**A**

**SEMINAR PRESENTAION**

**ON THE TOPIC:**

**INFLUENCE OF PLANT EXTRACTS ON POULTRY MEAT QUALITY**

**WRITTEN BY:**

**USENNDIOK**

**AK18/AGR/ANS/026**

**SUPERVISED BY:**

**DR. JOSEPH EKPO**

**DEPARTMENT OF ANIMAL SCIENCE**

**FACULTY OF AGRICULTURE**

**AKWA IBOM STATE UNIVERSITY**

**OBIO AKPA CAMPUS**

**JUNE, 2023**

**SUMMARY**

This work evaluates the influence of plant extracts on poultry meat quality. The use of plant extract is getting global concerns among animal nutrition to mitigate the negative impact of high cost of feed to achieve high feed efficiency. This work reviews the importance of poultry, some plant extracts used in poultry nutrition and the empirical studies on the use of plant extracts and their corresponding effect on meat shelf-life, microbial counts, antioxidative properties, nutritional composition and meat sensory properties.

**INTRODUCTION**

Poultry, which refers to domesticated birds raised for their meat, eggs, or feathers, holds significant importance in various aspects. Firstly, domesticated birds were only limited to chickens, turkeys, goose and ducks, but it has recently expanded to include; quail, pigeon and guinea fowl (Ibeiro, 2014). Globally, the poultry industry benefits the farmer (producer) and by extension contributes to the national economy. It provides a means of livelihood or employment to the populace, source of income to the farmer, source of food (as meat and egg) for the population, source of raw materials for industrial activities, source of foreign exchange via export of products and contributes to the Gross Domestic Product (GDP) of the National economy (Okoli *et al.,* 2018). The poultry industry is one of the emerging agri-business enterprise that has established its position as the fastest growing segment in the agricultural sector in Nigeria (Okoli *et al.,* 2018). The influence of plant extracts on poultry meat quality has gained significant attention in recent years due to the rising demand for natural and organic products. Plant extracts are known to possess various bioactive compounds such as polyphenols, flavonoids, terpenoids, alkaloids, and saponins, which have been demonstrated to have potential beneficial effects on meat quality attributes in poultry (Goliomytis *et al.,* 2014). Some of this plant extracts are derived from; garlic, ginger, turmeric, moringa, amongst others (Goliomytis *et al.,* 2014). This work reviews the influence of plant extracts uses in poultry meat quality.

**OBJECTIVES**

This work evaluates;

* the importance of poultry
* some plant extracts used in poultry nutrition
* the influence of plants extracts on poultry meat quality (sensory properties, nutritional composition and meat shelf-life)

**IMPORTANCE OF POULTRY**

Poultry, which refers to domesticated birds raised for their meat, eggs, or feathers, holds significant importance in various aspects. Here are some key points outlining the importance of poultry:

* **Nutrition**: Poultry meat, such as chicken and turkey, is a rich source of high-quality proteins, essential amino acids, vitamins (especially B-complex vitamins), and minerals like iron and zinc. These nutrients play a crucial role in maintaining a healthy and balanced diet (Babji *et al.,* 2016).
* **Livelihood and Economy:** Poultry farming provides livelihood opportunities for millions of people worldwide. It serves as a source of income for farmers, breeders, traders, and poultry industry workers. The poultry industry contributes significantly to the global economy through employment generation, trade, and revenue generation (Torok *et al.,* 2016).
* **Food Security:** Poultry plays a vital role in addressing food security by providing a steady supply of affordable protein-rich food. It is an efficient converter of feed into edible products, and poultry rearing requires less land and resources compared to other livestock, making it a feasible choice for protein production (Okoli *et al.,* 2018).
* **Source of Employment**: Poultry farming creates employment opportunities along the entire value chain, including breeder farms, hatcheries, feed mills, processing plants, distribution, marketing, and retail. This helps reduce unemployment rates and alleviates poverty in many regions (AOC, 2021).
* **Diversification of Agriculture:** Integrating poultry into agricultural systems promotes diversification, reducing the dependence on single-crop or single-livestock farming. Poultry farming can offer farmers an additional income stream, reduce risks, and enhance the sustainability of agricultural practices (Mekonnen & Kebede, 2014).
* **Waste Management:** Poultry waste, such as manure, can be utilized as organic fertilizer in crop production. Proper management and recycling of poultry waste reduce environmental pollution and support sustainable agricultural practices (Bowler & Atapattu, 2016).

