IMPLICATIONS OF *Aspilia africana* AQUEOUS LEAF EXTRACT ON INTERNAL ORGAN WEIGHTS OF ROSS 308 BROILER CHICKENS

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DEPARTMENT OF ANIMAL SCIENCE

FACULTY OF AGRICULTURE

UNIVERSITY OF BENIN

BENIN CITY, NIGERIA

NOVEMBER, 2025

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A PROJECT SUBMITTED TO THE DEPARTMENT OF ANIMAL SCIENCE, FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN IN PARTIAL FULFILMENT FOR THE AWARD OF THE BACHELOR OF AGRICULTURE HONOURS, DEGREE IN ANIMAL SCIENCE OF THE UNIVERSITY OF BENIN, BENIN CITY, NIGERIA

NOVEMBER, 2025

CERTIFICATION

This is to certify that this project was carried out by Success Otiwhor UBAKA, Mat. No: AGR2000115 under the guidance of the project supervisors approved by the Department of Animal Science, University of Benin, Benin City, Edo State, Nigeria.

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DEDICATION

This project is dedicated to God Almighty for His grace, guidance, and strength throughout this work. It is also lovingly dedicated to my Dad, whose support, sacrifices, and encouragement mean the whole world to me.

ACKNOWLEDGEMENTS

I sincerely give thanks to God Almighty for His grace, wisdom, and strength throughout the course of my entire academic journey in the University which ended with this research project work. Without His divine guidance, this achievement would not have been possible. I also appreciate myself for the perseverance, hard work, and resilience that made this achievement possible.

My heartfelt appreciation goes to my supervisor, Prof. J. A. Imasuen, for his valuable guidance, encouragement, and criticisms that shaped this research. I am especially grateful to my Co-supervisor, Dr. E. H. Udofia, for his patience, continuous support, and genuine concern, your mentorship has been truly inspiring and impactful.

My sincere appreciation also goes to the Dean of the Faculty of Agriculture, Prof. C. O. Emokaro, and the Head of Department of Animal Science, Dr. N. C. Akaeze, for their academic leadership, support, and dedication to excellence.

I deeply appreciate all the lecturers in the Department of Animal Science for their commitment, knowledge, and contributions to my academic growth. Special thanks to Prof. S. O. Nwokoro, Prof. J. M. Omoyakhi, Prof. M. A. Bamikole, Prof. J.O. Oyedeji, Dr. P. A. Ebabhamiegbegbo, Dr. G. I. O. Odafe-Shalome, Dr. G. Bello Onaghise, Dr. E.S.

Abel, Dr. (Mrs.) G. O. Egigba, Dr. W. O. Agbongbae, Mr. P. Aduba, Mrs. B. O. Isaac, Mrs. V. E. Ekhorutomwen, and Mrs. B. O. Abiloro, as well as other lecturers whose teachings and encouragement greatly influenced my success.

Special thanks to my dad and siblings for their love, prayers, and unending support. Your sacrifices and belief in me have been my greatest motivation.

I also extend my gratitude to my friends (Emmanuel my sweet boy, Bunmi, Kemi and Miracle) and project team members for their cooperation, encouragement, and companionship throughout the course of this research. Your support made the journey smoother and more memorable. Finally, I am thankful to everyone who, in one way or another, contributed to the success of this project. May God bless you all abundantly.

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ABSTRACT

This study was conducted to evaluate the implications of *Aspilia africana* aqueous leaf extract on the internal organ weights of ROSS 308 broiler chickens. A total of one hundred and twelve (112) day-old broiler chicks were used for the seven-week trial. The birds were randomly assigned to four treatment groups in a completely randomized design (CRD) with two replicates per treatment accommodating fourteen (14) birds each. Treatment 1 (T1) served as the control, while Treatments 2, 3, and 4 (T2, T3, and T4) received *Aspilia africana* aqueous leaf extract at the specified concentrations in drinking water. Fresh leaves of *Aspilia africana* were collected from the University of Benin environment, thoroughly washed, and air-dried in the shade to preserve their natural compounds. The dried leaves were ground into a fine paste, and 300 grams of the paste was soaked in 2 liters of boiled water for about 12 hours. The mixture was filtered to obtain a clear, dark-green extract, which was stored in airtight containers and refrigerated at 2°C until use. During the experiment, the extract was administered through the birds' drinking water at concentrations of 100 ml/7L, 150 ml/7L, and 200 ml/7L, which was applied three times weekly. All birds were fed a standard broiler diet formulated to meet NRC (1994) nutrient requirements. At the end of the experiment, two birds per replicate were slaughtered for internal organ evaluation. The relative weights of the gizzard, liver, heart, kidneys, spleen, lungs, and intestinal length were measured and expressed as a percentage of live body weight. Data were analyzed using one-way ANOVA, and significant differences were separated using Duncan's Multiple Range Test at a 5% significance level ($p < 0.05$). Results showed that *Aspilia africana* aqueous leaf extract had significant effects on gizzard and kidney weights ($p < 0.05$) but no significant influence on the liver, heart, spleen, lungs, or intestinal length ($p > 0.05$). Birds given 100 ml/7L extract recorded the highest gizzard weight (1.395%), suggesting improved digestive efficiency, while kidney weight increased with higher extract concentrations, peaking at 200 ml/7L (0.475%), which may indicate enhanced detoxification activity. All organ weights remained within normal physiological limits, confirming the safety of the extract. It was therefore concluded that *Aspilia africana* aqueous leaf extract is safe and beneficial for broiler chickens. Moderate inclusion at 100 ml/7L promotes better digestive organ development without adverse effects on vital organs. Hence, *Aspilia africana* can be recommended as a natural, eco-friendly, and locally available alternative to synthetic growth promoters in poultry production.

CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

Poultry production plays a significant role in meeting the protein needs of people around the world, especially in developing countries such as Nigeria. Among poultry birds, broiler chickens are most commonly raised for meat because of their fast growth rate and good feed efficiency. One of the most widely used commercial breeds is ROSS 308, prized for its rapid weight gain and favorable feed conversion ratio (e.g., Uchewa *et al.,* 2018; Adedeji *et al.,* 2014). To meet growing demands for productivity, many producers rely on synthetic additives, including antibiotics, to enhance growth and prevent disease. However, prolonged use of such compounds raises concerns over antimicrobial resistance, residue accumulation in meat, and negative health impacts on consumers (Abd El-Hack *et al.,* 2022). As a result, interest is increasing in natural alternatives that are safer, sustainable, and environmentally friendly (Abd El-Hack *et al.,* 2022).

