A review on role of phytobiotic as feed addtives in poultry industry Marwa, M. Sarhan; Mohamed, Darwish; Halla, M. Khalil; Halla, Salah and Heba, A. Ewis

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Review Article

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Abstract

Modern broilers industry need a good feed additives for induce high production and good feed conversion. In the past antibiotic growth promoters were used for decrease pathogenic bacteria beside improved body performance. Antibiotic residuce and bacterial resistant strains were directed to use alternatives natural growth promoters as phytobiotic (phytogenics or botanicals). Using antibiotics growth promoters in broilers ration has been banned as a result of increasing pressure from consumers due to negative effects on human health. Phytobiotics are plant-derived compounds has been considered a new class of natural growth promoters that gained popularity and acceptability among poultry farmers. Nowadays, phytobiotics act as natural growth promoters as they have antibacterial, antifungal, anticoccidial, immunostimulant, antioxidant, anticancer, antistress and manipulates gut microflora beside improved body performance. In the present review, the advantage of using some natural feed additives (phytobiotic) in broilers production (growth performance, nutrient digestibility, immune system and antibacterial) has been described and reviewed.

Keywords: Broilers, phytobiotic, antibiotics growth promoters.

Introduction

Poultry meat is considered as a good source of high biological value protein contains essential amino acids, low cholesterol and unsaturated fatty acids values (Lee *et al.* 2012). poultry industry in the world is rapidly is developed and increased to satisfy the needs of the market from meat and eggs (Kamboh and Zhu 2013). Nutrition has play a vital role in broiler production (Musilova *et al.* 2014). Poultry industry is always under threat of major losses by poultry disease but several attempts are directed to increase poultry production by decrease their feeding cost and control diseases (Hassan *et al.* 2010).

Growth promoters can be used in both animals and broilers farms which its a substan-ces play an important role in increase both growth rate and feed efficiency (Sabina and Ligita 2012). In modern poultry industry need many save feed additives as growth prom-oters which its essential for good body weight gain and feed conversion rate (Shahid et al. 2015). many antibiotics were used in subtherapeutic dose as growth promoters for kill pathogenic bacteria and balancing intestinal flora leading to enhance body weight gain and feed conversion rate (Haulisah et al. 2021). Using antibiotic growth promoters induced many adverse effect as produce antibiotic residuce in meat which transmitted to human associated with produce antibiotic-resistant bacteria (Chowdhury et al. 2009). Nowadays using antibiotics growth promoters in poultry nutrition is facing reduced social acceptance due to resistant strains of bacteria and its residues (Umit, *et al* 2011).

Antibiotic growth promoters were banned due to presence of residue in meat beside development of antibiotic resistant bacteria which directed to researchers to found other alternate save natural growth promoters (Sabina and Ligita 2012). Antibiotic resistance bacteria and residue in tissues has directed the researchers to use other alternatives as feed additives in poultry ration (Muhammad, et al. 2022). Replacement of antibiotics with natural feed additives in animal feeding is a main concern for organic livestock farming (Dalle et al. 2013). Natural growth promotors were suggested as alternative to antibiotic growth promote-rs which its maintain growth and feed efficiency in animals (Sultan et al. 2015). Currently, phytobiotic has been successfully used as a feed and water supplement of different poultry classes to enhance body performance and immune responses (Scicutella, et al. 2021). Plant phytochemical derivatives contain a variety of antimicrobial, antifungal, and immunostimulant compounds (Miguel, 2010).

Recently, in different areas of the world antibiotic growth promoters were removed from poultry rations (Pourhossein et al. 2015) and directed to use natural which act as growth promoters due to its has protective effects against dangerous effects on human and animal health such as drug toxicity, pathogenic factors and pollutants (Silveira, et al. 2019). Researchers have looked for new natural save feed additives and healthier for humans and animals (Faixova and Faix 2008). Natural growth promoters includ many substance (phytobiotics, probiotic, prebiotic, synbiotic, organic acid and absorption enha-ncers) which help in improving body weight gain and feed conversion rate (Zhou et al. 2009). Therefore, the purpose of current review is to focuses on collect literature and description advantages of phytobiotic as natural growth promoters applied as antimic-robial molecules or growth promoter in poultry feeding as alternatives to antibiotic growth promoters. phytobiotics is a natural growth promoters substance which used in poultry production as substitutes for antibiotic growth promoters to avoid fears of antibiotic resistance bacteria, drug residuce and its good effects in human health (**Daka 2013**). Medicinal plants can be used to prevent or treat diseases in animals and human (**Haniarti** *et al.*, **2018**). Many plants and their extracts as feed additives have been used in animal nutrition (**Magdy and Moataz 2023**). Medicinal plants were used in different forms (powder, saline, infuseons, decoctions and ointments) (**Cumali and Keskin, 2018**). Many plantderived bioactive compounds are present in plant of high biological value for human and animal value referred as phytobiotics or phytochemicals or phytogenics (Liu 2004).