**PLANT EXTRACTS USED IN POULTRY PRODUCTION**

Plant extracts, also known as phytogenic additives or botanicals, have gained significant interest in the poultry industry as a potential alternative to synthetic additives. They are derived from various parts of plants such as leaves, stems, roots, and seeds. These extracts have shown promising effects on poultry performance, health, and disease prevention due to their bioactive compounds. In this section, we will discuss the most commonly used plant extracts in poultry production.

1. **Garlic Extract**: Garlic *(Allium sativum)* contains compounds like allicin, diallyl trisulfide, and ajoene, which possess antimicrobial and antioxidant properties. Studies have demonstrated that garlic extract can improve growth performance, feed utilization, and immunity in poultry (Windisch *et al.,* 2008; Abd El-Hack *et al.,* 2017).
2. **Oregano Extract:** Oregano *(Origanum vulgare)* is rich in phenolic compounds, such as carvacrol and thymol, which exhibit antimicrobial, antiviral, and antioxidative qualities. Research has shown that oregano extract can enhance the growth performance, nutrient digestibility, and immunity of poultry (Cross *et al.,* 2010; Hashemipour *et al.,* 2013).
3. **Turmeric Extract:** Turmeric *(Curcuma longa)* contains curcumin, a potent antioxidant and anti-inflammatory compound. Curcumin has been found to improve growth performance, antioxidant status, and immune response in poultry (Suresh *et al.,* 2013; Panda *et al.,* 2015).
4. **Cinnamon Extract**: Cinnamon *(Cinnamomum verum)* possesses cinnamaldehyde and eugenol, which exhibit antimicrobial and antioxidant properties. Studies have indicated that cinnamon extract can improve growth performance, intestinal health, and immune responses in poultry (Abdel-Wareth *et al.,* 2012; Ghazanfari *et al.,* 2015).
5. **Ginseng Extract:** Ginseng (*Panax ginseng)* is known for its bioactive compounds called ginsenosides. These compounds possess immunostimulatory and antioxidant activities. Several studies have demonstrated that ginseng extract can enhance growth performance, immune responses, and antioxidant status in poultry (Lee *et al.,* 2011; Chen *et al.,* 2016).
6. **Grape Seed Extract:** Grape seed extract is rich in proanthocyanidins, which have antioxidant and antimicrobial properties. Research has suggested that grape seed extract supplementation can improve growth performance, gut health, and antioxidant status in poultry (Baurhoo *et al.,* 2009; Salim *et al.,* 2010).
7. **Neem *(Azadirachta indica):*** Neem is widely known for its medicinal and insecticidal properties. Its extracts have shown potential in improving poultry health by acting as natural immunostimulants, antivirals, and antibacterials. Neem seed oil, derived from neem seeds, has been used to control poultry ectoparasites such as lice, mites, and fleas (Salim *et al.,* 2010)
8. **Moringa *(Moringa oleifera):*** Moringa is a nutrient-rich plant that offers various health benefits. The leaves, seeds, and bark of the moringa tree contain bioactive compounds with immunomodulatory, antioxidant, and antimicrobial properties. Incorporating moringa leaf meal in poultry diets has shown positive effects on weight gain, feed conversion ratio, and immune response (Torok *et al.,* 2016)
9. **Ginger *(Zingiber officinale):*** Ginger contains bioactive compounds like gingerol, which have been attributed to various health benefits. Ginger extracts have demonstrated antimicrobial and anti-inflammatory effects. Studies suggest that adding ginger to poultry diets may enhance growth performance, improve nutrient digestibility, and modulate the immune system (Shakerian, 2019).

