

APPLICATION OF PLANT EXTRACTS AS FEED ADDITIVES IN POULTRY NUTRITION

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Abstract

Various kinds of antibiotics have been used extensively as growth promoters in animal feeds for a large number of years, especially in the fields of poultry production. As a result of the decision to ban of the antibiotics in livestock production researches on plant extracts as alternatives to the use of growth promoters (antibiotics) has significantly increased. Many novel natural candidate replacements including probiotics, prebiotics, organic acids and plant extracts and essential oils have been applied to maintain good production. Recently, herb and plant extracts have been received a great attention to be fed to poultry as feed additives to improve and increase production. The most commonly studied plants to be used in animal nutrition are cinnamon, oregano, cumin, garlic, sumac, cloves, anise, mint, coriander and ginger. Researchers have shown that these extracts are the powerful stimulators of the immune and animal digestive systems as well as highly beneficial effects in poultry nutrition due to their antioxidant, antimicrobial, antiviral, anticoccidial and anthelmintic properties. The aim of this review is to provide an overview of the recent knowledge on the use of plant extracts in poultry feeds as feed additives and their effects on the poultry performance.

Key words: plant extracts, nutrition, action mechanism, poultry.

INTRODUCTION

Many kinds of antibiotics have been used as feed additives in animal nutrition to improve growth performance and health. Starting with a discovery in late of 1940's, the use of antibiotics as feed additives in pig and poultry industry has become a common application. However, the use of them as growth promoters in animal feed have been banned by the European Union and United States due to the possibility of developing resistant populations of bacteria (Hashemi and Davoodi, 2010). As a result of the decision to ban of the antibiotics in livestock production researches on plant extracts as alternatives to the use of growth promoters (antibiotics) has significantly increased. Many novel natural candidate replacements include probiotics, prebiotics, organic acids and plant extracts and essential oils have been applied to maintain good production (Fulton et al., 2002). Addition of plant extracts and essential oils obtained from plants into diets may play role in improving growth performance of animals and health status as well (Manzanilla et al., 2001; Denli et al., 2004). The aim of this review is to provide

an overview of the recent knowledge on the use of plant extracts as feed additives in poultry feeds and their effects on the poultry performance.

PLANTS AND THEIR ACTIVE COMPOUNDS

The active compounds from the common plants used are 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

<i>Aromatic herbs and spices</i>			
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, carminatif
Peppermint	Leaf	Menthol	Appetite and digestion stimulant, antiseptic

PLANT EXTRACT PROPERTIES

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 and 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 and 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, and Davoodi, 2011). They can exhibit their effects by stimulating feed intake and endogenous secretions or having antioxidant, antimicrobial activities.

PLANT EXTRACTS AS FEED ADDITIVES IN POULTRY NUTRITION

Various plant or herbal extracts are commonly included in poultry diets for promoting of growth performance and animal health

especially when there are health challenge conditions. A lot of research have documented the benefit effects of plant extracts on the performance of poultry (Jamroz and 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).

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 and 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 significantly.

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

Plant Extract	Dose	Performance effect	Literature
Chinese herbal medicine	0.5-1%	Better growth performance from 7 to 21 days	Guo et al. (2004)
Cinnamon	0.2%	Higher growth performance	Al-Kassie, (2009)
Red pepper extract	0.1%	No effect on live performance or in organ morphometrics.	Barreto et al. (2008)
Thyme extracts	3 and 6%	No improved the performance and carcass traits	Amouzmehr et al. (2002)
Thyme essential oil	0.2%	Improved growth performance	Denli et al. (2004)
Black cumin seeds	1%	Increased BW, improved feed efficiency	Khalaji et al. (2011)
Plant extract consisting ofcapsaicin, cinnamaldehyde and	0.1%	No affected the BW, feed efficiency was improved at 4.2 %	Jamroz et al. (2005)

CONCLUSIONS

The use of plant extracts as feed additives in poultry can be valuable because they allows maximize the overall performance and an improvement 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 animal. Therefore they can use as an alternative feed additives in poultry production.

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