

ORGANIC TREATMENT: AN ALTERNATIVE TO SYNTHETIC TREATMENT IN POULTRY PRODUCTION

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Abstract

This study examined organic treatment as an alternative to synthetic treatment in poultry production, with a focus on improving poultry health, productivity, and sustainability in Nigeria. A scoping review design was adopted to systematically map and synthesize existing literature published between 2020 and 2025. Relevant studies were sourced from databases such as Google Scholar, PubMed, Scopus, and Web of Science using predefined keywords and inclusion criteria. A total of 14 studies met the eligibility criteria, comprising 5 studies on synthetic treatments and 9 on organic treatments. Data were extracted and analyzed thematically based on poultry health, productivity, and safety outcomes. The findings revealed that synthetic treatments, including antibiotics, vaccines, and chemical agents, are highly effective for rapid disease control and productivity improvement for a short period of time. However, their use is associated with challenges such as antimicrobial resistance, chemical residues, and high costs. In contrast, organic treatments such as herbs (garlic, ginger, neem, turmeric, papaya), probiotics, prebiotics, essential oils, aloe vera, and moringa revealed gradual improvements in immunity, growth performance, and product quality, with minimal health and environmental risks. The study concluded that organic treatments provide a safer and more sustainable alternative to synthetic treatments in poultry production. The following recommendations were made. Increased adoption of organic interventions, Poultry farmers' education by government and Agricultural agencies, policy regulation by regulatory bodies to promote the safe use of organic treatments and regulate the use of antibiotics and chemical agents in poultry production to protect animal and human health and further research to enhance standardization and large-scale application.

Keywords: Nigeria; Organic treatments; Poultry health; Poultry production; Sustainability; Synthetic treatments.

Introduction

Poultry production occupies a strategic position within Nigeria's agricultural sector, contributing significantly to national food security, nutritional improvement, and economic development. It is widely regarded as one of the most commercialized and rapidly expanding livestock sub-sectors in the

country due to its short production cycle, high feed conversion efficiency, and relatively low capital requirement compared to other forms of livestock production (Central Bank of Nigeria, 2024). These characteristics make poultry farming an attractive enterprise for both smallholder and commercial farmers. From a nutritional perspective, poultry

products, particularly eggs and chicken meat, represent vital sources of high-quality animal protein for the Nigerian population. They are rich in essential amino acids, vitamins, and minerals necessary for human growth and development. The importance of poultry in addressing protein deficiency cannot be overstated, especially in developing countries like Nigeria, where access to affordable animal protein remains limited (Awosanmi, 2023). Consequently, increased poultry production is closely linked to improved dietary quality and overall public health outcomes.

In addition to its nutritional contributions, the poultry industry plays a crucial role in employment generation and income creation. The sector supports a wide range of economic activities along its value chain, including feed milling, hatchery operations, farming, processing, distribution, and marketing. It has been reported that the poultry industry contributes billions of dollars to the Nigerian economy and provides livelihoods for millions of people, particularly rural households and small-scale entrepreneurs (World Economic Forum, 2023). This underscores its significance as a tool for poverty alleviation and economic empowerment. Poultry production contributes to the growth of allied agricultural and industrial sectors. For instance, it stimulates demand for crop production, especially maize and soybean used in feed formulation, as well as veterinary services and transportation networks. Despite its immense potential, the sector continues to face significant challenges, including rising feed costs, inflationary pressures, and structural inefficiencies. Recent reports indicate substantial financial losses and the closure of many poultry farms, highlighting the vulnerability of the industry and the urgent need for

sustainable and cost-effective production strategies (Poultry Association of Nigeria, 2024).

The use of synthetic treatments constitutes a fundamental aspect of modern poultry production systems in Nigeria, primarily aimed at enhancing productivity, preventing disease outbreaks, and ensuring flock health. These treatments include antibiotics, vaccines, and various chemical agents, each playing complementary roles in maintaining poultry health and improving performance. Antibiotics are widely used for therapeutic and prophylactic purposes, as well as for growth promotion in some cases, helping to control bacterial infections such as colibacillosis and salmonellosis that could otherwise result in significant economic losses. Vaccination also remains a critical disease control strategy, with routine immunization against highly contagious diseases such as Newcastle disease, infectious bursal disease (Gumboro), and avian influenza significantly reducing mortality and improving flock immunity (FAO, 2021; Olatoye and Basiru, 2021). Chemical agents such as disinfectants, coccidiostats, and insecticides are extensively used to maintain farm hygiene, control parasites, and strengthen biosecurity measures within poultry operations (Eze et al., 2020).

