

EFFECT OF PHYTOBIOTIC PLANTS IN NUTRITION AND PERFORMANCE INDICES OF BROILER CHICKENS: A REVIEW

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ABSTRACT

The aim of this review was to evaluate the potentials of phytobiotic plants as feed additives and alternative to antibiotics in broiler chicken nutrition to increase production of animal protein products with reduced cost of production. Recent ban on the use of antibiotics in animal production as a result of growing problem of microbial resistance and threat to human health has made phytobiotic based research becomes a major option for alternative to Antibiotic Growth Promoters (AGPs) for Researchers and Farmers to enhance Broiler chicken performance in terms of growth, meat quality, and health status. However, nutritional and medicinal relevance of some phytobiotic plants in Broiler nutrition were reviewed to ascertain their potentials as alternative to AGPs. These phytobiotics includes, Chaya plant, Garlic, Ginger, Turmeric, Guinea hen weed and Bitter leaf. These plants contain bioactive constituents (phenolic compounds) and phytobioactivity properties which are responsible for their nutritional and medicinal benefits for improved Bodyweight gain, FCR, low mortality rate as well as improved haematological parameters such as WBC, PCV and Platelet. It was concluded that it is the onus of Animal Nutritionists to promote Phytobiotic usage in broiler nutrition to enhance performance of Broiler chicken.

Key words: Phytobiotic plants, Broilers, Bodyweight, Nutrition, Antibiotic alternative and Health.

Description of problem

The Phytobiotic application as recently used in Broiler nutrition made a remarkable Progress in terms of efficient and rapid animal production of Poultry origin to meet the demand of animal products by increasing human population. Phytobiotic plants possessed the potentials to be used as feed additives and alternative to antibiotics in modern Animal agriculture to stimulate growth performance, meat quality and health status of Broiler Chicken (1,2,3). However, the ban of antibiotic usage in poultry production due to the problem of microbial resistance and threat to human health have made phytobiotic innovations thrive in recent time to become Research and Farmers interest over antibiotics in improving the productivity of Broiler Birds(4,1,5).

It is important to know that phytobiotics are nutraceutical in nature used as food and traditional medicine in monogastric animal nutrition including Humans and Broiler Birds(6,1,4). They also involve major medicinal plants containing plant's natural products and Bioactivity profile such as antimicrobial

activity, antioxidant, antianemic, anti-inflammatory, anticarcinogenic, anticardiac

depressant and hypoglycaemic to influence growth and immunity level of broiler birds (4,1,,6). However, the phytobiotic plants with amazing phytobioactivity profile includes Chaya plant (*Cnidioscolus aconitifolius*), Garlic (*Allium sativum*), Ginger (*Zingiber Officinale*), Turmeric (*Curcuma longa*), Guinea Hen Weed (*Petiveria allica*) and Bitter Leaf (*Vernonia amygdalina*) (3,2,4,7,8). Phytobiotics usage is relatively safe with a far reaching effects over antibiotics in enhancing growth performance and immune system of farm animals. It is crucial that an ideal phytobiotic alternative to antibiotics in monogastric nutrition should have the same mechanism of action or even more beneficial effects than Antibiotic Growth Promoters (AGPs) (9,10).

Turmeric (*Curcuma longa*) has been used as a promising medicinal herb from the time immemorial, and also belong to *Zingiberaceae* family with great potential as a natural feed additive and supplement in poultry production (2). Inclusion of Turmeric powder in Broiler diet has improved food palatability, food flavor and appearance, food preservation, and to a large extent used as traditional medicine as well as alternative to antibiotics(10,2). Turmeric

contains phenolic compounds such as curcumin, Bisdemethoxycurcumin, Denmentoxycurcumin and Tetrahydrocurcuminoids (11,12), which produced its high bioactivity potentials. It has been reported that active ingredients in Turmeric powder possessed the potential to prevent Coccidiosis and other intestinal diseases in Poultry Birds (13,2).

Garlic (*Allium sativum*) which belong to the Family of *Alliaceae*, has been an ancient phytobiotic plant whose origin and production spread across several Continents. *Allium sativum* contains a major Bioactive agent Allicin, and other compounds such as ajoene, diallylsulfide, saponins, enzymes(allinase), B-vitamins and minerals. It has been reported that the odour of allicin (aromatic smell) as well as other organo-sulfur compounds were responsible for scaring and destroying microbial organisms by inhibiting the Bacteria's quorum – sensing system, gene expression and genetic materials (1,2,14). Ginger also known as *Zingiber officinale* has been used as a supplement in Human and Broiler nutrition as well as used in Traditional medicine even as an alternative to antibiotics. Ginger contains phytoactive components and essential oils such as Zingiberene and Zingiberol.

Chaya plant (*Cnidioscolus aconitifolius*), and its parts especially the leaf contains high Bioactive agents such as flavonoids, saponin, phenol, alkaloids and cardiac glycosides which are responsible for its phytoactive potentials such as antimicrobial activity, antioxidant, antianemic, anti-inflammatory, anticancerous and anti depressant properties(1,3,15,16). The leaf is more nutritious than other parts.

Bitter leaf (*vernonia amygdalina*) is a plant possessing dual potentials with nutritional and medicinal benefits. The aqueous extract of the plant (Leaf) has shown lowering effects of Lipid profile such as Cholesterol, Triglyceride as well as Glucose level (17,18). The Bioactive components contained in Bitter leaf have the potential to improve Broiler performance, and regulate its immune system.