These are just a few examples of plant extracts used in poultry production. It's worth noting that the specific effects of these extracts may vary depending on factors such as dosage, duration of supplementation, and bird age.

**Influence of Plant Extracts on Poultry Meat Quality**

The influence of plant extracts on poultry meat quality has gained significant attention in recent years due to the rising demand for natural and organic products. Plant extracts are known to possess various bioactive compounds such as polyphenols, flavonoids, terpenoids, alkaloids, and saponins, which have been demonstrated to have potential beneficial effects on meat quality attributes in poultry.

1. **Antioxidantive and sensory properties:** Plant extracts are rich sources of natural antioxidants that can inhibit or scavenge free radicals, which are responsible for oxidative stress and lipid peroxidation. The presence of polyunsaturated fatty acids in poultry meat makes it susceptible to lipid oxidation, resulting in decreased product quality and shelf life. Plant extracts, due to their antioxidant properties, can help inhibit lipid oxidation and preserve the overall quality of meat. Studies have demonstrated the efficacy of plant extracts such as green tea extract, sage extract, and ginger extract at 5-20% inclusion level reduces lipid oxidation in poultry meat (Goliomytis *et al.,* 2014; Tzora *et al.,* 2018; Shakerian *et al.,* 2019). These antioxidants help in preserving the color, flavor, and texture of poultry meat. Studies have shown that plant extracts such as rosemary, green tea, grape seed, and garlic extract at 5-20% inclusion level can effectively reduce lipid oxidation in poultry meat (Botsoglou *et al.,* 2003; Goliomytis *et al.,* 2014). Plant extracts have been reported to enhance the sensory attributes of poultry meat, including taste, flavor, color, and texture. For example, studies have shown that the addition of rosemary extract at 5% inclusion to broiler diets can improve the flavor and aroma of meat (Benito *et al.,* 2008). Similarly, the inclusion of oregano extract at 10% has been found to enhance the color and tenderness of chicken meat (Ribeiro *et al.,* 2014). Some plant extracts exhibit unique flavors that can enhance the taste and aroma of poultry meat. For instance, spices like thyme, sage, and rosemary have been reported to add distinctive flavors to meat products (Fernández-López *et al.,* 2005). These extracts can be utilized as natural flavor enhancers in processed poultry products.
2. **Antibacterial activity and meat shelf-life:** Some plant extracts possess antimicrobial properties that can inhibit the growth of spoilage and pathogenic bacteria in poultry meat. For instance, essential oils derived from oregano, thyme, and cinnamon at 5-10% inclusion have shown broad-spectrum antimicrobial activity against bacteria, including Salmonella and Campylobacter (Burt, 2004; Skoufos *et al.,* 2015). The incorporation of plant extracts into poultry diets or their application as natural preservatives in meat products has been found to extend the shelf life of poultry meat. Plant extracts such as garlic extract, cinnamon extract, and thyme extract at either 5-15% inclusion level have shown antimicrobial activity against common pathogens, thereby reducing microbial spoilage and enhancing product safety (Djenane *et al.,* 2011; Tajkarimi *et al.,* 2010; Ganhão *et al.,* 2011).
3. **Nutritional Value:** Several plant extracts possess bioactive compounds such as antioxidants, polyphenols, and flavonoids that can positively impact the nutritional profile of poultry meat. These compounds play a vital role in reducing oxidative stress, improving immune function, and preventing certain chronic diseases. For instance, the supplementation of thyme extract in broiler diets at 20% has been shown to increase the content of beneficial omega-3 fatty acids in meat (Padalino *et al.,* 2015). Similarly, the addition of grape seed extract at 10% has been found to enhance the antioxidant capacity of chicken meat (Zhang *et al.,* 2015).
4. **Meat tenderness:** Plant extracts containing proteolytic enzymes, such as bromelain and papain from pineapple and papaya, respectively, have been reported to enhance meat tenderness by breaking down collagen and connective tissues (Sureshkumar *et al.,* 2015). Tenderizing effect of plant extracts can potentially reduce the cooking time and improve overall eating quality of poultry meat.
5. **Flavor enhancement: I**t is worth noting that while plant extracts offer potential benefits, their incorporation into poultry diets or meat products should be carefully optimized considering factors such as dosage, stability, bioavailability, and interactions with other ingredients. Furthermore, regulatory guidelines and quality standards must be adhered to when using plant extracts in poultry production and processing.

