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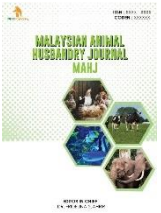

RESEARCH ARTICLE

ASSESSING THE BENEFITS AND CONSIDERATIONS OF FUNCTIONAL FEED ADDITIVE ADMINISTRATION IN BROILER CHICKEN

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ABSTRACT

In order to increase growth performance and microbiological food safety in chicken, functional feed additives such as direct feed mechanisms, dietary prebiotics, and phytogenic preparations have been shown to be effective. Modern intensive poultry farming has made incredible progress toward the affordable and effective production of high-quality products. The use of fruits and vegetables is also favoured by substantial environmental, economic, economic, and social aspects. Essential oils, which are secondary metabolites generated from a variety of plants, may be added to functional feed for broilers. Finding an alternative to antibiotic growth promoter has become more important over the last several years because to customers' growing knowledge of and concern about antibiotic residues in chicken products.

KEYWORDS

Poultry, Feed additives, Broiler, Essential oils; Antioxidants

1. INTRODUCTION

A feed additive is a supplement that contains additional nutrients or medication for animals. Vitamins, amino acids, fatty acids, minerals, pharmaceuticals, fungi, and steroidal substances are a few examples of these additions. Products used in animal nutrition to enhance the quality of feed are known as feed additives (Broderick et al., 2021). Feed additives are compounds that are incorporated into food products during processing or preparation. Probiotics, prebiotics, immunological stimulants, organic acids, nucleotides, and exogenous enzymes are examples of functional feed additives (Griffiths & Borzelleca, 2014). Both animal and human diets include a broad range of additives. These additives are, however, largely used in poultry diets to increase the effectiveness of the bird's development and egg-laying capability, avoid illness, and enhance feed consumption. Moreover, nanoscale additives for animal feed have been developed. There are nano-sized liquid vitamin mixes that may be utilized in the manufacturing of poultry and animal feed (Yadav et al., 2022a). The feed supplements are tailored to the breed and age of the birds being fed (Yitbarek, 2015). Two categories of feed additives exist: Direct feed additives are often introduced during processing to (1) provide nutrients, (2) assist with processing or preparation of the feed, (3) maintain product freshness, and (4) make the feed more attractive. They may be man-made or natural. Adjuvants for indirect feed: These feed additives are chemicals that may be present in processed or unprocessed food. They weren't intentionally utilised or added to the stream. The finished product contains just trace quantities of these ingredients (Griffiths & Borzelleca, 2014).

1.1 Functions of Feed Additives

There are several types of feed additives, each with different functions and benefits. Some of the functions of feed additives include (MedlinePlus, 2020):

- Give the feed a smooth and consistent texture
- Improve or preserve the nutrient value
- Maintain wholesomeness of feed
- Control the acid-base balance of feeds
- Provide colour and enhance flavour

2. RESOURCES FOR FUNCTIONAL FEED ADDITIVES IN BROILER CHICKEN DIETS

2.1 Fruits and Vegetables Co-Products as Functional Feed Ingredients

Due to the worldwide expansion of feed production, which has resulted in the formation of significant amounts of food co-products and wastes, there has recently been significant societal and environmental demand for the effective reutilization of agricultural sector leftovers (Eleni Kasaipidou, 2015). Because feeding food scraps to farm animals, including broilers, is an effective way to transform low-quality materials into high-quality feeds, using agro-industrial by- and co-products in poultry nutrition reduces the environmental impact of the food industry and increases the profitability and valorizations of agricultural by-products (Evangelia Sossidou, 2015). For the contemporary consumer, feed additives may also have an impact on factors like shelf life, sensory qualities, nutritional value, and health-improving ingredients (Paraskevi Mitlianga, 2015). Depending on the raw materials and processing method used, processing of fruits, vegetables, and considered fruits produces a variety of amounts and kinds of byproducts. For the majority of fruits and vegetables, the creation of probable waste is predicted to be about 30% of processed material (Table 1). By-products from the processing of fruits and vegetables are a possible source of useful elements including phytochemicals (carotenoids, phenolics, and flavonoids), antioxidants, antimicrobials, vitamins, or dietary fats that have beneficial technical or nutritional qualities (Ueda et al., 2022). Moreover, Mango seed kernel (MSK) may be an ideal substitute for raising chickens and other small animals (Lahutiya & Yadav, 2023). Given that mango seed kernels have high metabolizable energy, which is comparable to maize, and balanced nutritious levels, chemicals, and amounts (Yadav & Paudel, 2022).