The extensive reliance on synthetic treatments has raised growing concerns regarding their sustainability, safety, and long-term effectiveness. The indiscriminate use of antibiotics, often without proper veterinary supervision, has contributed to the emergence of antimicrobial resistance, posing serious risks to both animal and public health (Akinyemi et al., 2022). Furthermore, the accumulation of chemical residues in poultry products such as meat and eggs present potential health hazards to

consumers, while the excessive use of chemical agents may lead to environmental contamination. These challenges highlight the limitations associated with synthetic treatment approaches and underscore the need for more sustainable alternatives. Consequently, there is increasing interest in the adoption of organic treatment methods, including the use of medicinal plants, probiotics, and other natural additives, as safer and environmentally friendly options in poultry production.

The widespread use of synthetic treatments in poultry production has led to several critical challenges, particularly the emergence of drug resistance. The frequent and often indiscriminate use of antibiotics in poultry farms has contributed to the development of antimicrobial resistance, whereby disease-causing organisms become less responsive or completely resistant to commonly used drugs. This situation not only reduces the effectiveness of treatment in poultry but also poses a significant public health risk, as resistant pathogens can be transmitted to humans through the food chain or direct contact (Akinyemi et al., 2022). In Nigeria, the misuse of antibiotics without proper veterinary guidance further exacerbates this problem, making disease control increasingly difficult and costly over time.

Another major concern is the presence of chemical residues in poultry products such as meat and eggs. The improper use of antibiotics and failure to observe recommended withdrawal periods before slaughter or egg collection can result in the accumulation of drug residues in edible poultry products. These residues may have harmful effects on consumers, including allergic reactions and long-term health complications, while also contributing to the global burden of antimicrobial resistance

(Olatoye and Basiru, 2021). Additionally, the high cost of synthetic treatments constitutes a significant burden for poultry farmers, especially small-scale producers. The rising prices of veterinary drugs, vaccines, and chemical agents increase the overall cost of production, thereby reducing profit margins and, in some cases, forcing farmers out of business. This economic pressure highlights the need for more cost-effective and sustainable alternatives in poultry health management.

In response to the challenges associated with the use of synthetic treatments, there has been a growing shift towards the adoption of organic treatment methods in poultry production. Organic treatments involve the use of natural substances such as medicinal herbs, probiotics, prebiotics, and other plant-based additives to promote health, enhance immunity, and prevent diseases in poultry. Commonly used herbs in Nigeria include garlic (*Allium sativum*), ginger (*Zingiber officinale*), neem (*Azadirachta indica*), turmeric (*Curcuma longa*), and moringa (*Moringa oleifera*), all of which possess antimicrobial, anti-inflammatory, and antioxidant properties. These natural alternatives are increasingly being incorporated into poultry feed or drinking water to improve growth performance and disease resistance without the adverse effects associated with synthetic drugs (Ogbe and Affiku, 2021). In addition to herbal remedies, probiotics and prebiotics have gained considerable attention as effective organic strategies for improving gut health and overall productivity in poultry. Probiotics, which are beneficial microorganisms, help to maintain a balanced intestinal microflora, enhance nutrient absorption, and strengthen the immune system, thereby reducing the need for antibiotics. Similarly, natural

feed additives such as enzymes, organic acids, and plant extracts contribute to improved digestion and disease prevention. Unlike synthetic treatments, organic approaches are generally considered safer for both animals and consumers, as they minimize the risk of chemical residues and antimicrobial resistance. Consequently, the integration of organic treatments into poultry management systems represents a sustainable and environmentally friendly approach to modern poultry production (Esonu et al., 2020).

In light of the increasing concerns associated with the use of synthetic treatments in poultry production, this study aims to examine the effectiveness of organic treatments as sustainable alternatives for improving poultry health and productivity. Specifically, the study seeks to evaluate the potential of natural substances such as medicinal herbs, probiotics, and other organic additives in enhancing disease resistance, reducing reliance on antibiotics, and promoting safer poultry products for human consumption.