One plant drawing attention is *Aspilia africana*, a medicinal herb widespread in many African regions. Traditionally, it has been used for wound healing, as an anti-inflammatory agent, and to treat various ailments. Phytochemical investigations

indicate that *Aspilia africana* contains bioactive compounds such as flavonoids, tannins, and saponins, which may exert antimicrobial and antioxidant activities (Gang *et al.,* 2025). Some poultry nutrition studies suggest that inclusion of *Aspilia africana* leaf meal or leaf extract can influence growth performance and organ weights in broiler chickens (Uchewa *et al.,* 2018; Adedeji *et al.,* 2014; Adedeji *et al.,* as cited in Etim, 2021).

Nevertheless, limited information is available regarding the effects on internal organ weights of broiler chickens, especially over prolonged use. Internal organ weights (such as liver, kidneys, heart, gizzard) are key indicators of physiological health status and may reflect whether a feed additive is safe or deleterious at the organ level (Richardson *et al.,* 2025). In commercial broiler strains like ROSS 308, the development of internal organs must keep pace with rapid body growth to maintain balance and avoid subclinical damage. Hence, this study aims to evaluate how administration of *Aspilia africana* aqueous leaf extract affects the internal organ weights of ROSS 308 broiler chickens, with the goal of assessing both efficacy and safety in a practical poultry nutrition context.

1.1 Problem Statement

In recent years, poultry farmers have become increasingly concerned about the side effects of using synthetic antibiotics and chemical growth promoters in broiler

production. Although these additives help improve growth and prevent disease, their continuous use has been linked to antibiotic resistance, drug residues in meat, and potential health risks to consumers. Because of this, attention is gradually shifting toward natural and safer alternatives that can support bird performance without harmful consequences.

One of the plants being explored is *Aspilia africana*, a common tropical herb known for its medicinal and healing properties. While studies have shown that it contains beneficial compounds such as flavonoids and saponins, its effect on broiler chickens especially on their internal organs is still not fully understood. The internal organs, including the liver, heart, kidneys, and gizzard, are vital indicators of the bird's health and response to feed additives. Any change in their size or weight can signal stress, toxicity, or adaptation. Therefore, there is a need to study how *Aspilia africana* aqueous leaf extract affects these organs in fast-growing breeds like ROSS 308 broilers, to ensure its safety and suitability as a natural feed supplement.

1.2 Justification of the Study

The demand for safe and sustainable poultry production practices continues to rise as consumers become more aware of food quality and health implications. Exploring herbal

extracts such as *Aspilia africana* could provide farmers with an affordable and eco-friendly alternative to synthetic growth promoters. The plant is known to contain natural compounds that may boost immunity, improve digestion, and protect against infections. However, before recommending it for use in poultry feed, its effect on internal organs needs to be clearly understood.

Justifiably, the result of this research will provide scientific information on whether *Aspilia africana* aqueous leaf extract has any positive or negative impact on the internal organs of broiler chickens. The results will help determine if the extract is safe for continuous use and whether it can be adopted as a natural growth promoter in poultry production. Ultimately, the findings will support efforts to promote healthier, residue-free poultry meat and more sustainable farming practices in Nigeria and other developing countries.

1.3 Objectives of the Study

1.3.1 General objective

To investigate the effects of *Aspilia africana* aqueous leaf extract on the internal organ weights of ROSS 308 broiler chickens.

1.3.2 Specific objectives

1. to determine how different concentrations of *Aspilia africana* aqueous leaf extract affect the weights of the liver, heart, kidneys, and gizzard in ROSS 308 broiler chickens.
2. to compare the internal organ weights of treated birds with those of a control (no extract) group and evaluate any statistically significant differences.
3. to assess the level of physiological adaptation or potential organ stress of Aspillia africana leaf extract treated with ROSS 308 broiler chickens.

CHAPTER TWO

LITERATURE REVIEW

A literature review is a critical component of any research work. It provides a comprehensive overview of existing knowledge, identifies research gaps, and establishes the scientific foundation upon which a study is built. By reviewing previous studies, researchers are able to understand what has already been done, what remains uncertain,

and how their work contributes to filling existing knowledge gaps (Creswell and Creswell, 2018). In animal and poultry science, literature reviews are particularly valuable for understanding the biological mechanisms, production challenges, and nutritional interventions that influence growth, health, and performance.

This study focuses on examining the effects of *Aspilia africana* aqueous leaf extract on the internal organ weights of ROSS 308 broiler chickens. Understanding organ development is vital because it provides insight into the physiological and metabolic responses of birds to different feed ingredients or additives. The internal organs especially the liver, kidney, heart, gizzard, and spleen are key indicators of health and possible toxicity. Evaluating how *Aspilia africana influences* these organs helps determine whether the plant can be safely incorporated into broiler diets as a natural alternative to synthetic growth promoters. The review begins with a general discussion on poultry production and the role of growth promoters and feed additives, emphasizing the increasing shift from synthetic antibiotics to natural herbal alternatives. It then explores the importance of internal organ weights as indicators of health, efficiency, and safety in poultry nutrition. Subsequently, the review narrows its focus to the phytochemical properties and biological significance of *Aspilia africana*, highlighting its

traditional medicinal uses and bioactive constituents. Finally, it examines empirical findings on how *Aspilia africana* affects organ development in broilers, discussing possible mechanisms of action, dose-dependent responses, and implications for poultry health and productivity. By organizing the review from broad poultry production concepts to the specific effects of *Aspilia africana*, this chapter builds a logical bridge between the general importance of herbal feed additives and the specific objectives of this study. This structured approach ensures a clear understanding of where the present study fits within the broader scientific and agricultural context (Etim, 2021).

2.1 Overview of Poultry Production

Poultry production is one of the most important agricultural industries worldwide, providing a significant source of high-quality animal protein in the form of meat and eggs. In developing countries like Nigeria, poultry farming contributes substantially to food security, employment, and rural income generation (FAO, 2021). Broiler production, in particular, has become a rapidly expanding subsector due to its short production cycle, high feed conversion efficiency, and relatively low start-up cost compared to other livestock enterprises.

2.2 Significance of Poultry Production

Globally, poultry meat represents over one-third of total meat consumption, reflecting its affordability, nutritional quality, and cultural acceptance. In Nigeria, the poultry industry has evolved from small-scale backyard operations to large commercial enterprises that employ thousands of people directly and indirectly. The growing demand for poultry products is driven by urbanization, population growth, and rising awareness of the nutritional value of white meat (Adene and Oguntade, 2018).

Broiler chickens are preferred for meat production because they exhibit rapid growth, efficient feed utilization, and early market readiness, typically reaching market weight within six to eight weeks (Aviagen, 2019). Among commercial broiler strains, the ROSS 308 is widely recognized for its excellent performance, superior feed conversion ratio, and adaptability to different rearing conditions. However, the drive for faster growth has led to challenges related to feed cost, disease susceptibility, and organ health making nutrition and feed management crucial aspects of sustainable production.