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Table 1: Percentage of food wastes and by-products in fruit and vegetable production	
Production Process	Waste and by-products (%)
White wine production	20-30
Red wine production	20-30
Fruits and vegetable juice production	30-50
Fruits and vegetable processing and preservation	5-30
Sugar production from sugar beet	85

Source: (Ueda et al., 2022)

2.2 Essential Oil as Feed Additive Ingredients

Several nations have outlawed the use of antibiotics as a feed addition in poultry or cattle production, notably commercial chicken farming, where they have been used for decades as a growth regulator (Ayed et al., 2004). As a result, the WHO urged the search for antibiotic alternatives to manage enteric illness (Humphrey et al., 2002). For their antibacterial, anti-fungal, antiparasitic, and antiviral properties, natural antibiotics like probiotics, prebiotics, symbiotics, organic acids, essential oils, enzymes, and photogenic including herbs, essential oils, botanical, and oleoresins are frequently used feed additives in the poultry industry (Yadav et al., 2022b).

3. What Does Essential Oil Actually Mean?

Essential oils are generated from a variety of plant components, including flowers, buds, seeds, leaves, twigs, bark, herbs, timber, fruits, and roots (Gopi et al., 2014). These are aromatic volatile chemicals that bear the name of their source (Oyen and Dung, 1999). While there are several ways to produce essential oils, including expression, fermentation, and extraction, steam distillation is the process that is most often employed in the commercial world. Terpenes and phenylpropenes are the two main types of chemicals found in essential oils. Essential oils have distinctive odors that are unique to individual oils. At room temperature, they either take the form of liquid or a volatile substance. Common organic solvents like ether and benzene acetone make them easily soluble (Dhifi et al., 2016).

4. Uses of Essential Oils as Feed Additive in Poultry Feeding

Essential oils are natural plant extracts that have been used for various purposes, including as feed additives in poultry diets. Here are some potential uses of essential oils as feed additives in poultry feeding:

4.1 Antimicrobial Activity

From ancient times, essential oils have been used for their antibacterial properties. In vitro tests on the pure compounds have shown their antibacterial properties (Cowan, 1999). To maintain a healthy microbial balance in the intestines of chickens, essential oils might be used for their specific inhibitory properties. 29 essential oils' antibacterial abilities against 59 microbes (Deans and Ritchie, 1987).

4.2 Antioxidant Activity

In the biological system, essential oils have a good antioxidant function. Essential oil is a powerful scavenger of free radicals (Youdim and Deans, 1999 and 2000). By offsetting the higher level of unsaturation, the essential oil's strong antioxidant activity improves the oxidative stability of fat-containing animal products like meat and eggs (Bauer et al, 2001).

4.3 Essential Oils in Meat Type Chicken

In the production of broilers, the essential oils, either alone or in combination, may be employed as a growth enhancer. The performance of broilers' growth would be stimulated by adding dietary essential oil. The microbial habitat in the intestine is optimized by the essential oils, which also encourage the release of digestive enzymes and increase poultry development (Williams and Losa, 2001). Similarly, some additional applications for essential oils include their usage as flavoring agents, effects on digestive processes, and roles in lipid metabolism (Gopi et. al, 2014).

4.4 Antioxidants

In order to boost the number of calories in chicken diets, fat is often added; this is particularly true with high density broiler diets. Moreover, fish meal has a lot of fat when utilized. Antioxidants are often given to the diet to aid in preventing feed from going bad, which is typical in high-fat items (Gopi et. al, 2014).