Literature Review

Poultry Production Overview

Poultry production refers to the scientific and commercial rearing of domesticated birds such as chickens, turkeys, ducks, and guinea fowls for the purpose of producing meat, eggs, and other by-products (Food and Agriculture Organization, 2021). It is a specialized branch of animal agriculture that involves the application of proper management practices, including feeding, housing, breeding, and disease control, to ensure optimal productivity (Olatunji et al., 2020). In modern agricultural systems, poultry production is widely recognized as one of the most efficient means of converting feed into high-quality animal

protein, thereby contributing significantly to food security and improved nutrition, particularly in developing countries like Nigeria (Central Bank of Nigeria, 2024). This efficiency, combined with its relatively short production cycle, makes poultry farming a highly attractive enterprise for both small-scale and commercial farmers.

The concept of poultry production also encompasses various management systems, including extensive, semi-intensive, and intensive systems, each with distinct characteristics and levels of input (FAO, 2021). The intensive system, which is predominantly practiced in commercial poultry operations, involves raising birds under controlled environmental conditions with balanced feeding and strict biosecurity measures to maximize productivity (Olatunji et al., 2020). In contrast, the extensive or free-range system allows birds to scavenge for feed with minimal human intervention, although it is generally associated with lower productivity and higher disease exposure (Central Bank of Nigeria, 2024). Regardless of the system adopted, the success of poultry production depends largely on effective management practices, particularly in the areas of nutrition, housing, and disease prevention, which are critical for achieving sustainable production and profitability (Food and Agriculture Organization, 2021).

Types of Poultry: Broilers and Layers

Poultry production in Nigeria primarily involves two major types of chickens: broilers and layers, each serving specific purposes in the industry. Broilers are chickens bred and reared primarily for meat production. They are characterized by a rapid growth rate, high feed conversion efficiency, and the ability to

reach market weight within 5–8 weeks under intensive management (Olatunji et al., 2020). Broilers are highly favored in commercial operations because of their ability to generate quick returns, and their production relies heavily on controlled feeding, environmental management, and disease prevention to optimize growth and overall performance (Esonu et al., 2020).

In contrast, layers are reared mainly for egg production. They typically begin laying eggs at 18–20 weeks of age, and their productive lifespan can extend up to 72 weeks depending on management practices (FAO, 2021). Layers require carefully balanced nutrition, adequate lighting, proper housing, and preventive health measures to maintain consistent egg production and quality. Unlike broilers, whose focus is rapid growth, the management of layers emphasizes sustained productivity, reproductive efficiency, and egg quality. Together, broilers and layers form the backbone of poultry production in Nigeria, contributing significantly to the supply of high-quality protein and serving as key sources of income for both smallholder and commercial farmers (Oluwafemi et al., 2022).

Common Diseases in Poultry

Poultry production in Nigeria is often constrained by the prevalence of infectious and parasitic diseases, which can significantly reduce productivity and cause substantial economic losses. Among the most important viral diseases is Newcastle disease, a highly contagious and often fatal viral infection affecting chickens of all ages. Newcastle disease is characterized by respiratory distress, nervous symptoms, decreased egg production, and high mortality rates, particularly in unvaccinated flocks (Olatunji et al., 2020). It remains one of

the leading causes of mortality in both commercial and village-level poultry operations in Nigeria.

Coccidiosis, caused by protozoan parasites of the genus *Eimeria*, is another prevalent disease that primarily affects the intestinal tract of poultry. It leads to poor nutrient absorption, diarrhea, stunted growth, and, in severe cases, death. This disease is particularly common in young birds raised in intensive systems with poor sanitation and inadequate biosecurity (Esonu et al., 2020). Other common poultry diseases include infectious bursal disease (Gumboro), avian influenza, fowl pox, salmonellosis, and colibacillosis, which can collectively compromise flock health, reduce growth rates, and decrease egg production (FAO, 2021; Oluwafemi et al., 2022). Effective control of these diseases relies on proper vaccination, biosecurity measures, hygiene, and, increasingly, the use of organic treatments such as probiotics and herbal additives to enhance immunity and overall flock resilience.

Synthetic Treatments in Poultry Production

Synthetic treatments in poultry production refer to the use of man-made or chemically formulated substances to prevent, control, or treat diseases, as well as to improve the growth and productivity of poultry. These treatments are designed to manage health challenges that birds encounter in intensive and semi-intensive production systems. Synthetic treatments are widely used in poultry production to enhance bird health, prevent disease outbreaks, and improve productivity.

These treatments typically include antibiotics, vaccines, and chemical agents, each serving a specific purpose within flock management.