**Plant Extracts and Poultry Meat Shelf-life**

The application of plant extracts in the poultry industry has shown promising results in terms of improving the quality and safety of poultry meat.

**Antimicrobial Effect:** Plant extracts exhibit antimicrobial properties against a wide range of spoilage and pathogenic microorganisms. They can inhibit the growth of bacteria, fungi, and yeasts, thus preventing spoilage and reducing the risk of foodborne illnesses. Ribeiro *et al.,* (2014) investigated the effect of essential oils from thyme and oregano at 5% and 10% inclusion level respectively on the shelf life of poultry meat. Results showed that these extracts inhibited the growth of spoilage bacteria, such as: *Staphylococcus aureus, Escherichia coli, and Salmonella spp.,* thereby extending the shelf life of the meat.

**Antioxidant Effect:** The oxidation process is a major cause of deterioration in meat quality. Plant extracts with antioxidant properties can scavenge free radicals, inhibit oxidative reactions, and delay lipid and protein oxidation, thus preventing color changes, off-flavors, and texture deterioration. Zhang, (2015) evaluated the effect of grape seed extract on the shelf life of chicken breast meat. The extract at 20% inclusion level successfully reduced lipid oxidation, maintained color stability, and extended the shelf life of the meat during refrigerated storage.

**Preservation Effect:** Plant extracts can act as natural preservatives, inhibiting the growth of spoilage microorganisms and enzymatic activities that lead to meat deterioration. They can be used as coatings, dips, or incorporated into packaging materials to enhance meat preservation. Choi *et al.,* (2016) investigated the antimicrobial and antioxidant effects of rosemary extract on poultry meat. The study revealed that incorporating rosemary extract at 10% inclusion level into packaging film effectively inhibited microbial growth, reduced lipid oxidation, and extended the shelf life of the meat.

Overall, the utilization of plant extracts as natural preservatives in poultry meat has shown great potential for enhancing its shelf life by inhibiting microbial growth, delaying oxidation, and preserving sensory attributes. It is important to note that the effectiveness of plant extracts may vary depending on factors such as extract concentration, extraction method, meat type, and storage conditions.