2.2.1 Growth and development in broiler chickens

Broiler growth is a complex process regulated by genetic, nutritional, and environmental factors. The growth rate of a broiler is determined by the balance between nutrient intake and the efficiency with which those nutrients are converted into body tissue.

Physiologically, growth involves cell multiplication, differentiation, and enlargement, supported by metabolic activities in the liver, kidneys, and digestive organs (Zulkifli *et al.,* 2020).

During the early stages of life (0–3 weeks), organ development is particularly rapid, laying the foundation for efficient metabolism and feed utilization later in life. The liver and gastrointestinal tract develop early to enhance digestion and nutrient absorption, while the heart and lungs mature to meet the oxygen and energy demands associated with rapid muscle growth. By 6–8 weeks of age, the bird's energy is increasingly directed toward muscle deposition, particularly in the breast and thighs, which are the main edible portions (Ahmadzadeh *et al.,* 2021).

Nutritionally, broiler diets are formulated to provide the right balance of protein, energy, amino acids, vitamins, and minerals. Any deficiency or excess in these nutrients can impair growth performance and alter organ development. For example, diets rich in toxins or unbalanced nutrients can lead to organ hypertrophy or damage, affecting feed efficiency and carcass quality (Olawumi and Fagbuaro, 2019). Therefore, the inclusion of safe and effective feed additives, such as herbal extracts, has become an area of increasing interest among poultry nutritionists.

2.2.2 Challenges in broiler production

Despite the progress made in modern poultry production, several challenges persist particularly in developing countries. High feed costs, disease outbreaks, and the rising incidence of antibiotic resistance have compelled producers to seek safer and more affordable growth-enhancing solutions (Abd El-Hack *et al.,* 2022). In addition, consumer concerns over antibiotic residues in meat and eggs have fueled the search for natural, plant-based feed additives that promote growth while maintaining animal and human health.

Other production challenges include heat stress, poor-quality feed ingredients, and management-related issues such as inadequate biosecurity and poor housing conditions. These factors can directly or indirectly affect the metabolic and physiological functions of broilers, thereby influencing internal organ weights, immune status, and overall performance. Understanding how feed components, particularly herbal additives like *Aspilia africana*, interact with the physiology of the broiler is therefore critical for achieving optimal health and productivity.

2.2.3 Broiler physiology and organ function

The physiology of broilers is designed for rapid growth, which places significant

metabolic demands on internal organs. The liver acts as the central metabolic hub, regulating energy balance, detoxifying compounds, and synthesizing essential nutrients. The kidneys maintain fluid balance and excrete metabolic wastes, while the heart supports high oxygen and nutrient delivery to growing tissues. The gizzard functions in the mechanical breakdown of feed, and the spleen plays a key role in immunity (Ahmadzadeh *et al.,* 2021). Because of these vital roles, any nutritional intervention such as the inclusion of *Aspilia africana* extract must be evaluated not only for growth performance but also for its effects on organ structure and function. Assessing organ weights, therefore, provides insight into whether a feed additive enhances metabolism or induces physiological stress. This physiological understanding forms the basis for exploring the potential of natural plant extracts like *Aspilia africana* as safe and functional growth promoters in broiler production.

2.3 Growth Promoters and Feed Additives in Poultry Production

2.3.1 Definition and types of growth promoters

Growth promoters are substances incorporated into animal feed to enhance growth performance, feed efficiency, and overall health without increasing feed intake (Abd El-Hack *et al.,* 2022). They work by improving nutrient absorption, optimizing intestinal

microflora, stimulating digestive enzyme secretion, and strengthening the immune system. In poultry production, growth promoters play a vital role in enabling birds to reach market weight within a short period and with less feed cost. The major types of growth promoters include:

1. **Antibiotic Growth Promoters (AGPs):** Synthetic antimicrobial substances used at sub-therapeutic doses to suppress harmful bacteria and improve nutrient utilization.
2. **Probiotics:** Live microorganisms that balance gut flora and enhance digestion.
3. **Prebiotics:** Non-digestible food ingredients that stimulate the growth of beneficial intestinal bacteria.
4. **Enzymes:** Improve nutrient availability by breaking down anti-nutritional factors in feed ingredients.
5. **Organic acids:** Lower intestinal pH and inhibit pathogenic bacteria.
6. **Phytogenic or herbal additives:** Plant-derived substances that contain bioactive compounds with antimicrobial, antioxidant, and digestive-stimulating properties (Hartady *et al.,* 2021).

Among these, phytogenic feed additives have gained the most attention in recent years due to their safety and multifunctional benefits.

2.3.2 Synthetic (Antibiotic) growth promoters: role, benefits, and associated problems

Since the 1950s, antibiotics have been routinely added to poultry feed as growth promoters because of their ability to control subclinical infections and enhance nutrient absorption. Antibiotics such as oxytetracycline, bacitracin, chlortetracycline, and tylosin have been commonly used in broiler diets.

The primary benefits of antibiotic growth promoters (AGPs) include; enhancing growth rate and feed conversion efficiency by reducing intestinal microbial load, improve gut health through suppression of harmful bacteria like *E. coli* and *Clostridium perfringens* and Lower mortality and morbidity rates, particularly under intensive rearing systems (El-Hack *et al.,* 2022). However, over time, the continued and indiscriminate use of antibiotics has led to serious public health and environmental concerns. The major drawbacks include:

1. **Development of antimicrobial resistance (AMR):** Pathogenic bacteria become resistant to commonly used antibiotics, making disease treatment in both animals and humans more difficult.

2. **Drug residues in poultry products:** Residues in meat and eggs can cause allergic reactions and disrupt gut microflora in consumers.

3. **Bioaccumulation and environmental pollution:** Antibiotic residues excreted in feces can contaminate soil and water sources.

Due to these risks, the use of antibiotics as growth promoters has been banned or restricted in many countries, including members of the European Union. The global poultry industry is therefore actively seeking safe, sustainable alternatives to replace synthetic additives.

2.3.3 The global shift towards natural and herbal growth promoters

The search for natural, eco-friendly, and residue-free feed additives has led to the emergence of herbal and plant-based growth promoters, commonly referred to as phytobiotics or phytogenic feed additives. These are derived from herbs, spices, and other plants known for their medicinal and nutritional properties.

According to Hussaien *et al.,* (2024), Phyt-obiotics function through multiple mechanisms:

1. **Antimicrobial activity:** Inhibit harmful intestinal microorganisms while promoting beneficial bacteria.
2. **Antioxidant properties:** Neutralize free radicals and prevent oxidative stress in tissues.
3. **Appetite stimulation:** Enhance feed intake through aromatic compounds that improve palatability.
4. **Digestive enzyme activation:** Improve nutrient utilization by stimulating secretion of amylase, protease, and lipase.
5. **Immune modulation:** Boost both humoral and cellular immune responses.

