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PHYTOCHEMICALS AS SUSTAINABLE ALTERNATIVES TO ANTIBIOTICS IN POULTRY: A NOVEL APPROACH TO MITIGATING RESISTANCE

K. Sindhu[1], R. Kavitha[2*] and S. Gobika[3]
[1]B.V.Sc. & A.H., - fourth year,
[3]M.V.Sc. scholar, Department of Animal Nutrition,
Veterinary College and Research Institute, Namakkal - 637 002.
[2]Associate Professor, Livestock Farm Complex,
Veterinary College and Research Institute, Orathanadu - 614 625.
Tamil Nadu Veterinary and Animal Sciences University
E-mail: vetkavi2004@gmail.com (**Corresponding Author*)

Abstract: Antibiotics have traditionally been used in poultry feeds for growth promotion and disease control; however, their excessive use has led to antibiotic residues in poultry products and the emergence of antimicrobial-resistant bacteria, posing serious public health concerns. This review focuses on phytogenic feed additives as effective substitutes for antibiotic growth promoters in poultry nutrition. Phytobiotics derived from herbs and plant extracts (garlic, ginger, turmeric, moringa, oregano, cinnamon and aloe vera), possess antimicrobial, antioxidant, immunomodulatory and digestive-enhancing properties that improve gut health, growth performance, feed efficiency, immune response and economic returns. In conclusion, phytogenic feed additives represent a safe, sustainable and economically viable approach for promoting antibiotic-free poultry production.
Keywords: Phytogenic, phytobiotic, antibiotic, additives

Introduction

India ranks 2nd in egg production and 5th in chicken meat production in the world. The poultry industry is contributing about 1,44,000 crores to the National GDP and providing employment to more than 4 million peoples either directly or indirectly. In poultry production, antibiotics have been widely used for disease prevention and control, as well as for growth promotion. However, the misuse and improper application of these antibiotics can lead to residues in chicken tissues, posing potential risks of direct toxicity to humans and disrupting microbial balance, which may contribute to the development of antibiotic-resistant strains. As a result, there is a rise in consumer demand for chicken and egg products free from antibiotic residues. This review will discuss the antibiotic usage in poultry nutrition and explore alternative approaches.

Feed Additives

Feed additives are substances added to animal feed to improve feed quality, animal health,

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performance, and the quality of animal products. They are broadly classified into:

- Nutrient feed additives – provide additional nutrients or improve digestion and gut health (e.g., amino acids, minerals, and vitamins).
- Non-nutrient feed additives – added in small quantities to improve feed quality, storage, or animal performance (e.g., antibiotics, enzymes, probiotics, acidifiers, antioxidants, and immunomodulators).

Antibiotics as Feed Additives

Antibiotics are widely used in poultry at sub-therapeutic levels to promote growth, improve feed efficiency, and control gastrointestinal infections by modifying intestinal microbiota.

Despite their benefits, excessive antibiotic use has contributed to antimicrobial resistance. Resistant bacteria such as Salmonella and Campylobacter can spread to humans through food or the environment. Avoparcin use in poultry produced strains cross-resistant to vancomycin used in human medicine (Marshall and Levy, 2011). Similarly, the use of colistin in food animals has raised concerns because it is considered a last-resort antibiotic for multidrug-resistant infections in humans.

Alternatives to Antibiotics

Following the ban on antibiotic growth promoters in the EU, alternatives such as probiotics, prebiotics, phytobiotics, spirulina, synbiotics, enzymes, organic acids, and medicinal plants have gained importance. Among these, phytogenic feed additives are widely used because of their positive effects on growth, immunity, and stress reduction.

Phytobiotics as Feed Additives

Phytogenic feed additives (PFAs), also called phytobiotics, are plant-derived products including herbs, essential oils, and oleoresins. They improve appetite, enzyme secretion, gut health, immunity, and production performance while exhibiting antimicrobial, anticoccidial, and antioxidant properties. Condensed and hydrolysable tannin-rich extracts showed strong antimicrobial activity against Campylobacter jejuni (Anderson et al., 2012), while ethanolic cinnamon extract was effective against Salmonella aureus (Bonilla and Sobral, 2017). Cinnamaldehyde and essential oil blends were also effective against poultry pathogens such as *Brachyspira intermedia* and *Salmonella heidelberg*.

Economics of Phytobiotics

Mohamed et al. (2016) reported that allicin supplementation at 25, 50, and 75 mg/kg increased returns by 6.9, 13.0, and 10.3%, respectively. Ganai et al. (2022) observed lower feed cost per kg body weight gain and improved economic efficiency in broilers

supplemented with herbal powder. Singh et al. (2015) also reported a significant increase (9.79%) in gross returns in birds fed phytogenic growth promoters compared to the control diet.

