et al*., 2013 indicated a high rate of disease and insect infestations as a major difficulty in chicken production.

**2.1.6 Possible solutions to the challenges of poultry production in Nigeria**

Despite the challenges faced by the poultry industry in Nigeria, it continues to function, albeit at a reduced production rate. Addressing these issues is not beyond reach. A significant issue in Nigeria's chicken industry is the frequent outbreak of diseases. Veterinary intervention is essential to minimize losses associated with these diseases (Anosike *et al,.* 2018)

**2.2 Cassava peel**

**2.2.1 Cassava peel as feed ingredient for animal**

Cassava is also used as feed and regularly fed to small ruminants on small-scale subsistence farms in Africa. In recent survey of small holder small ruminant farmers in South West Nigeria, a majority of the farmers indicated that cassava by-products of cassava peels were regularly given to their livestock as increased supplement to grass and hay. Cassava is referred to as a food security crop (Barratt et al., 2006).

**2.3 Moringa (*Moringa oleifera)* Plant**

**2.3.1 Nutritional Value of *Moringa oleifera***

Moringa oleifera is highly nutritious plant because all parts of its is a good source of protein, vitamins, essential amino acids, minerals and various phenolics compounds and moringa leaves contain negligible content of antinutritional factors such as tannins, saponins, tripsin inhibitors and pyhtates (Makkar and Becker 1997, Nouala *et al.* 2006

**2.3.2 Effect of *Moringa oleifera* on production performance and gut health in broilers**

Moring oleifera has several positive health factors, including the immune responses of the birds. Moreover, chick diet supplements with MO indicate greater performance (production) and immunity than untreated chicks (Ochi *et al* 2015). The dietary leaf powder of MO might enhance physiological and physiochemical features as well as intestinal health in birds, which is linked to the Moringa leaf’s capacity to reduce inflammation in the intestinal tract Khalid *et al* 2021.

**2.4 Microbes in the guts (guts microbiota)**

The chicken GI tract harbors a very complex microbiota, with over 600 different bacterial species from more than 100 bacterial genera (Torok *et al.* 2011). In general, the most abundant phylum in the chicken intestinal microbiota is *Firmicutes* followed by two minor phyla, Proteobacteria and Bacteroidetes In addition, members of phyla Actinobacteria, Tenericutes, Cyanobacteria and Fusobacteria (Qu *et al.* 2008) can be found in very low abundance.

**CHAPTER THREE**

**3.0 MATERIALS AND METHODS**

**3.1 Experimental site**

The experiment will be conducted at the Institute of Food Security and Environmental Resources and Agricultural Research (IFSERAR) of Federal University of Agriculture, Abeokuta, Ogun State. The location is located at latitude 7.230N, longitude 3.39o E, at an elevation 76mm above sea level in the derived Savannah zone of South Western Nigeria. The mean annual rainfall of 1100mm, and the mean temperature and humidity are 34.70C and 83%, respectively. These statistics indicate a humid environment (Google Earth, 2024).

**3.2 Management of experimental Animals, design and management**

A total of two hundred (200) day old chicks comprising of a broiler and dual purpose strain will be sourced from a reputable and reliable hatcheries for this study. The birds will go through first phase which is brooding for two weeks so as to provide heat for the chicks and they will be fed four (4) different feed. The housing was amended due to some materials that were worn out, and it was swept and disinfected before the arrival of the dayold chicks. The birds will be vaccinated and appropriate medications will be administered when needed. Deep litters system of management will be practiced, the pen will be fully equipped with feeders and drinkers and light. Feed and water will be provided *ad libitum* throughout the experimental period.

**3.3 Experimental design and management**

A total of two hundred (200) will be allotted on weight equalization into eight (8) dietary treatments involving 2x4 factorial arrangement. Four experimental diet were formulated to include cassava-peel-grits-moringa-leaf blend at 0%, 25%, 50%, 75% respectively.

**Treatment 1=** control diet (%CPMLB)

**Treatment 2=** diet supplemented with Cassava-peel-moringa-leaf-blend at 25%

**Treatment 3=** diet supplemented with Cassava-peel-moringa-leaf-blend at 50%

**Treatment 4=** diet supplemented with Cassava-peel-moringa-leaf-blend at 75%

**Table 2: Starter phase experimental diet**

Diet 1 Diet 2 Diet 3 Diet 4

% Replacement of

blend

**Ingredients 0% 25 50 75**

Maize 50.00 37.50 25.00 12.50

Blend (CP+Moringa) 0.00 12.50 25.00 37.50

Soyabean 22.00 22.00 22.00 22.00

GNC 10.00 10.00 10.00 10.00

Wheat offal 6.50 6.50 6.50 6.50

Fish meal 2.50 2.50 2.50 2.50

Bone meal 3.00 3.00 3.00 3.00

Limestone 5.00 5.00 5.00 5.00

Premix 0.25 0.25 0.25 0.25

Salt 0.25 0.25 0.25 0.25

Lysine 0.25 0.25 0.25 0.25

Methionine 0.25 0.25 0.25 0.25

Total 100 100 100 100

Proximate analysis (%)