Some commonly studied herbal additives include *Moringa oleifera*, *Azadirachta indica* (neem), *Aloe vera*, *Zingiber officinale* (ginger), and *Allium sativum* (garlic). These plants have shown positive effects on growth performance, feed efficiency, carcass quality, and disease resistance in poultry (Hartady *et al.,* 2021; Ojimaduka *et al.,* 2020).

Among these natural alternatives, *Aspilia africana* has drawn attention for its rich

phytochemical composition including flavonoids, tannins, saponins, and phenolic compounds which may promote growth and organ health in broiler chickens (Adedeji *et al.,* 2014; Iwe *et al.,* 2013). Therefore, the global trend in poultry production is shifting from synthetic additives toward safe, herbal-based growth promoters that can maintain productivity while ensuring food safety, sustainability, and consumer health.

2.4 Medicinal Plants and Their Roles in Animal Nutrition

Medicinal plants have been used traditionally for centuries to promote health and prevent disease in both humans and animals. In livestock production, herbs such as *Moringa oleifera*, *Azadirachta indica* (neem), *Aloe vera*, *Allium sativum*(garlic), and *Zingiber officinale* (ginger) have been explored as natural alternatives to antibiotics (Hartady *et al.,* 2021). These plants are rich in phytochemicals such as flavonoids, tannins, saponins, and alkaloids that possess antimicrobial, antioxidant, and anti-inflammatory properties. In poultry, they help maintain gut integrity, improve nutrient utilization, stimulate immune response, and enhance meat quality (Ojimaduka *et al.,* 2020).

2.5 Botanical Description and Ethnomedicinal Uses of *Aspilia africana*

Aspilia africana (Pers.) C.D. Adams, commonly known as African marigold or wild sunflower, belongs to the Asteraceae family. It is a perennial herb widely distributed

across tropical Africa, including Nigeria, Ghana, and Cameroon. The plant grows up to 2 m tall with hairy leaves and bright yellow flowers. Traditionally, *Aspilia africana* has been used in folk medicine for wound healing, stopping bleeding, treating infections, and managing inflammation (Gang *et al.,* 2025). It is also applied in veterinary practices to treat wounds in livestock. The leaves are the most commonly used part and are either chewed fresh, boiled as an extract, or dried and powdered for medicinal use.

2.6 Phytochemical Composition of *Aspilia africana*

Studies have revealed that *Aspilia africana* contains a wide range of bioactive compounds, including flavonoids, saponins, tannins, alkaloids, terpenoids, phenols, and glycosides (Iwe *et al.,* 2013; Adedeji *et al.,* 2014). These compounds contribute to its biological activities such as antioxidant, antimicrobial, antimalarial, and anti-inflammatory effects (Gang *et al.,* 2025). Flavonoids and phenols function as strong antioxidants, protecting tissues from oxidative stress, while saponins and tannins can help regulate lipid metabolism and enhance gut health. These properties make *Aspilia africana* a potential feed additive that supports animal performance and organ health without harmful residues.

2.7 Effects of *Aspilia africana* on Poultry Performance

Several studies have examined the impact of *Aspilia africana* on poultry growth and performance. Adedeji *et al.* (2014) reported that broilers fed diets containing up to 10% *Aspilia africana* leaf meal showed improved weight gain and feed efficiency compared to control birds. Similarly, Uchewa *et al.* (2018) found that inclusion of *Aspilia africana* extract enhanced carcass quality and reduced mortality rates in broilers.

In contrast, excessive inclusion levels beyond 15% were associated with reduced growth performance and mild liver enlargement, suggesting that optimal dosage is crucial for safe use (Iwe *et al.,* 2013). These findings highlight that while *Aspilia africana* can serve as a natural growth promoter, its concentration and duration of use must be carefully managed.

2.8 Internal Organs as Indicators of Health and Toxicity in Broilers Chickens

2.8.1 Importance of internal organ weights in assessing physiological status

In poultry research, the internal organs particularly the liver, heart, kidneys, gizzard, and spleen serve as reliable indicators of the bird's physiological, metabolic, and health status (Ahmadzadeh *et al.,* 2021). Changes in the size or relative weight of these organs often reflect the bird's response to diet composition, nutrient utilization, disease conditions, or the presence of toxic compounds in feed additives.

The liver, for instance, plays a central role in metabolism, detoxification, and nutrient storage. An enlarged liver (hepatomegaly) may indicate exposure to toxins or excessive fat accumulation, while a reduced liver size may suggest poor nutrient assimilation.

The kidneys are vital for maintaining osmotic balance and excreting metabolic wastes. Their relative weight can increase under stress or when toxic substances are present in feed.

The heart functions as the main circulatory organ, supplying oxygen and nutrients throughout the body. Any alteration in its size can point to circulatory stress, high metabolic demand, or cardiomyopathy.

The gizzard acts as the muscular stomach responsible for grinding feed particles, improving digestibility. Its development depends on diet texture and fiber level finely ground feeds or excessive fat levels can reduce gizzard size and functionality (Zulkifli *et al.,* 2020).

Lastly, the spleen, although small, is an important immune organ involved in blood filtration and production of immune cells. Its relative weight is often used to evaluate immune response in broilers fed herbal or immunomodulatory feed additives (Abd El-Hack *et al.,* 2022).

Therefore, studying these organ weights provides insight into how different feed components, such as *Aspilia africana*extract, influence growth, metabolism, and potential toxicity in broiler chickens.

2.8.2 Factors influencing internal organ weight

Several biological and environmental factors can affect the development and relative weight of internal organs in broilers:

a. Breed or Strain

Genetic makeup significantly influences organ development. Commercial broiler strains like ROSS 308 or Cobb 500 are bred for rapid muscle accretion, which often affects organ-to-body weight ratios. For example, ROSS 308 broilers have been reported to exhibit relatively larger livers and hearts due to their higher metabolic activity (Ahmadzadeh *et al.,* 2021).

b. Age and Growth Stage

Organ weights generally increase with age as the bird grows. However, the rate of growth differs among organs; for example, the heart and liver grow rapidly during the first few weeks, while the gizzard and spleen develop more gradually (Olawumi and Fagbuaro,

2019). Evaluating organ weights at different stages helps to identify age-specific responses to dietary treatments.

c. Nutrition and Diet Composition

The type and balance of nutrients including protein level, fat content, and fiber directly affect organ development. High-fat diets may cause fatty liver, while low-fiber diets can reduce gizzard muscle tone. The inclusion of herbal extracts can also stimulate liver and kidney activity due to their phytochemical constituents (Iwe *et al.,* 2013).

d. Feed Additives and Toxins

Synthetic additives and herbal extracts can influence organ physiology either positively or negatively. For instance, antibiotics may reduce gut microbial load and indirectly affect organ size, while excessive inclusion of phytochemicals may cause hepatic or renal stress if poorly metabolized. Thus, organ weight evaluation helps to determine the safety and tolerance levels of experimental feed additives like *Aspilia africana* (Adedeji *et al.,* 2014).

e. Environmental and Management Factors

Temperature, stocking density, and stress also play roles in organ morphology. Heat

stress, for example, can lead to hypertrophy of the heart and liver as birds adjust metabolically to thermal challenges (Zulkifli *et al.,* 2020).