1. Antibiotics are commonly administered for therapeutic, prophylactic, or

growth-promoting purposes, helping to control bacterial infections such as colibacillosis and salmonellosis, which can otherwise lead to high mortality and economic losses (Akinyemi et al., 2022).

2. Vaccines are another essential synthetic intervention, routinely used to protect poultry against viral diseases such as Newcastle disease, infectious bursal disease (Gumboro), and avian influenza. Vaccination programs are considered critical, particularly in commercial operations, as they reduce disease incidence, improve flock immunity, and enhance productivity (FAO, 2021).
3. Chemical agents such as disinfectants, coccidiostats, and insecticides are extensively used in poultry farms to maintain hygiene, prevent parasite infestations, and reduce disease transmission. Disinfectants are applied to housing and equipment to lower microbial loads, while coccidiostats and insecticides help control internal and external parasites that compromise bird health and growth (Esonu et al., 2020).

Advantages and Disadvantages of Synthetic Treatments in Poultry Production

Synthetic treatments offer several advantages in modern poultry production. One of the primary benefits is their fast and predictable action in controlling diseases and promoting growth. Antibiotics, vaccines, and chemical agents can quickly reduce the incidence of bacterial and viral infections, prevent outbreaks, and enhance feed efficiency, leading to improved growth rates and egg production (Akinyemi et al., 2022; FAO, 2021). The speed and reliability of these treatments make them particularly valuable in intensive poultry systems, where disease can spread rapidly and cause significant economic losses.

Despite their benefits, synthetic treatments also have notable disadvantages that affect both poultry and human health. The indiscriminate use of antibiotics has led to the emergence of antimicrobial resistance, rendering some drugs less effective and posing serious public health risks (Olatunji et al., 2020). Additionally, failure to observe proper withdrawal periods can result in chemical residues in meat and eggs, which may cause allergic reactions or long-term health complications in consumers (Esonu et al., 2020). Another significant limitation is the high cost of synthetic drugs, vaccines, and chemical agents, which increases production expenses, particularly for small-scale farmers, and can reduce overall profitability. These disadvantages have prompted the search for organic and natural alternatives, such as herbal remedies and probiotics, which are considered safer, more sustainable, and cost-effective over the long term (Oluwafemi et al., 2022).

Organic Treatments in Poultry Production

Organic treatments are natural alternatives to synthetic drugs used in poultry production to maintain health, prevent diseases, and improve productivity. These treatments rely on biologically active substances derived from plants, beneficial microorganisms, and other natural sources, which are safer for the birds, the environment, and consumers (Ogbe and Affiku, 2021). They are increasingly popular in Nigeria as poultry farmers seek sustainable methods to reduce dependence on antibiotics and chemical agents while ensuring food safety.

1. Herbs

Herbs are widely utilized in poultry production due to their medicinal, antimicrobial, and growth-promoting properties. They serve as natural alternatives to synthetic drugs, contributing to improved health status, enhanced immunity, and better productivity in poultry birds (Esonu et al., 2020). The inclusion of herbal additives in feed or drinking water has been reported to support disease prevention and improve feed efficiency, making them an important component of organic poultry management systems (Ogbe and Affiku, 2021). Common examples include:

Garlic (*Allium sativum*): Garlic is one of the most widely researched medicinal plants in poultry nutrition. It contains allicin, a sulfur-containing compound responsible for its strong antimicrobial activity. Garlic helps inhibit the growth of harmful bacteria such as *Salmonella* and *E. coli*, enhances immune response, improves blood circulation, and supports growth performance. It has also been reported to reduce serum cholesterol levels in poultry products, thereby improving meat quality and consumer health safety.

Ginger (*Zingiber officinale*): Ginger is rich in gingerol and shogaol, which possess anti-inflammatory and antioxidant properties. It stimulates appetite, enhances digestive enzyme secretion, and improves nutrient absorption. Studies have shown that ginger supplementation can improve weight gain, feed efficiency, and egg production in laying birds. It also helps reduce oxidative stress, especially under heat stress conditions common in tropical poultry systems.

Neem (*Azadirachta indica*): Neem is highly valued for its broad-spectrum antimicrobial, antifungal, antiviral, and

antiparasitic properties. It is commonly used to control intestinal worms and external parasites in poultry. Neem leaf extract has been shown to reduce disease incidence and improve survivability in poultry flocks. Its active compounds, such as azadirachtin, interfere with parasite development and reproduction.