**Plant Extracts and Poultry Meat Sensory Properties**

The effect of plant extracts on poultry meat sensory characteristics has gained considerable attention in recent years due to the increasing demand for natural and healthy food products. Plant extracts are rich sources of bioactive compounds such as polyphenols, flavonoids, and essential oils, which have been found to possess antimicrobial, antioxidant, and flavor-enhancing properties. Incorporating plant extracts into poultry diets or using them as marinades or coatings for meat can potentially improve the sensory attributes of poultry products (Naveena *et al.,* 2010). One of the key sensory characteristics of meat is its flavor. Studies have shown that plant extracts can enhance the flavor profile of poultry meat. For instance, the addition of rosemary extract at 15% inclusion level has been found to improve the sensory attributes of chicken meat, including aroma, taste, and overall acceptability (Choi *et al.,* 2016). Similarly, incorporating oregano extract at 10% into broiler diets has been reported to positively impact the flavor of poultry meat (Abudabos *et al.,* 2017). Another significant sensory aspect of poultry meat is its tenderness. Plant extracts have been shown to have tenderizing effects on meat due to their proteolytic activity. For example, papaya leaf extract at 10% inclusion level has been used as a natural tenderizer for poultry meat (Naveena *et al.,* 2010). The tenderization effect of plant extracts can be attributed to enzymes such as papain and bromelain, which break down protein structures and enhance meat tenderness. Furthermore, plant extracts can also exert antioxidant effects on poultry meat, thereby improving its shelf life and reducing lipid oxidation. Oxidative processes in meat can lead to off-flavor development and deterioration in sensory quality. Incorporating plant extracts, such as green tea extract or grape seed extract, into poultry diets or using them as meat marinades has been found to reduce lipid oxidation, resulting in improved sensory attributes (Siripongvutikorn et al., 2014; Cheng *et al.,* 2017). It is worth mentioning that the effectiveness of plant extracts on poultry meat sensory characteristics can vary depending on factors such as; the type and concentration of the extract, the processing conditions, and the animal's diet.

**Plant Extracts and Poultry Meat Nutritional Composition Properties**

The effect of plant extracts on poultry meat nutritional composition has been a subject of interest in recent years due to their potential to improve meat quality and enhance its nutritional value. Plant extracts are derived from various herbs, spices, and medicinal plants, and they contain bioactive compounds such as polyphenols, flavonoids, alkaloids, tannins, and essential oils, among others. These compounds have been recognized for their antioxidant, antimicrobial, anti-inflammatory, and immune-stimulating properties (Khan *et al.,* 2012). Several studies have investigated the impact of incorporating plant extracts into poultry diets on the nutritional composition of poultry meat. Here are some notable findings:

**Protein Content:** Research has shown that plant extracts can enhance the protein content of poultry meat. For example, a study by Aydin *et al*., (2016) found that supplementation of oregano extract at 15% inclusion level in broiler diets significantly increased the protein content of breast meat.

**Fat Composition:** Plant extracts have also been reported to influence the fatty acid composition of poultry meat. For instance, Khan *et al.,* (2012) demonstrated that the inclusion of garlic extract at 20% inclusion level in broiler diets increased the proportion of beneficial omega-3 fatty acids in breast meat, while reducing the levels of saturated fatty acids.

**Antioxidant Activity:** Plant extracts are known for their antioxidant properties, which can play a crucial role in preserving meat quality and preventing lipid oxidation. Ahmed *et al.,* (2019) investigated the effect of rosemary extract at 10% inclusion level on broiler meat and found that it had significant antioxidant activity, reducing lipid oxidation and improving the stability of meat.

**Vitamin and Mineral Content:** Certain plant extracts have been shown to enhance the vitamin and mineral content of poultry meat. For example, Heshmati *et al.,* (2015) demonstrated that supplementation of thyme extract at 5% inclusion level in quail diets increased the levels of vitamins A and E in breast meat.

It is important to note that the specific effects of plant extracts on poultry meat composition may vary depending on factors such as the type of extract, dosage, duration of supplementation, and the basal diet of the poultry. Therefore, further research is still needed to fully understand the optimal utilization of different plant extracts in poultry nutrition.

**CONCLUSION**

The use of plant extracts to mitigate the high cost of feed and to increase poultry productivity is positive. Plant extracts are also known for their potential health benefits, antimicrobial properties, and ability to enhance productivity in poultry. From this review, it could be deducted that the use of plant extracts in poultry has a substantial effect on meat quality of poultry in terms of meat sensory properties, anti-oxidative and antimicrobial as well as the shelf-life of poultry meats.

**RECOMMENDATION**

The influence of plant extracts on poultry meat sensory properties, shelf-life and nutritional composition is position but It is important to note that the use of these plant extracts in poultry production should be combined with proper management practices. While these natural remedies have been traditionally used and show promise, more scientific research is needed for a comprehensive understanding, validation of their efficacy and optimal usage levels.

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