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RECENT TRENDS IN THE UTILIZATION OF MEDICINAL PLANTS AS GROWTH PROMOTERS IN POULTRY NUTRITION – A REVIEW

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Abstract. Plants are one of the numerous gifts of nature, they are loaded with several bioactive chemicals or phytochemicals as part of their normal metabolic activities. The beneficial effects of phytochemicals could be attributed to their antimicrobial, antiviral, antifungal and antioxidant properties. The use of medicinal plants (herbs, spices and their extracts) as organic alternatives have increased due to the increasing awareness on food safety and the dangers on the indiscriminate use of antibiotics. Herbs are cheap, easily available and produce no toxic residue on final products from animals when compared with antibiotics. Phytochemicals (such as flavonoids, phenols, saponin, alkaloids etc.) performs multiple biological activities in animals, such activities include improving performance, increased proliferations of immune cells, relief from intestinal challenge, reduction in oxidative stress, reduced mortality and increased antibody titers. The efficacy of these bioactive chemicals and results obtained from animals depends on extraction method, stage and age of plants, geographical location, species or breeds of animals, management methods and concentrations administered. So many potential abound in the use of medicinal plants and it was even recommended by the European Union (2006) as botanical alternative to antibiotics. Therefore, this review focuses on ways to bridge the gap between food safety and animal production.

Keywords: *medicinal plants, phytochemical, bioactive chemicals, antibiotics.*

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1. Introduction

The use of medicinal plants in livestock production is gaining more recognition as a result of numerous efforts in phasing out antibiotics due to public reservations regarding the development of antibiotics – resistant bacteria and residual effects in food (Ekunseitan *et al*., 2016). These development has prompted the European Union in 2006 to place a ban on the use of antibiotics, medicinal plants are however used as botanical or alternative to antibiotics in animal husbandry. The worldwide interest on herbal products has grown significantly as described by Verigi *et al*. (2003), cattle, goat, sheep, horses and pigs represents about 70% of the animals treated with herbal remedies followed by poultry (9.1%), dogs (5.3%) and rabbits (4.3%). Medicinal plants are mostly used especially by rural and small scale farmers because they are cheap, accessible and effective.

Recent researchers have suggested the use of probiotics, prebiotics, organic acids and plant extracts and essential oils as natural alternatives for replacing antibiotic growth promoters (AGPs) in poultry feed because they have antimicrobial, antiviral, anti-parasitic, antifungal, antioxidant and anti-helminthic properties due to the presence of phytochemical or bioactive chemicals in plants (Fulton *et al.*, 2002; Gopal, 2014). To

gain the advantageous effect of medicinal plants, they can be added to feed as dried plants or part of plants as extracts (Tamara *et al*., 2009). The content of medicinal plants and their final products may vary widely depending on the parts used (seeds, leaves etc.), extraction method, stage and age of maturity, geographical origin, storage conditions and harvesting seasons (Burt, 2004). Medicinal plants have been shown to offer wide range of activities, including animal performance and nutrient availability when compared to antibiotics or inorganic chemicals, they are less toxic and are free of unwanted residues and also act as growth promoters when used as supplements in animal diets (Falcao *et al*., 2007).

According to Hyun *et al*. (2018) phytochemicals can be used in solid, dried or ground form or as extracts (crude or concentrated) and can also be classified as essential oils and oleoresins depending on the process used to derive the active ingredients (bioactive chemicals). Essential oils especially those that contain phenol and aldehydes, for example cinnamaldehyde, citral, thymol and eugenol as major components could show considerable antibacterial activity (Dormans & Deans, 2000) as presented in Table 1.

Table 1. Common plant extracts, their utilised parts, main active substances and reported properties (Richard, 1992; Charalambous, 1994)

Plant Name	Utilized parts	Main Compounds	Reported properties
Aromatic spices			
Clove	Flower	Eugenol	Appetite Enhancer, Digestive Stimulant, Antiseptic
Cinnamon	Leaf	Cinnamaldehyde	Appetite Enhancer, Digestive Stimulant, Antiseptic
Coriander	Leaf-seed	Linalol	Appetite Enhancer, Digestive Stimulant
Cumin	Seed	Cuminaldehyde	Digestive, carminative, galactagogue
Anise	Fruit	Anethol	Digestion stimulant, galactagogue
Celery	Fruit, Leaf	Phtalides	Appetite and Digestion stimulant
Pungent spices			
Capsicum	Fruit	Capsaicin	Antidiarrhoeic, anti-inflammatory, stimulant, tonic
Pepper	Fruit	Piperine	Digestion stimulant
Ginger	Rhizome	Zingerone	Gastric stimulant
Aromatic herbs and spices			
Garlic	Bulb	Allicin	Digestion stimulant, antiseptic
Rosemary	Leaf	Cineol	Digestion stimulant, antiseptic, antioxidant
Thyme	Whole Plant	Thymol	Digestion stimulant, antiseptic, antioxidant
Sage	Leaf	Cineol	Digestion stimulant, antiseptic, carminative
Peppermint	Leaf	Menthol	Appetite and digestion stimulant, antiseptic

Source: Richard, 1992; Charalambous, 1994.