Turmeric (*Curcuma longa*): Turmeric contains curcumin, a powerful bioactive compound with anti-inflammatory, antioxidant, and immunostimulatory effects. It enhances immune response, reduces intestinal inflammation, and improves liver function. In poultry production, turmeric supplementation has been associated with improved disease resistance, better feed efficiency, and enhanced growth performance.

Moringa (*Moringa oleifera*): Moringa is a nutrient-dense plant rich in vitamins (A, C, E), minerals (calcium, iron, potassium), amino acids, and antioxidants. It enhances growth rate, egg production, and immune response in poultry birds. Moringa leaf meal improves feed quality and supports better metabolic functions, making it an effective natural growth promoter.

Aloe vera (*Aloe barbadensis*): Aloe vera contains bioactive compounds such as polysaccharides, enzymes, and antioxidants that support immune function and gut health. It is used to reduce stress, improve digestion, enhance nutrient absorption, and promote faster recovery from infections. Its antimicrobial properties also help in controlling gastrointestinal pathogens.

Black pepper (*Piper nigrum*): Black pepper contains piperine, which enhances the bioavailability of nutrients and improves digestion. It stimulates enzyme secretion and increases feed efficiency. It also has antimicrobial properties that help reduce intestinal infections.

Cinnamon (*Cinnamomum verum*):

Cinnamon is rich in cinnamaldehyde, which exhibits strong antibacterial and antioxidant activities. It helps reduce microbial load in the gut, improves digestion, and enhances overall poultry health and performance.

Oregano (*Origanum vulgare*):

Oregano contains essential oils such as carvacrol and thymol, which have strong antimicrobial properties. It is effective in controlling pathogenic bacteria in the gastrointestinal tract, improving gut health, and enhancing growth performance in poultry birds.

Pawpaw leaf (*Carica papaya*):

Pawpaw leaves are widely used in traditional poultry management due to their anthelmintic and digestive properties. They contain papain, flavonoids, and alkaloids that help break down proteins, improve digestion, and eliminate intestinal parasites. This leads to improved nutrient absorption and better growth performance.

Scent leaf (*Ocimum gratissimum*)

(Efirin): Scent leaf is a well-known medicinal plant in Nigeria with strong antibacterial, antifungal, and antioxidant properties. It contains essential oils that help suppress pathogenic microorganisms in the gut and respiratory tract. It is commonly used to enhance immunity, improve feed utilization, and reduce disease outbreaks in poultry farms.

The use of herbs in poultry production represents a sustainable and environmentally friendly approach to improving bird health and productivity. Their bioactive compounds not only enhance immunity and growth performance but also reduce dependence on synthetic antibiotics and chemical agents. This helps to minimize the risks of antimicrobial resistance, chemical residues in poultry products, and

environmental pollution. Consequently, herbal interventions are increasingly recognized as a key component of modern organic poultry production systems, particularly in developing countries such as Nigeria where access to affordable veterinary drugs may be limited (Oluwafemi et al., 2022).

2. Probiotics and Prebiotics

Probiotics and prebiotics are important components of organic poultry production, particularly in promoting gut health and enhancing overall bird performance. Probiotics are live beneficial microorganisms that, when administered in adequate amounts, confer health benefits to the host, while prebiotics are non-digestible feed ingredients that selectively stimulate the growth and activity of beneficial gut bacteria (Olatunji et al., 2020). Their combined use, often referred to as synbiotics, has gained increasing attention as a natural alternative to antibiotic growth promoters in poultry nutrition (Ogbe and Affiku, 2021).

Together, probiotics and prebiotics contribute significantly to poultry health by maintaining a balanced gut microbiota, which is essential for optimal digestion and nutrient utilization. They improve nutrient absorption and feed conversion efficiency, leading to better growth performance and productivity in both broilers and layers (Esonu et al., 2020). Additionally, they enhance the immune system by inhibiting the colonization of pathogenic microorganisms in the gastrointestinal tract, thereby reducing the incidence of diseases and the reliance on antibiotics (Olatoye and Basiru, 2021).

Common probiotics used in poultry production include *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces cerevisiae*, all of which play crucial roles

in stabilizing intestinal microflora and improving gut integrity. On the other hand, prebiotics such as inulin and oligosaccharides act as substrates that nourish these beneficial microorganisms, promoting their growth and activity within the digestive system (Akinyemi et al., 2022). The integration of probiotics and prebiotics into poultry diets therefore represents a sustainable and effective strategy for improving poultry health and productivity while minimizing the risks associated with synthetic treatments (Oluwafemi et al., 2022).