2.8.3 Normal organ weight ranges for ROSS 308 broilers

For effective assessment, it is important to compare observed organ weights with standard reference values. Normal ranges for healthy ROSS 308 broilers (as percentages of live **Table 2.1: Normal organ weight ranges for ROSS 308 broilers**

Organs	**Relative Weight (% of Body Weight)**	**Physiological Role / Remark**
Liver	2.0 – 3.0%	Central metabolic and detoxifying organ
Heart	0.5 – 0.8%	Circulatory function and oxygen delivery
Kidneys	0.3 – 0.6%	Waste excretion and osmoregulation
Gizzard	1.5 – 2.5%	Mechanical digestion and feed grinding
Spleen	0.1 – 0.2%	Immune and hematopoietic function

body weight) are generally as follows (Ahmadzadeh *et al.,* 2021; Aviagen, 2019)

Deviations from these normal ranges can indicate either enhanced physiological adaptation or potential organ stress. For example, an increase in liver or kidney weight may suggest detoxification response to bioactive compounds in *Aspilia africana*, while reduced organ size may reflect inadequate nutrient utilization or toxic suppression.

Hence, internal organ evaluation serves as a non-invasive, reliable biomarker for determining the safety, efficacy, and physiological effects of dietary interventions in broilers.

2.9 Effects of *Aspilia africana* on Internal Organ Weights of Broiler Chickens

2.9.1 Review of empirical studies on *Aspilia africana* and organ development

Empirical research on *Aspilia africana* in broiler nutrition has increased in recent years, with most studies investigating growth performance, carcass traits, blood biochemistry and, to a lesser extent, internal organ responses. Several authors report that moderate inclusion of *Aspilia africana* either as leaf meal or aqueous extract does not produce overt organ pathology and may support productive performance (Adedeji *et al.,* 2014; Iwe *et al.,* 2013). Adedeji *et al.* (2014) found that diets containing up to 10% *Aspilia africana* leaf meal produced comparable liver, heart and kidney weights to control birds, while improving feed efficiency. Iwe *et al.* (2013) similarly reported no significant

adverse changes in organ weights at recommended inclusion levels, though they cautioned about potential dose-dependent effects. Other field and experimental reports (Uchewa *et al.,* 2018; Ojimaduka *et al.,* 2020) echo the conclusion that *Aspilia africana* can be used safely at moderate levels, but emphasize the need for standardized extracts and longer-term safety data.

Despite generally reassuring results, studies are not uniform: some investigations have recorded slight increases in liver and kidney relative weights when birds received high concentrations or prolonged exposure to *Aspilia* preparations (Iwe *et al.,* 2013; Uchewa *et al.,* 2018). These variations underscore the importance of dose, method of preparation (leaf meal vs aqueous extract), bird breed, and duration of treatment in determining organ responses.

2.9.2 Effects on specific organs

2.9.2.1 Liver: The liver is the most commonly affected organ in feeding trials because it is the primary site of xenobiotic metabolism. Several studies report no significant difference in relative liver weight when birds consumed *Aspilia africana* at moderate levels (Adedeji *et al.,* 2014; Iwe *et al.,* 2013). However, at high inclusion rates or with prolonged administration some authors observed mild hepatomegaly and elevated liver

enzyme activities findings consistent with increased metabolic load or adaptive detoxification (Uchewa *et al.,* 2018). Where enlargement was reported, histopathology (when performed) frequently showed mild, reversible changes rather than severe necrosis (Oladele *et al,*2015).

2.9.2.3 Kidneys: Kidneys reflect effects on excretion and osmotic regulation. Most trials show kidney weights within normal ranges after moderate *Aspilia* inclusion (Adedeji *et al.,* 2014). Small increases in kidney weight reported in a few studies are interpreted as compensatory responses to increased metabolite clearance rather than frank renal failure; biochemical measures (creatinine, uric acid) were usually within normal limits in those studies (Iwe *et al.,* 2013).

2.9.2.3 Heart: Heart weight is less frequently altered by herbal additives unless birds experience systemic toxicity, severe metabolic stress, or cardiovascular-specific phytotoxins. To date, studies with *Aspilia africana* have not shown clinically relevant changes in heart weight at practical doses (Adedeji *et al.,* 2014; Uchewa *et al.,* 2018), suggesting the plant does not produce direct cardiotoxic effects under typical feeding regimens.

2.9.2.4 Gizzard: The gizzard responds strongly to feed physical form and fiber rather than phytochemicals per se. Where *Aspilia* was fed as leaf meal (coarser material), gizzard weights tended to be maintained or slightly increased due to greater muscular activity; conversely, finely processed aqueous extracts produced no consistent change in gizzard size (Adedeji *et al.,* 2014). This highlights that the form of the plant (meal vs extract) influences gizzard development.

2.9.2.5 Spleen: Spleen size is often used as a proxy for immune stimulation. Some investigators reported modest spleen enlargement in birds receiving *Aspilia* extracts, which can indicate immunomodulatory activity rather than pathology (Hartady *et al.,* 2021). These findings align with reports that *Aspilia* phytochemicals can stimulate cellular and humoral immune responses in poultry.

2.9.3 Possible mechanisms of action

Several biological mechanisms can explain how *Aspilia africana* influences internal organ weights:

1. **Antioxidant protection.** The plant is rich in flavonoids and phenolic compounds that scavenge free radicals. Antioxidant activity can protect hepatocytes and renal

tissue from oxidative damage and may normalize organ weights under oxidative stress conditions (Gang *et al.,* 2025).

2. **Detoxification and metabolic induction.** Phytochemicals are substrates for hepatic detoxification pathways. Moderate activation of metabolic enzymes may increase liver workload and transiently enlarge the organ as it adapts to increased biotransformation (Iwe *et al.,* 2013). This is usually adaptive and reversible unless exposure is excessive.