Plant extracts consists mainly of proteins, peptides, oligosaccharides, fatty acids, vitamins, micro minerals. Plant extracts have a wide range of activities and their active secondary plant metabolites typically belong to the classes of isoprene derivatives and flavonoids (Tajodini *et al.,* 2015). They have a wide range of activities. A great number of plant extracts contain chemical compounds exhibiting antioxidant (Kähkönen *et al.*, 1999; Hashemi *et al.,* 2009), antimicrobial (Hammer *et al.,* 1999; Hsieh *et al.,* 2001),

anti-inflammatory (Pradeep & Kuttan, 2004), anticoccidial (Arab *et al.,* 2006) and anthelmintic (Hoste *et al.,* 2006) properties. The cultivation area, climatic conditions, vegetation phase, genetic modifications and others are factors affecting their chemical and biological diversity (Miliauscas *et al.,* 2004). These properties of plant extract are mainly due to the bioactive compounds such as flavonoids and glucosinolates isoprene derivatives found in nature (Kutlu & Erdogan, 2010). Additionally, the properties probably are the major mechanisms by which plant exert positive effects on the growth performance and health of animals (Hashemi & Davoodi, 2011). They can exhibit their effects by stimulating feed intake and endogenous secretions or having antioxidant, antimicrobial activities as presented in Table 2. All the results obtained depends on the variety of the test materials used, geographical location or environmental condition, species of animals as well as management system.

2. Plant extracts as feed additives in poultry nutrition

Various plant or herbal extracts are commonly included in poultry diets for promoting growth performance and animal health especially when there are health challenging conditions. A lot of researches have documented the beneficial effects of plant extracts on the performance of poultry (Jamroz & Kamel, 2002; Tucker, 2002; Alçiçek *et al.,* 2003; Denli *et al.,* 2004). They reported that the supplementation of plant extracts or oils in to diets increased the body weight gain, feed intake and improved feed conversion rate in poultry (Table 2).

Table 2. Effects of dietary plant extracts used as feed additives on poultry performance

Plant Extract	Dose	Performance effect	Literature
Albizia lebbeck seed oil	0.1-0.4 %	Better growth performance from 7-12 weeks	Alagbe (2019)
Cinnamon	0.2%	Higher growth performance	Al-Kassie, (2009)
Delonix regia extract	5-15 ml/lit	Higher growth in broiler chicks	Alagbe (2019)
Red pepper extract	0.1%	No effect on live performance or in organ morphometrics	Barreto *et al.,* (2008)
Thyme extracts	3 - 6%	No improved the performance and carcass traits	Amouzmehr *et al.,* (2002)
Parkia leaf extract	5-20 ml/lit	Increased BW, improved feed efficiency	Alagbe (2019)
Thyme essential Oil	0.2%	Improved growth performance	Danli *et al.,* (2004)
Cumin seeds	1%	Increased BW, improved feed efficiency	Khalaji *et al.,* (2011)
Lemon grass + Garlic extract	3-12ml/liter	Higher body weight & feed efficiency	Alagbe & Oluwafemi (2019)
Polyalthia longifolia seed oil	0.2 – 0.4 %	Improved growth performance	Alagbe *et al*. (2017)

BW: body weight

The main action of plant extracts or oils as feed additives is improving the ecosystem of gastrointestinal microbiota through controlling potential pathogens and digestive capacity in the small intestine (Hashemi & Davoodi, 2011). Wenk *et al.,* (2000) observed that dietary plant extracts exhibit strong effects on stimulate endocrine system and intermediate nutrient metabolism. Tucker (2002) demonstrated a significant

improvement of performance, survive rate in broilers fed diet with many kinds of plant extracts.

Beneficial actions of herbal extracts or their active compounds in animal nutrition may include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion (Rahimi *et al.,* 2011). Tollba *et al.,* (2007) reported that at two, four and six week of age, the broiler receiving varying levels of black pepper showed better body weight gain.

Results from the most of studies exhibits beneficial actions of plant extracts on poultry productivity and health. However, some researchers reported that some plant extracts additives have no any effects on growth performance or health status of poultry. Al-Kassie *et al.,* (2011) showed that no difference in broilers fed diet with black pepper. In addition, Aydin *et al.,* (2008) reported that dietary black cumin seed at the level of 1, 2 or 3 % had no effects on body weight gain, feed conversion rate or feed intake in laying hens. Similarly, Hernandez *et al.,* (2004) showed that supplementing broilers diets with essential oil extract from oregano, cinnamon and pepper affected the performance slightly, but this effect was not significant.

3. Conclusions

The use of plant extracts as feed additives in poultry can be valuable because they allow maximizing the overall performance and improvement in digestibility of poultry. The most of plant extracts tested in poultry experiments exhibited positive effects on the productivity and no any harmful effects on animal health and products obtained from the animal. Therefore, they can be used as a botanical alternative in poultry production.

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