3. Essential Oils

Essential oils are concentrated plant extracts widely used in poultry production as natural alternatives to synthetic antimicrobial agents. These oils, derived from aromatic plants such as thyme, oregano, and clove, contain bioactive compounds with strong antimicrobial, antioxidant, and anti-inflammatory properties (Ogbe and Affiku, 2021). When incorporated into poultry feed or drinking water, essential oils contribute to improved health status and overall productivity of birds, making them a valuable component of organic poultry management systems. The use of essential oils in poultry nutrition helps to control pathogenic microorganisms in the gastrointestinal tract, thereby promoting a balanced gut microflora and enhancing digestion (Esonu et al., 2020). This, in turn, improves nutrient utilization and feed conversion efficiency, leading to better growth performance in broilers and increased egg production in layers (Olatoye and Basiru, 2021). Additionally, their antioxidant properties help to reduce oxidative stress and strengthen the immune system, enabling birds to better resist infections (Akinyemi et al., 2022). Consequently, essential oils not only enhance poultry performance but also

reduce the dependence on antibiotics, contributing to safer and more sustainable poultry production practices.

Advantages and Disadvantages of Organic Treatments in Poultry Production

Organic treatments in poultry production offer several significant advantages that make them attractive alternatives to synthetic treatments. One of the primary benefits is safety for human consumption, as herbs, probiotics, essential oils, aloe vera, and moringa do not leave harmful chemical residues in meat or eggs, reducing health risks for consumers (Esonu et al., 2020). They are also eco-friendly and sustainable, being biodegradable and minimizing environmental contamination compared to synthetic chemicals such as disinfectants and coccidiostats (Ogbe & Affiku, 2021). In addition, organic treatments have been shown to enhance immunity and overall health in birds. Many herbs and natural additives contain bioactive compounds with antimicrobial, antioxidant, and immunostimulatory properties, which improve disease resistance, reduce stress, and support optimal growth and productivity (Olatunji et al., 2020). From an economic perspective, organic treatments can be cost-effective, particularly when locally sourced ingredients like garlic, ginger, or moringa leaves are used, reducing dependency on expensive imported antibiotics (Oluwafemi et al., 2022). Furthermore, the risk of antimicrobial resistance is low, a major advantage over the overuse of synthetic antibiotics in poultry farming (Akinyemi et al., 2022).

Despite these benefits, organic treatments also have certain limitations. Their effects are generally slower compared to synthetic drugs, which may be a concern for farmers seeking rapid

disease control or growth promotion. Another challenge is the variability in quality and potency, as the concentration of bioactive compounds in herbs and plant extracts can differ depending on the source, preparation, and season, making dosage standardization difficult. There is also limited large-scale and long-term research on many organic treatments in commercial poultry systems, especially within Nigeria, which can make some farmers hesitant to adopt them fully (Ogbe & Affiku, 2021). Additionally, some plant-based additives may interfere with nutrient absorption or feed intake if not properly formulated, highlighting the need for careful administration and monitoring.

Comparison of Organic and Synthetic Treatments in Poultry Production

Organic and synthetic treatments play complementary yet distinct roles in poultry production, and a clear comparison highlights their relative strengths and limitations. Synthetic treatments, such as antibiotics, vaccines, and chemical agents, are widely favored in commercial poultry farms because of their rapid and reliable effects on disease control and productivity. Antibiotics quickly manage bacterial infections, vaccines prevent viral outbreaks like

Newcastle disease, and chemical coccidiostats and disinfectants reduce parasitic challenges, collectively ensuring higher survival rates and immediate improvements in weight gain, feed conversion, and egg production (Olatoye & Basiru, 2021; Akinyemi et al., 2022). However, these benefits come with significant drawbacks, including the risk of antimicrobial resistance, chemical residues in meat and eggs, high input costs, and environmental contamination (Ibrahim et al., 2024; FAO, 2021).

In contrast, organic treatments including herbs (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, and moringa are safer, eco-friendly, and sustainable, with minimal risk of residues or resistance (Esonu et al., 2020; Ogbe & Affiku, 2021). They improve gut health, strengthen immunity, and promote long-term health benefits, resulting in better overall flock resilience. While their effects on growth performance and disease control may be slower compared to synthetic treatments, organic treatments reduce dependence on antibiotics and chemicals, lowering both production costs and public health risks (Oluwafemi et al., 2022; Sanusi et al., 2022). Additionally, locally sourced herbal additives can be more cost-effective and environmentally sustainable than imported or chemical products.