Phytobiotics (phytochemicals or phytogenics) is non-nutritive compounds have many biological functions and have recently used as alternatives to synthetic growth promoters antibiotic (Motoi, 2021). Phytobiotic is essential oils or secondary metabolites of plants help in digestion by production of digestive enzymes (Nedra, et al 2021). Phytobiotics are divided into six categories (alkaloids phenolic compounds, phytosterols, organosulfur compounds, nitrogen-containing compounds and carotenoids) (Kikusato et al. 2021 and Uchechukwu et al. 2024). Phytobiotics are characterized by complexity of the biologically active ingredients, non-nutrient substances plant origin such as herbs; spices and essential oils used as feed additives to enhance body performance and health beside reduce pathogenic micro-organisms (Ganguly, 2013). Phytobiotics are plant-derived compounds used as feed or water additives for improve body weight gain, feed conversion rate and immunity of live-stock through its anti-oxidant effects (Banerjee et al. 2013). Phytobiotic have beneficial effects by balancing gut microbiota ecosystem, regulating lipid metabolism, maintaining gut integrity, stimulate digestive enzymes secretion and modulating immune response (Kolbadinejad and Rezaeipour, 2020). Phytobiotic are herbal extracts used as alternatives to synthetic antibiotic growth promoters and improve poultry health through its positive effect in bird health, less toxic, residue -free beside reduction intestinal pathogenic bacteria leading to improve gut functions due to its antimicrobial effects (Ogbuewu et al. 2020). Phyto-biotics are natural bioactive compounds that can be extracted from various plant sources such as herbs and spices which improved gut function (Windisch et al. 2008). Phytobi-otics are improved body performance and health of broilers and animals (Mehdi, et al. 2018). Phytobiotics contain many active principals (terpenoids, phenolics, glycosides and alkaloids) (Huyghebaert et al. 2011). Phytobiotics are considerd ideal growth promoters feed additives for animal and poultry in comparsion to synthetic antibiotics due to its natural substance, less toxic not has residue in meat and tissues (Hashemi et al. 2008). Phytobiotics are non-nutritive compound have antioxidant activity so its has health benefits and low bio-availability beside have beneficial effects in several tissues and organs (Motoi, 2021). Phytobiotics are rich in biological compounds (phenolic compo-unds, flavonoids, alkaloids, organosulfur compounds, nitrogencontaining compounds, phytosterols and carotenoid and terpenoids) mainly extracts from plant materials (flow-ers, buds, seeds, leaves, twigs, bark, herbs, wood, fruits and root (Jung, et al. 2006). Phytobiotic used as growth promoter due to their positive effects on growth and reduced stress response (Mehdi et al. 2018). Nowadays the directions are used phytobiotics for control and treatment animals and human diseases beside reduce drug resistance and improvment immune system (Yasmin et al. 2020).

Mode of action of different phytochemical 1- Antimicrobial influence of phytobiotics

a) Phytobiotic have lipophilic activites so its penetrate cell wall of bacteria and have anti-bacterial activities (Farag *et al.*1989)

b) Phytobiotics have strong antibacterial and antifungal effects through several routs (Si *et al.* 2006)

c) Phtobiotics disintegration cell membrane structures of pathogens causing migration of valuable ions from the pathogen's cell to external environment (Windisch *et al.* 2008).

d) Phytobiotics act as antimicrobial in gastrointestinal tract so improved gut health (Huyghebaert *et al.* 2011).

e) Phytobiotic active against both Gr-ve and Gr-ve bacteria either in vitro or in vivo (Daka 2013).

f) Phytobiotic prevents activation of bacterial

enzymes and decrease bacterial adhesion and thrust of bacterial membrane (Shimao *et al* 2019).

g) Phytobiotic modulates ruminal fermentation due to antimicrobial action so reduction number of intestinal pathogenic organisms (**Jahani-Azizabadi** *et al.* 2022).

i) Phytobiotics stimulate secretion of high amounts of intestinal mucus leading to alleviating pathogic bacteria to adhesion to intestinal wall and augmentated intestinal functionsbeside improved nutrient digestion and absorption (Muanda, *et al.* 2011).