Metabolizable energy 2798 2768.63 2739.26 2709.89

Crude protein 21.39 21.51 21.64 21.79

Fat 3.69 3.31 2.93 2.54

Crude fibre 3.18 3.18 3.19 3.20

Calcium 2.81 2.80 2.80 2.80

Phosphorus 0.56 0.55 0.54 0.53

Lysine 1.26 1.23 1.19 1.16

Methionine 0.58 0.55 0.93 0.51

**Table 3.: Finisher phase experimental diet**

Diet 1 Diet 2 Diet 3 Diet 4

% Replacement of

blend

**Ingredients 0% 25 50 75**

Maize 60.00 45.00 30.00 15,00

Blend (CP+Moringa) 0.00 15.00 30.00 45.00

Soyabean 15.00 15.00 15.00 15.00

GNC 12.00 12.00 12.00 12.00

Wheat offal 4.20 4.20 4.20 4.20

Bone meal 3.00 3.00 3.00 3.00

Limestone 5.00 5.00 5.00 5.00

Premix 0.25 0.25 0.25 0.25

Salt 0.25 0.25 0.25 0.25

Lysine 0.15 0.15 0.15 0.15

Methionine 0.15 0.15 0.15 0.15

Total 100 100 100 100

Proximate analysis (%)

Metabolizable energy 2876.40 2841.16 2805.91 2770.67

Crude protein 18.11 18.26 18.41 18.56

Fat 3.72 3.26 2.80 2.34

Crude fibre 3.18 3.18 3.19 3.20

Calcium 2.81 2.80 2.80 2.80

Phosphorus 0.56 0.55 0.54 0.53

Lysine 1.26 1.23 1.19 1.16

Methionine 0.58 0.55 0.93 0.51

**Note:** Blend will replace maize, when the formulation is formed, it will be **ISONITROGENOUS.**

**3.4 Experimental diets and designs**

Moringa oleifera leaves will be harvested from the plants at The Federal University of Agriculture, Abeokuta, Ogun State premises at Directorate of University Farms (DUFARMS), the cassava peel will be obtained from International Livestock Research Institute (ILRI) in International Institute of Agriculture (IITA), Ibadan, Oyo state processed following standard procedures to ensure quality and consistency. The sundried cassava peels will be grinded while the leaves were dried under the shade and then milled to a fine powder, Moringa oleifera 35kg will be used in the feed formulation with cassava peel. The latter product will be subsequently regarded as cassava-peel-grits-moringa-oleifera-leaf blend meal.

**3.5 Data collection**

**3.5.1 Microbial counts**

A bird from each replicate will be selected for sampling. After cervical dislocation, the small intestine and ingesta will be collected. From the duodenum (at the duodenal loop), jejunum (between duodenum and ilium), and ilium (distal segment before the ileocecal junction equaling the length of the cecum), Ingesta from ilium will be collected in normal saline and used for microbial counts.

**3.5.2 Microbial types**

At the end of the experiment (8 weeks), 16 chickens of similar body weight to the group average will be selected from the treatment group (1 chicken per replicate), weighed and slaughtered by severing the jugular vein, they will be then thoroughly bled and scald by dipping in warm water with temperature of 50-550C before defeathering. The internal organs will be removed. From the eviscerated organs, a section of the crop and ceca will be cut and used for microbial analysis. Approximately 1 g of the crop and cecal contents will be mixed with 9 ml of pre-reduced sterile dilution blank solution Bryant *et al.,* 1953 and homogenized for 3 minutes individually. From the initial 101 dilution, 6 fold serial dilutions will be made in sterile pre reduced dilution blank solution for total coliforms, lactic acid bacteria (LAB‟s) and total microbes. For each dilution, 1 ml will be inoculated in mediums which include MRS agar for LAB‟s, MacConkay agar for coliforms. All the inoculated plates will be then incubated at 37-40oC between 24-48 hours. Total number of bacterial colonies will be counted at the end of each incubation period using improved bacteria colony conter (they are used for accurate counting and analyzing bacteria colonies, they allow you to quantify the beneficial and harmful effectively). Jin L.Z (1998)

**3.5.3 Microbial population**

At the end of the experiment (8 weeks), 16 chicken will be selected from the treatment group (1 chicken per replicate), weighed and slaughter. Data will be collected in the intestine (the microbes must be alive), swap stick will be used in collecting the sample into the laboratory, in the samples, population of the good and bad microbes will be checked. If the population of the good microbes (Lactobacillus, Enterococcus) are more than the bad ones (E. coli, Salmonella). It implies that good bacteria will help to contribute to a balanced gut microbiome in chickens, and also if the bad microbes are more than the good microbes it will affect the general health of the chickens.

**3.6 Statistical Analysis**

All data collected will be subjected to two-way analysis of variance using 2 x 4 factorial arrangement (SAS, 2002). All significant means will be separated at p<0.05 using chicken in the software.

**Model**

Yijk = µ + Pi + Lj + (PL)ij + ∑ijk

Where;

Yijk = Dependent variable

µ = Population means

Pi= Effect of ith processing method

Lj = effect of jth level of extract

(PL)ij = effect of interaction between ijth of processing method and in clusion level

∑ĳk = Residual Error

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