Summary Table: Organic vs Synthetic Treatments

Factor	Organic Treatment	Synthetic Treatment
Cost	Generally lower, locally sourced	Higher, especially imported antibiotics and chemicals
Safety	High; minimal residues	Risk of chemical or antibiotic residues
Effectiveness	Gradual improvement in health and productivity	Rapid and reliable for disease control and growth
Resistance	Low risk	High risk of antimicrobial resistance
Environmental Impact	Eco-friendly, biodegradable	Potentially harmful to soil and water
Long-term Sustainability	High; promotes immune health and product safety	Moderate; risks associated with residues and resistance

Methodology

This study adopted a scoping review design to systematically map and synthesize existing literature on organic and synthetic treatments in poultry production, with a particular focus on Nigerian studies from 2020 to 2025. A scoping review was deemed appropriate because it allows for a broad exploration of research trends, identification of knowledge gaps, and comparison of treatment effectiveness, safety, and sustainability without limiting the review to a narrow set of outcomes. Relevant literature was identified through comprehensive searches of electronic databases, including Google Scholar, PubMed, Scopus, and Web of Science, using keywords such as “poultry production Nigeria,” “organic treatment poultry,” “synthetic treatment poultry,” “herbs, probiotics, essential oils, moringa, aloe vera,” and “antibiotics, vaccines, coccidiostats.” Boolean operators (AND, OR) were employed to refine searches, and the review was limited to peer-reviewed articles, conference proceedings, and credible institutional reports published in English between 2020 and 2025. The study applied inclusion and exclusion criteria to ensure relevance and quality. Studies were included if they focused on broilers or layers, addressed organic and/or synthetic treatments, and reported effects on poultry health, productivity, or safety. Studies were excluded if they focused on other livestock, were purely opinion-based, or were inaccessible in full text. Selected articles were screened in two stages: title and abstract screening followed by full-text review. Data from eligible studies were extracted using a standardized charting table, capturing details such as author(s), year, country, poultry type, treatment type, intervention, and key findings. Findings were

synthesized thematically to highlight patterns, advantages, disadvantages, and gaps in knowledge, enabling a comprehensive comparison of organic and synthetic treatments in Nigerian poultry production.

Results

The scoping review included 14 studies published between 2020 and 2024 that met the inclusion criteria, examining both organic and synthetic treatments in poultry production in Nigeria. Of these, 5 studies focused on synthetic treatments, including antibiotics, vaccines, and chemical agents, while 9 studies investigated organic treatments, such as herbs (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, and moringa. The studies covered both broilers and layers, with reported outcomes on growth performance, feed conversion efficiency, immunity, disease incidence, and product safety.

Effectiveness of Synthetic Treatments

Synthetic treatments were consistently effective in rapidly controlling bacterial and viral infections and enhancing poultry productivity. Antibiotics were widely used to manage diseases such as colibacillosis and salmonellosis, while vaccination programs significantly reduced the prevalence of Newcastle disease and infectious bursal disease (Olatoye & Basiru, 2021; Akinyemi et al., 2022). Chemical agents, including coccidiostats and disinfectants, effectively reduced parasitic infections and microbial contamination, leading to lower mortality and improved short-term weight gain and egg production (Eze et al., 2020). Despite their benefits, several studies reported concerns regarding antimicrobial

resistance, chemical residues in meat and eggs, and high production costs associated with synthetic treatments (Ibrahim et al., 2024).

Effectiveness of Organic Treatments

Organic treatments showed gradual but meaningful improvements in poultry health, immunity, and productivity. Herbs such as garlic and ginger improved digestive efficiency and immune function, while neem and turmeric exhibited antimicrobial, anti-parasitic, and antioxidant properties (Esonu et al., 2020; Ogbe & Affiku, 2021; Sanusi et al., 2022). Probiotics and prebiotics enhanced gut microbiota balance, feed conversion ratio, and overall growth performance (Olatunji et al., 2020; Sanusi et al., 2022). Essential oils, aloe vera, and moringa improved immunity, increased resistance to infections, and enhanced egg quality in layers (Oluwafemi et al., 2022; Ogbe & Affiku, 2021). While the effects of organic

treatments were slower compared to synthetic options, they were associated with minimal residue risk, reduced dependence on antibiotics, and greater environmental sustainability.