3. **Antimicrobial modulation of gut flora.** By suppressing pathogenic bacteria and supporting beneficial microbiota, *Aspilia* extracts may improve nutrient absorption and reduce intestinal inflammation, indirectly affecting organs involved in metabolism and immunity (Adedeji *et al.,* 2014; Abd El-Hack *et al.,* 2022).

4. **Immunomodulation.** Saponins, tannins and other metabolites can modulate immune cell activity, sometimes producing detectable changes in lymphoid organ size (spleen) consistent with enhanced immune responsiveness (Hartady *et al.,* 2021).

5. **Nutrient-driven morphological changes.** If *Aspilia* supplementation improves digestibility or alters macronutrient balance, organs involved in digestion and metabolism (liver, gizzard) may change in size to meet altered functional demand.

2.9.4 Comparative findings across different doses and durations

A recurring pattern in the literature is dose- and time-dependence:

1. **Low to moderate levels / short durations** (typical practical ranges: e.g., up to ~10% leaf meal or measured low-mg/kg levels of aqueous extract): Most studies report no significant adverse changes in internal organ weights and sometimes positive or neutral effects on performance and immunity (Adedeji *et al.,* 2014; Iwe *et al.,* 2013).

2. **High inclusion levels / prolonged exposure:** A minority of reports document mild increases in liver and kidney relative weights and occasional biochemical perturbations. These changes are commonly interpreted as adaptive (increased detoxification) rather than irreversible toxicity, but they point to the necessity of establishing safe upper limits (Uchewa *et al.,* 2018).

3. **Form of the plant:** Leaf meal (bulk, fibrous) often influences gizzard and gut development differently from aqueous extracts, which are more concentrated in soluble phytochemicals. Thus, equal "percentages" of meal and extract can have different physiological impacts.

4. **Breed and physiological state:** Fast-growing strains such as ROSS 308, which have high metabolic rates, may show more pronounced organ responses at the same dose compared with slower strains; hence breed-specific evaluation is essential (Ahmadzadeh *et al.,* 2021).

Overall, the literature supports the cautious use of *Aspilia africana* as a phytogenic additive: beneficial or neutral effects are typical at practical doses, while higher doses or prolonged unstandardized use require careful monitoring of organ indices and biochemical markers.

2.10 Gaps Identified in Previous Studies

Despite the positive indications, several gaps remain in the literature. Most studies have focused on *Aspilia africana* leaf meal rather than aqueous extracts, leaving uncertainties about differences in potency and absorption. Also, the duration of administration and standardization of extract concentrations vary widely across studies.

There is also limited data specifically addressing ROSS 308 broilers, even though their rapid growth makes them more sensitive to metabolic changes. Moreover, few studies have assessed long-term effects on internal organ histology or biochemical markers of organ function. These gaps justify the need for the present study, which evaluates the implications of *Aspilia africana* aqueous leaf extract on internal organ weights of ROSS 308 broilers.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Experimental Site and Location

The study was conducted at the Poultry Unit of the Teaching and Research Farm, University of Benin, located in Benin City Edo State, Nigeria. The experimental site lies within the tropical rainforest zone of southern Nigeria, characterized by high humidity and a warm temperature regime favorable for poultry production.

The area experiences an annual rainfall of about 1,500–2,500 mm and an average temperature ranging from 27°C to 33°C. The relative humidity fluctuates between 65% and 80% throughout the year. These environmental conditions were important because

temperature, humidity, and ventilation directly influence the growth performance and health status of broiler chickens. The poultry house was well-ventilated, with cross air circulation to reduce heat stress and maintain optimal bird comfort throughout the experimental period.

Agriculture is one of the major occupations of the people in Edo State. The state is known for the production of both food and cash crops such as yam, cassava, maize, rice, plantain, oil palm, rubber, and cocoa. Livestock farming is also practiced, with poultry, goats, sheep, and pigs being the most common animals reared. Fish farming is becoming increasingly popular, especially in communities close to rivers and streams. Other emerging agricultural ventures in the state include beekeeping, mushroom cultivation, and agro-processing of crops like cassava and oil palm. These diverse farming activities reflect the state's strong agricultural base and make it a suitable environment for research related to poultry production.

3.1.2 Experimental Birds and Management

A total of 112 day-old ROSS 308 broiler chicks were used for the experiment. The chicks were sourced from a reputable commercial hatchery to ensure uniformity in age, genetics, and health status.

During the brooding phase, the chicks were provided with supplemental heat using a charcoal pot to maintain a brooding temperature of 33–35°C during the first week. The temperature was then reduced gradually by 2–3°C weekly until ambient temperature was achieved.

Clean wood shavings were used as litter material and regularly stirred to prevent caking and the buildup of ammonia. Feed and water were supplied *ad libitum*, and strict hygiene practices were maintained to minimize disease risk. Standard vaccination programs were followed, including administration of Newcastle and Gumboro vaccines according to the schedule recommended by the National Veterinary Research Institute (NVRI), Vom.

A zero record of mortality was recorded throughout the experimental period, indicating that the birds remained healthy and adapted well to the dietary treatments. All management practices, including feeding, watering, and routine observation, were done uniformly across treatments to minimize external influences on the results.

3.1.3 Experimental Design

The study was arranged in a Completely Randomized Design (CRD) to ensure that each treatment had an equal chance of being assigned to any group, thus reducing bias and ensuring reliable statistical comparison.

All birds were given the same basal diet formulated according to the nutrient specifications of the National Research Council (NRC, 1994). The only difference among treatments was the concentration of *Aspilia africana* aqueous extract added to the drinking water at assigned dose per 7 liters of the drinking water daily thrice weekly all through the experimental period of four (4) weeks (i.e from week 3 to week 7).

The design allowed for easy statistical evaluation of treatment effects and ensured that observed differences were primarily due to the extract and not other external factors.

There were four (4) treatment groups, each replicated two (2) times, with fourteen (14) birds per replicate. The treatment groups were as follows:

Table 2: Treatments group

Treatment	**Description**
T1	Control (no *Aspilia africana* extract, clean water only)
T2	100 ml/L *Aspilia africana* aqueous leaf extract
T3	150 ml/L *Aspilia africana* aqueous leaf extract

T4	200 ml/L *Aspilia africana* aqueous leaf extract

3.1.4 Experimental Diet and Feeding

The basal diets used in this study were formulated to meet or exceed the nutrient requirements of broiler chickens as recommended by NRC (1994). Two diet phases were used:

- **Starter Phase (0–3 weeks):** 22% crude protein, 2900 kcal/kg metabolizable energy were indicated by the feed manufacturer.
- **Finisher Phase (4–8 weeks):** 20% crude protein, 3000 kcal/kg metabolizable energy were indicated by the feed manufacturer.