4.5 Mold Inhibitors or Mycotoxin Binders

Mold may develop on cereals in the field and during handling, storing, and processing after harvest. The mycotoxins that they create will persist even after the mold is removed and may be very hazardous to poultry. In order to stop mycotoxins from entering the bloodstream via the stomach and being absorbed, many diets include a mold inhibitor or a mycotoxin binder (Gopi et. al, 2014).

4.6 Acidifiers

Feed acidifiers are given to the feed to reduce its pH and, as a result, the environment in the gut. The development of harmful gut microorganisms may be partially or completely inhibited by a lower pH. Acidifiers might be in the form of related salts or organic or inorganic acids. Both the feed and the whole gut may benefit from their antibacterial effect (Gopi et. al, 2014).

4.7 Probiotics

When consumed, probiotics may have a positive impact on the host animal by enhancing the features of the intestinal microbiota. Probiotics are described as living mono or mixed cultures of bacteria that are non-pathogenic, resistant to gastric and bile acids, and non-pathogenic in general. Probiotics have been shown to have immunomodulatory effects, mostly via altering the makeup of the gut microbiota and therefore impacting both innate and adaptive immunity. They do this by fostering circumstances in the gut that favor beneficial bacteria and prevent the growth of harmful bacteria (Fijan, 2014).

4.8 Prebiotics

Prebiotics are described as "a substrate that is specifically used by host microorganisms delivering a health advantage" (Gibson et al., 2017) by the International Scientific Society for Probiotics and Prebiotics. Prebiotics are classified as indigestible dietary components that promote a certain group of bacteria's development or activity non the gastro intestinal tract of the host animal. Prebiotics may aid in the competitive exclusion of pathogenic germs and the selective colonization of helpful microbes after entering the gut where they function as a substrate for the naturally occurring good bacteria (Wang et al., 2020).

In many species of chicken kept on floors, coccidiosis is an issue. Everything is home to the protozoa that cause coccidiosis. Although a modest concentration of coccidia in the digestive system is not harmful, a large concentration may cause poor feed efficiency, ill health, and premature mortality. While birds are young and growing, coccidiostats are sometimes given to the meal to maintain the coccidia at low levels so they can build up resistance. Coccidiostats aid in preventing the illness rather than treating it (Peek & Landman, 2011).

5. Description of The Problems

Subtherapeutic antibiotic dosing has been utilized extensively in chicken production to boost weight growth (Engberg et al., 2000), enhance feed efficiency (Miles et al., 1984), and lower poultry food borne infections (Williams, 1985). The continuing development of antibiotic alternatives will become more crucial as the demand for poultry and other animals produced without the use of antibiotics rises. The administration of functional additives as alternatives to the use of antibiotic growth promoters has gained popularity due to their advantages. Even though the advantages of administering direct fed microbes, prebiotics, and phytogenic preparations have been extensively documented, their use in poultry is variable, their overall performance is mixed, and the functions of certain additives are little known (Broderick et al., 2021). Similar to this, a lot of farmers with commercial poultry farms are ignorant of poultry feed additives and their significance. On the other hand, supplies for feed additives are difficult to come by in our nation. Resources for feed additives must come from our neighbours.

6. Conclusion

This study focused on the present state of feed additives, their significance, and the evolution of feed additives in the production of poultry. The usage of several locally accessible resources as chicken feed additives was discussed in this study. The use of essential oils in chicken feed will have a significant impact on the growth of the business in the near future. With the addition of essential oils to the chicken diet, lean meat is generated, which lowers the risk of customers developing hyperlipidemia. Essential

oils have well-established antibacterial properties, but their toxicological consequences only become apparent at extremely high dosages. To sum up, the chicken diet's essential oils might be employed in place of antibiotics, growth promoters, and value-added goods. Beneficial feed additives encourage an improved GI microbiota and an increase in the overall Lactic Acid Bacteria population. Measures of gut function are improved by functional feed additives.

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