Guinea hen weed (*Petiveria alliaceae*) is a perennial plant that belongs to the Family of *phytolaccaceae* and has been used in folk medicine to treat various diseases. Its

phytochemical screening showed presence of Terpenoid, flavonoid, saponin and alkaloids which are responsible for its health benefits in Broiler nutrition (9).

Methods

The review paper was conducted by examining phytobiotic based published articles on feed additives and alternative to antibiotics.

Bioactivity Potentials of Phytobiotics

The active ingredients as well as secondary metabolites of phytobiotic plants includes saponin, tannin, phenol, flavonoids, alkaloids, steroids and cardiac glycosides. These bioactive agents play important role to protect plants for their own survival, and against parasitic attack and infection as well as protect Farm animals from diseases (21). Tannins are known for its wound healing potentials and also possess anti – inflammatory, antihemorrhagic and diarrhoeic properties (3,22). Saponins have been implicated to prevent parasitic infection in order to strengthen immune system provide antimicrobial protection against viral and bacterial diseases in man and animals (6). It regulate enzyme (urease) to reduce NH₃ formation to enhance kidney function (1). Saponin possess a hemolytic activity, a potential that help regulate the blood profile of monogastric animals inhibit bleeding and blood loss during injury(3). Phenolic compounds exhibit high bioactivity potential to restrict the activities of microbial organisms and control the disease of Broiler chicken.

Antimicrobial Potentials of Phytobiotics

Over the years, studies have shown that phytobiotic plants possess strong antimicrobial activities over the Conventional Antibiotics, especially the phytobiotic plants that have been our interest in this review such as Turmeric, Chaya plant, Garlic, Ginger, Bitter leaf and Guinea Hen Weed. The Chaya plant(*Cnidioscolus aconitifolius*) has been reported to be nutraceutical in nature and contain strong phytoactive profile such as antimicrobial activity, antioxidant, antianemic, antidiabetic, antitumour and hematopoietic potential which generally possess the ability to combat diseases, stress and harsh environmental condition(23). The bioactive components as well as the metabolites of chaya and other phytobiotic agents such as

Terpenoids, Alkaloids, Coumarins, Phenolics and Flavonoids have been implicated for antimicrobial activity in Man and Broiler nutrition (23). Studies have shown that for very long time, *Cnidioscolus aconitifolius* has been used in traditional medicine as well as in the nutrition of Man and Farm animals (24). Herbal plants have become the most viable alternative to antibiotic usage to improve feed efficiency, weight gain and liveability in poultry production (3,7,25). Saponins regulates Urea metabolism by lowering the activities of the intestinal and fecal.

Phytobioactive Agents and Their Mechanism of Action

Studies have shown that bioactive constituents of phytobiotic plants such as Allicin, Curcumin, Cummarin and their Organosulphur compounds possess the capacity to inhibit and destroy bacterial activity (19). Allicin and Curcumin for example possess the potential to prevent microbial spread and activity by destroying bacteria's quorum sensing system, gene expression, cell division, protein synthesis by RNA- interruption, cell membrane and induction of reactive oxygen species (20).

Results and Discussion

Studies have shown that about 80% of the phytobiotic plants adopted in this review if not all were nutraceutical in nature, possessing both nutritional and medicinal benefits for monogastric animal nutrition including Broiler Chicken. Chaya leaf has been used in the nutrition of Broiler birds to enhance growth and immune system for effective performance(1). It has been reported that Chaya leaf possess the potential to be used as feed additive and alternative to antibiotics in Broiler nutrition due to its high phytobioactivity profile as source of antioxidant activity, antimicrobial, anti-inflammatory, antianemic and immunomodulatory potential which play a vital role in improving Bodyweight gain, FCR, as well as WBC and Platelet to maintain health status of Broiler chicken(3).

The bioactive composition of Garlic such as Allicin and other organosulfur compounds made *Allium sativum* a valuable phytobiotic plant with great potential of antimicrobial activities to prevent gastro intestinal diseases

such as coccidiosis in Broiler production(4,5). The result of the previous studies showed that phytomix inclusion of Garlic and Ginger in Broiler diet improved Bodyweight gain, FCR, meat quality and WBC(4,5). The aromatic odour of Allicin and other organosulfur compounds have the capacity to inhibit and destroy microbial activities especially bacterial diseases such as coccidiosis and diarrhoe in Broiler chicken(1,4). This finding was intandem with the reports made by (1,26) that Allicin sativum(Allicin) possess the potential to destroy microbial activities. It has also been reported that the essential oils (Zingiberene and Zingerdione) as well as bioactive ingredients contained in Ginger were responsible for its pungent taste which enhance antimicrobial potential and Gastro intestinal function (1). Turmeric(*Curcuma longa*) contain one of the major bioactive components curcumin which had capacity to destroy microbial activities by inhibiting the organism's quorum-sensing system, Diminishing the gene expression of bacteria, inhibition of sos- induced responses, cell division and prevention of protein synthesis by RNA disruption and induction of reactive oxygen species(2,26). A similar report was made by (27) that nano-curcumin of Turmeric in the diet of *Eimeria tenella* infected Broiler chicken, had the potential to inhibit *Eimeria* species.

Conclusion and Application

The potentials of phytobiotics in improving performance, meat quality as well as the immune system of Broiler chicken cannot be compromised with antibiotics as it has remained the only major option available to Poultry Farmers for enhancing the nutrition of Broiler Birds. Phytobiotic plants such as Chaya leaf, Garlic and Turmeric contains phytobioactivity potentials, such as antimicrobial, antioxidant, anti-inflammatory and antianemic to prevent cardiac attack, microbial diseases such as coccidiosis and other gastro intestinal diseases of Broiler Birds.

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