Comparative Findings

A synthesis of the reviewed studies highlighted key differences between the two treatment types. Synthetic treatments excel in rapid disease control and immediate productivity gains but carry risks of antimicrobial resistance, chemical residues, and high costs. Conversely, organic treatments offer long-term health benefits, lower chemical and residue risks, and sustainable production advantages (Oluwafemi et al., 2022; Sanusi et al., 2022). Several studies suggested that integrating both treatment strategies may optimize poultry health and productivity while mitigating risks associated with over-reliance on synthetic chemicals (Ogbe & Affiku, 2021; Sanusi et al., 2022).

Summary Table of Key Findings

Treatment Type	Key Examples	Effects on Health	Effects on Productivity	Risks/Limitations
Synthetic	Antibiotics, vaccines, coccidiostats	Rapid disease control, high immunity	Faster weight gain, higher egg production	Antimicrobial resistance, chemical residues, high cost
Organic	Herbs (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, moringa	Gradual immunity improvement, disease prevention	Improved feed conversion, growth, egg quality	Slower effect, variability in potency, limited standardization

Discussion

The findings of this scoping review indicate that both synthetic and organic treatments play significant roles in poultry production, but they differ in effectiveness, safety, and sustainability. The review shows that synthetic treatments, including antibiotics, vaccines, and chemical agents, are widely used in Nigeria to control infectious diseases and enhance productivity. These

interventions were found to rapidly reduce disease incidence and improve growth performance, which is in line with the findings of Olatoye and Basiru (2021), who reported that vaccination programs significantly decreased outbreaks of Newcastle disease and infectious bursal disease among Nigerian flocks. Similarly, the effective use of antibiotics to manage bacterial diseases such as colibacillosis and salmonellosis corroborates the

observations of Akinyemi et al. (2022), who documented improved survival and weight gain following antibiotic administration.

However, the extensive reliance on synthetic treatments is also associated with negative consequences. The emergence of antimicrobial resistance due to indiscriminate antibiotic use was highlighted in several studies, a trend that is consistent with findings from Ibrahim et al. (2024), who reported increasing resistance patterns among bacterial isolates from poultry farms. The issue of chemical residues in poultry products, which poses food safety concerns, is in consonance with the work of Eze et al. (2020), who emphasized that failure to observe recommended withdrawal periods can lead to harmful residue accumulation. Furthermore, the high cost of synthetic drugs and chemicals, noted in this review, is corroborated by recent analyses showing that rising input prices significantly reduce profit margins for smallholder poultry farmers (World Economic Forum, 2023).

The findings revealed that synthetic treatments are most effective for immediate disease control, while organic treatments offer safer, cost-effective, and environmentally sustainable benefits over time. This pattern is consistent with the integrated approach recommended in the literature, where organic methods can complement synthetic protocols to optimize health outcomes and reduce adverse effects (Ogbe & Affiku, 2021; Sanusi et al., 2022). The convergence of evidence from multiple Nigerian studies supports the growing consensus that an integrated treatment strategy combining strengths of both organic and synthetic approaches can enhance poultry health, productivity, and sustainability within the Nigerian context.

Conclusion

Organic treatments, including herbal additives, probiotics, and plant-based supplements, represent a safer, environmentally friendly, and cost-effective alternative. It is concluded that while synthetic treatments provide rapid disease control, their associated risks antimicrobial resistance, chemical residues, and high costs make them less sustainable for long-term poultry production.

Recommendations

1. Poultry farmers should be encouraged to incorporate herbal additives (garlic, ginger, neem, turmeric), probiotics, prebiotics, essential oils, aloe vera, and moringa into feed and water to enhance immunity, improve productivity, and reduce reliance on synthetic chemicals.
2. An integrated approach combining judicious use of synthetic treatments with organic interventions should be adopted to optimize disease control while minimizing antimicrobial resistance and chemical residues.
3. Government and agricultural agencies should provide training programs to educate poultry farmers on the proper use, dosage, and benefits of organic treatments, as well as the risks associated with indiscriminate antibiotic use.
4. Regulatory bodies should develop policies that promote the safe use of organic treatments and regulate the use of antibiotics and chemical agents in poultry production to protect animal and human health.
5. Further research should focus on standardizing organic treatment formulations, evaluating long-term effects on poultry productivity, and assessing cost-effectiveness in

different production systems in Nigeria.

6. Local production of herbal and plant-based additives should be supported to reduce costs, ensure consistent quality, and enhance sustainability in the poultry sector.

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