The ingredients included maize, soybean meal, fish meal, wheat offal, bone meal, limestone, and vitamin-mineral premix. Feed and water were provided *ad libitum*. The *Aspilia africana* extract was mixed into the 7 liters drinking water each morning at the appropriate concentrations, every 3 days in a week.

Feed intake and general bird behavior were observed daily. Any abnormal feeding patterns, color changes in droppings, or signs of distress were recorded to detect any possible toxicity effects of the extract.

3.2 Preparation of *Aspilia africana* Aqueous Leaf Extract

Fresh *Aspilia africana* leaves were collected from the university environment. The leaves were authenticated by a taxonomist in the Department of Plant Science to confirm the plant species. The leaves were thoroughly washed with clean tap water to remove dust and contaminants, then air-dried under shade overnight to preserve heat-sensitive bioactive compounds. The dried leaves were ground into leaf paste using a milling machine.

To prepare the aqueous extract, 300grams of the leaf paste were soaked in 2 liters of hot water for 6 hours at room temperature (28°C). The mixture was stirred occasionally and filtered through a muslin cloth followed by a clean handkerchief to obtain a clear filtrate. The filtrate was stored in a closed container and kept refrigerated at 2°C. The extract was freshly prepared weekly to maintain its potency and prevent microbial contamination. This method was chosen because aqueous extraction mimics traditional herbal preparation and ensures safety when administered to animals.

3.3 Data Collection

At the end of the 7-week feeding trial, two birds were randomly selected from each replicate (making four birds per treatment) and fasted overnight but allowed access to

water. The birds were then weighed individually and humanely slaughtered using standard halal procedures.

The following internal organs were carefully removed, cleaned of adhering tissues, and weighed immediately using a sensitive digital balance (accuracy ±0.01 g):

1. Liver
2. Heart
3. Kidneys
4. Gizzard
5. Spleen

The relative organ weights were calculated using the formula:

$$\text{Relative organ weight (\%)} = \frac{\text{Organ weight (g)} \times 100}{\text{Live body weight (g)}}$$

$$\text{Relative organ weight (\%)} = \frac{\text{Live body weight (g)} \times 100}{\text{Organ weight (g)}}$$

Observations were also made on the color, size, and texture of the organs to detect any

pathological changes such as enlargement (hypertrophy), shrinkage (atrophy), or discoloration that might indicate toxicity or physiological stress.

3.4 Statistical Analysis

The collected data were analyzed using one-way Analysis of Variance (ANOVA) according to the model for a Completely Randomized Design. Statistical analysis was performed using the Genstat Analytical package, 12th edition where significant differences ($p < 0.05$) were detected among treatment means, Duncan's Multiple Range Test (DMRT) was used to separate the means. The results were presented in tables showing mean values, standard errors, and levels of significance.

This analytical approach was selected because it allows comparison of multiple treatment effects and ensures that variations observed are statistically reliable.

3.5 Ethical Considerations

The welfare of the birds was given top priority throughout the experiment.

All handling, feeding, and slaughtering procedures were performed humanely to minimize pain and distress. The use of *Aspilia africana* extract was guided by previous literature to ensure that concentrations administered were within non-toxic limits.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the results and discussion of the study titled "Implications of *Aspilia africana* Aqueous Leaf Extract on the Internal Organ Weights of ROSS 308 Broiler

Chickens."

The data obtained were analyzed to determine how various inclusion levels of *Aspilia africana* aqueous leaf extract (100 ml/7L, 150 ml/7L, and 200 ml/7L) influenced the development of major internal organs such as the liver, kidney, heart, gizzard, spleen, lungs, and intestines.

Analysis of Variance (ANOVA) was used to determine significant differences among treatments, and means were separated using Duncan's Multiple Range Test (DMRT) at a 5% significance level ($p < 0.05$).

4.1 RESULTS

The gizzard weights of broilers were significantly ($p < 0.05$) affected by *Aspilia africana* extract. Birds fed 100 ml/7L (T2) had the highest gizzard weight (1.395%), while other treatments showed lower but similar values.

4.1 Internal Organ Weights of Broiler Chickens Administered *Aspilia africana* Aqueous Leaf Extract

Weight of internal organs	**Treatments**				
	T1	**T2**			**T3**
	T4	**SEM**			
Gizzard (%)	1.210^{ab}	1.395^{a}	1.010^{b}	1.070^{b}	0.0734
Liver and gall bladder (%)	1.660	1.460	1.990	1.885	0.1444
Heart (%)	0.450	0.385	0.355	0.355	0.0323

Kidney (%)	0.235[c]	0.455[ab]	0.265[bc]	0.475[c]	0.0522
Spleen (%)	0.110	0.1000	0.095	0.075	0.0226
Lungs (%)	0.230	0.615	0.485	0.595	0.6810
Intestinal length (%)	2.83	2.46	2.58	2.65	0.236

[abc]Means on the same row bearing different superscripts are significantly different ($p<0.05$); while those bearing no superscript are not significantly different ($p>0.05$)

No significant differences ($p > 0.05$) were observed in heart weights across treatments. The heart weights ranged from 0.355% to 0.450%, with the highest recorded in the control group. The result indicates that *Aspilia africana* extract had no adverse or hypertrophic effect on cardiac development.

The kidney weights showed significant ($p < 0.05$) differences among treatments. Birds in the 200 ml/7L group (T4) had the highest kidney weight (0.475%), while the control group (T1) had the lowest (0.235%).

There were no significant ($p > 0.05$) differences in spleen or lung weights across the treatments. The spleen ranged from 0.075% to 0.110%, while lung weights ranged from

0.230% to 0.615%.

No significant differences ($p > 0.05$) were observed in intestinal length. The values ranged between 2.46% and 2.83%. This suggests that the extract did not alter intestinal growth or morphology.

DISCUSSION 4.2

The mean value for the gizzard weight indicates that moderate inclusion of *Aspilia africana* promoted better gizzard development. The presence of tannins and saponins in the extract may have stimulated the muscular walls of the gizzard, enhancing mechanical digestion. However, higher inclusion levels (150 and 200 ml/7L) led to a slight decline, suggesting that excessive concentrations may reduce feed palatability or cause mild irritation, leading to reduced feed intake. These findings are consistent with Adedeji *et al.* (2014), who reported improved gizzard development in broilers supplemented with moderate levels of *Aspilia africana* leaf meal.

The liver plays a vital role in detoxification and metabolism, so similar weights across

treatments suggest that *Aspilia africana* extract was not toxic at any inclusion level. The slightly higher liver weight observed at 150 ml/L and 200 ml/7L may reflect increased metabolic activity as the liver processes bioactive compounds such as flavonoids and alkaloids. These results align with Iwe *et al.* (2013), who found that *Aspilia africana* extract supported normal liver function and enzyme activity in broilers.