2- Anti parasitic effects of phytobiotic

a) Phytobiotic inhibit energy metabolism and affecting motor activity of the parasites due to presence Benzyl isothiocyanate in phytobiotic (Kumar *et al.* 1991).

b) Phytobiotic induce vacuolization and disintegration of teguments of the parasite due to presence of saponins in phytobiotic which play an important role in permeability of parasites cell membrane (**Melzig** *et al.* 2001).

c) Phytobiotic plays an important role in digest ion of nematode cuticles due to proteo-lytic effect of cysteine proteinases papain and chymopapain (Das *et al.* 2004)

d) Phytobiotic inhibits glycolysis and glycogenolysis and nitric oxide activity in parasites due to presence of isoflavones in phytobiotic (Stepek *et al.* 2006).

e) Phytobiotic interfere the energy generation mechanism by uncoupling the oxidative phosphorylation of parasites and cause death dut to presence of phenolic and tannins compound in phytobiotics (John *et al.* 2009).

3- Effect of Phytobiotic body performance

a) A low pH increases the growth of beneficial microorganism, improves nutrient absorption, and thus improves growth performance (Boling *et al.* 2001).

b) Phytobiotics in broiler diet reduce crop and cecal pH (**Al-Tarazi, 2003**),

c) Phytobiotics improve normal intestinal architecture, increase villus length, and increase the intestinal surface absorption (Alcicek, *et al.* **2004**).

d) Phytobiotic of improve intestinal tissue morphology, stimulating salivation, secretion of digestible enzymes, bile production beside

enhance neutrient absorption leading to improve body performance (Windisch *et al.* 2008).

e) Phytobiotic activate endocrine systems so augmented intestinal functions leading to improved anabolic effect (**Tabatabaei**, 2016).

f) Phytobiotic improved feed consumption due to palatability and good flavor of ration (Valenzuela *et al.* 2017).

Effect in immunity

a) Phytobiotics has strong immunostimulatory effect due to presence of many active substance (polyphenols, sulfur compounds, alkaloids, terpenes, saponins, essential oils and tannins) (Nazeer *et al.* 2002).

b) Phytobiotics improvement host immunity by reactions of gut-associated lymphatic system (Windisch *et al.* 2008).

c) Phytobiotics has immunomodulatory effect through increase immune cell prolifer-ation, and cytokine expression beside elevation of antibody titer (Park *et al.* 2011).

d) Phytobiotics enhancement immunity (Huyghebaert et al. 2011).

e) Phytobiotics increased immunoglobulin (IgA, IgG and IgM) concentration which has a improtant role in immune status (IgG and IgA) protecte body against pathogenic microorganisms as the intestinal IgG has a role in defense intestinal barriers during the bacterial attack in the gastrointestinal tract (Tajodini, *et al.* 2015).

Antioxidant effect of Phytobiotics

a) Phytobiotics have antioxidant actions (Windisch *et al.* 2008).

b) Phytobiotics has antioxidants effects and minimize rancidity process, delay formation toxic oxidation in products and keeps maintain nutritional quality (**Muanda** *et al* **2011**)

c) Phytobiotics has antioxidant effect (Huyghebaert *et al.* 2011).

d) Phytobiotics has antioxidant properties due to presence active component (tannins, flavonoids, terpenes, phenols and hydrolysable proanthocyanins) which inhibit formation of reactive oxygen species leading to protecte membrane lipids against peroxidation (Caillet *et al.* 2012).

e) Phtobiotic minimizes the toxic effects of the

effects of reactive oxygen species (ROS). And decreasing damaging lipids, proteins and DNA (Bello, 2015).

f) Phytobiotic has antioxidative effects (Tabatabaei, 2016).

Conclusion

Phtobiotic is considered a natural growth promoter feed additive in broilers ration which improved body performance and improve broiler health and productivity beside promising path toward antibiotic-free poultry farming and aligning with consumer using healthier meat and meat products.

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