Table 1. Phytogenic feed additives and its effects reported by various authors

Herb	Active principles	Major beneficial effects	Reference
Ginger (*Zingiber officinale*)	Monoterpenes, sesquiterpenes	Improves body weight, digestion, carcass traits, immunity, and reduces abdominal fat	Marshall and Levy, 2011
Garlic (*Allium sativum*)	Allicin, ajoene, flavonoids	Enhances immunity, digestion, growth, FCR, and stress tolerance	Denli et al., 2016
Turmeric (*Curcuma longa*)	Curcuminoids, turmerones	Antioxidant, immunomodulatory, improves digestion and lipid profile	Darabighane et al., 2017
Moringa (*Moringa oleifera*)	Chlorogenic acid, flavonoids, carotenoids	Improves egg production, lowers FCR, antioxidant and stress alleviation	Aroche et al., 2018
Aloe vera (*Aloe barbadensis*)	Anthraquinones, polysaccharides, vitamins	Improves digestion, gut microflora, immunity, antioxidant status, and FCR	Tariq et al., 2018
Basil (*Ocimum basilicum*)	Essential oils	Improves hematological profile, stress tolerance, and bird welfare	
Peppermint (*Mentha piperita*)	Menthol, terpenes	Enhances appetite, digestion, egg quality, and reduces FCR	Vinus et al., 2018
Cinnamon (*Cinnamomum zeylanicum*)	Cinnamaldehyde, eugenol, polyphenols	Improves digestion, antioxidant status, antimicrobial activity, and stress relief	Krauze et al., 2021
Coneflower (*Echinacea purpurea*)	Polysaccharides, flavonoids, caffeic acid	Immunomodulatory, antimicrobial, antioxidant, improves growth and FCR	
Lavender (*Lavandula angustifolia*)	Alcohols, ketones, esters	Enhances lipid digestion and lowers cholesterol	
Nettle (*Urtica dioica*)	Carotenoids, flavonoids, tannins	Improves serum lipid profile and reduces cholesterol	Moula and Detilleux, 2019
Oregano (*Origanum vulgare*)	Carvacrol, thymol, polyphenols	Improves oxidative stability and lipid metabolism	
Shiny privet (*Ligustrum lucidum*)	Oleuropein, oleanolic acid	Reduces cholesterol, LDL, and triglycerides	
Eucalyptus (*Eucalyptus globulus*)	Essential oils	Anti-inflammatory, antimicrobial, antioxidant, respiratory support	

Conclusion

Phytogenic feed additives offer a sustainable and effective alternative to antibiotic growth promoters in poultry production. Also, the economic benefits associated with phytogenic supplementation further support their practical applicability in commercial poultry production systems. Further, the integration of phytochemicals into poultry nutrition represents a viable strategy for achieving antibiotic-free production. Future research should focus on standardization, optimal dosage and synergistic combinations of phytogenic compounds to maximize their efficacy and consistency under field conditions.

References

[1] Anderson, A. and Mishra, P. (2012). Dietary fiber in poultry nutrition and their effects on nutrient utilization, performance, gut health, and on the environment: a review. *Journal of Animal Science and Biotechnology*, *12*:1-16.

[2] Aroche, R., Martínez, Y., Ruan, Z., Guan, G., Waititu, S., Nyachoti, C. M., and Lan, S. (2018). Dietary inclusion of a mixed powder of medicinal plant leaves enhances the feed efficiency and immune function in broiler chickens. *Journal of Chemistry*, 20(1): 407- 420.

[3] Bonilla, J., and Sobral, P. J. D. A. (2017). Antioxidant and antimicrobial properties of ethanolic extracts of guarana, boldo, rosemary and cinnamon. *Brazilian Journal of Food Technology*, *20*:16-24.

[4] Darabighane, B., Mahdavi, A., Aghjehgheshlagh, F. M., Zarei, A., Kasapidou, E., and Nahashon, S. N. (2017). Effect of Aloe vera and vitamin E supplementation on the immune response of broilers. *Revista Colombiana de Ciencias Pecuarias*, 30*(2)*: 159-164.

[5] Denli, M., Akyildiz, S., Alp, S. Y., and Cardozo, P. W. (2016). Effects of dietary addition of chlorogenic substances on growth performance, intestinal microflora population and serum biochemistry in broilers. A*nimal science*, 59: 91-94.

[6] Ganai, A.M., Mehboob, S., Sheikh, G.G., Beigh, Y.A., Baba, J.F. and Reshi, P.A., 2022. Phytogenic feed additives in poultry with special reference to Urtica dioica-A Review. *SKUAST Journal of Research*, 24(2): 133-148.

[7] Krauze, M., Cendrowska-Pinkosz, M., Matusevičius, P., Stępniowska, A., Jurczak, P., andOgnik, K. (2021). The effect of administration of a phytobiotic containing cinnamon oil and citric acid on the metabolism, immunity, and growth performance of broiler chickens. *Animals*, 11(2): 399.

[8] Ksouri, R., Ksouri, W. M., Jallali, I., Debez, A., Magné, C., Hiroko, I., and Abdelly, C. (2012). Medicinal halophytes: potent source of health promoting biomolecules with

medical, nutraceutical and food applications. *Critical reviews in biotechnology*, 32(4): 289.

[9] Marshall, B.M., and Levy, S. B. (2011). Food animals and antimicrobials: impacts on human health. *Clinical microbiology reviews*, 24(4): 718-733.

[10] Mohamed, M.F., Abdelkhalek, A., and Seleem, M. N. (2016). Evaluation of short synthetic antimicrobial peptides for treatment of drug-resistant and intracellular Staphylococcus aureus. *Scientific reports*, 6(1): 297- 307.

[11] Moula, N., and Detilleux, J. (2019). A meta-analysis of the effects of insects in feed on poultry growth performances. *Animals,* 9(5): 201.

[12] Singh, S., Semwal, B.C., Sharma, H. and Sharma, D., 2023. Impact of phytomolecules with nanotechnology on the treatment of inflammation. *Current Bioactive Compounds*, 19(10): 122-148.

[13] Tariq, S., Somakala, K., and Amir, M. (2018). Quinoxaline: An insight into the recent pharmacological advances. *European Journal of Medicinal Chemistry*, 143: 542-557.

[14] Vinus, R.D., Sheoran, N., Maan, N., and Tewatia, B. (2018). Potential benefits of herbal supplements in poultry feed: A review. *The Pharma Innovation Journal*, 7(6): 651-656.