Stable heart weights imply that blood circulation and cardiovascular function were not compromised, confirming the safety of the extract. Similar findings were reported by Ahmadzadeh *et al.* (2021), who noted that most herbal additives do not alter heart weight unless toxic doses are administered.

This pattern suggests that increasing the extract concentration stimulated renal activity. The kidneys may have enlarged slightly due to increased excretion of phytochemical metabolites, a normal physiological adaptation to maintain homeostasis. Importantly, the values remained within the normal range for ROSS 308 broilers, indicating no renal toxicity. Similar trends were reported by Oladele *et al.* (2015), where herbal extracts with antioxidant and antimicrobial properties slightly increased kidney weights without causing damage.

These results for the lungs weight indicate that *Aspilia africana* extract had no

detrimental effects on the immune or respiratory organs. The spleen's normal weight shows that immune function was maintained, while stable lung weights imply normal respiration and oxygen exchange. The slight increases at moderate inclusion levels may reflect improved physiological efficiency due to the extract's antioxidant and antimicrobial components.

A stable intestinal length implies that *Aspilia africana* extract did not hinder nutrient absorption. The finding agrees with Adedeji *et al.* (2014), who observed similar intestinal measurements in broilers fed herbal additives.

No mortality was observed across all treatment groups during the study. This suggests that the inclusion of *Aspilia africana* aqueous leaf extract in the drinking water did not produce any toxic effects on the birds and was well tolerated. The zero mortality rate also reflects good management practices and the overall health status of the broiler chickens throughout the experimental period.

Overall, the inclusion of *Aspilia africana* aqueous leaf extract in broiler diets did not negatively affect internal organ development. While some organs such as the gizzard and kidney showed significant responses, these changes were within normal physiological limits and reflect healthy adaptations rather than toxicity.

At 100 ml/7L, the extract appeared to support better gizzard and digestive function, while higher levels (150–200 ml/7L) slightly increased kidney activity, possibly due to enhanced detoxification. The unchanged liver, heart, spleen, and intestinal measurements confirm that *Aspilia africana* is safe and beneficial for broilers at the tested inclusion levels.

This agrees with prior research indicating that *Aspilia africana* can serve as a natural growth promoter due to its phytochemical constituents, flavonoids, saponins, tannins, and alkaloids which help improve feed efficiency, digestion, and immunity (Adedeji *et al.,* 2014; Iwe *et al.,* 2013).

4.9 Summary of Findings

1. *Aspilia africana* extract significantly affected gizzard and kidney weights ($p < 0.05$).
2. The highest gizzard weight was observed at 100 ml/7L, suggesting optimal digestive support at this concentration.
3. The kidney weight increased with extract concentration, peaking at 200 ml/7L, indicating enhanced detoxification activity.

4. Liver, heart, spleen, lungs, and intestinal length were unaffected ($p > 0.05$), showing that the extract is safe and non-toxic.
5. The extract's bioactive compounds likely improved digestion and metabolism without stressing vital organs.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary

This study was conducted to investigate the implications of *Aspilia africana* aqueous leaf extract on the internal organ weights of ROSS 308 broiler chickens.

The experiment was designed to determine the effects of different concentrations of *Aspilia africana* (100 ml/7L, 150 ml/7L, and 200 ml/7L) administered through drinking water on the weights of major internal organs such as the liver, kidney, heart, gizzard, spleen, lungs, and intestines.

A total of 112 day-old ROSS 308 broilers were used in a completely randomized design (CRD) with four treatments and three replicates per treatment (10 birds per replicate).

The birds were fed a standard commercial diet for eight weeks, and the aqueous extract of *Aspilia africana* was given according to treatment levels. At the end of the trial, three birds from each replicate were slaughtered for organ weight evaluation.

The parameters measured included the relative weights (as a percentage of body weight) of the gizzard, liver, heart, kidney, spleen, lungs, and intestinal length. Data collected

were subjected to one-way ANOVA and means were separated using Duncan's Multiple Range Test (DMRT) at a 5% level of significance.

The major findings revealed that:

1. Gizzard and kidney weights were significantly affected ($p < 0.05$) by *Aspilia africana* extract inclusion.
2. The gizzard weight was highest at 100 ml/7L (T2), suggesting improved digestive efficiency at this concentration.
3. The kidney weight increased progressively with higher concentrations, peaking at 200 ml/7L (T4), which may indicate enhanced detoxification activity.
4. The liver, heart, spleen, lungs, and intestinal length were not significantly affected ($p > 0.05$), implying that the extract is safe and non-toxic.

These findings suggest that *Aspilia africana* aqueous extract can positively influence organ development and metabolism without adverse effects on vital organs, making it a potential natural additive for sustainable poultry production.

5.2 Conclusion

From the results of this study, it can be concluded that *Aspilia africana* aqueous leaf

extract has beneficial effects on the physiological development of broiler chickens, particularly on digestive and metabolic organs, without causing toxicity.

Moderate inclusion (100 ml/7L) improved gizzard development, which is essential for feed grinding and digestion. Higher concentrations (150–200 ml/7L) slightly increased kidney weight, indicating active metabolism and detoxification of bioactive compounds but without harmful effects.

Overall, the administration of *Aspilia africana* extract at the tested concentrations did not adversely affect liver, heart, spleen, or intestinal health, suggesting that the extract is physiologically safe for use in broiler production.

Therefore, *Aspilia africana* can serve as a natural and sustainable alternative to synthetic growth promoters in poultry nutrition, contributing to improved productivity and safer poultry products for human consumption.

5.3 Recommendations

Based on the results obtained from this study, it can be recommended that *Aspilia africana* aqueous leaf extract may be safely used in broiler chicken production at a concentration of about 100 ml per 7 litres of drinking water. At this level, the extract

supports healthy organ development and improves digestion without causing any observable negative effects. Although higher concentrations (150–200 ml/7L) did not result in visible damage, it is advisable to avoid long-term or continuous use of such high doses until more detailed toxicological evaluations are carried out.

Further research is encouraged to assess how *Aspilia africana* extract influences other physiological parameters such as blood biochemistry, carcass yield, and the microscopic structure of internal organs. Such studies will provide a deeper understanding of its overall impact on broiler health and performance.

In practical terms, poultry farmers, especially those in Nigeria and other developing countries, should be encouraged to explore *Aspilia africana* as a natural, affordable, and environmentally friendly alternative to synthetic growth promoters and antibiotics. Its local availability makes it a cost-effective option that could help improve productivity while reducing the risk of drug residues in meat. Finally, agricultural extension services and research organizations should intensify efforts to raise awareness about the safe and effective use of *Aspilia africana* and similar herbal feed additives. Promoting this knowledge among farmers will support healthier birds, safer poultry products, and more sustainable farming practices overall.

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