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Popular Article

## Phytogenic In Poultry Farming: Exploring Nature's Pharmacy as an Antibiotic Alternatives

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### *Abstract*

Antibiotics are widely used in poultry farming for treatment, prevention of diseases, and growth promotion, leading to significant concerns regarding antibiotic resistance. This resistance, driven by genetic mutations in bacteria, threatens human and animal health, with predictions of 10 million deaths annually from resistant bacteria by 2050. Furthermore, reliance on antibiotics has contributed to faster chicken growth, often at the expense of animal welfare. In response to these challenges, phytogenic feed additives have emerged as natural, sustainable alternatives to antibiotics. These plant-derived compounds, including garlic, anise, turmeric, cinnamon, and others, exhibit antibacterial, antioxidant, anti-inflammatory, and growth-promoting properties. This paper reviews 16 commonly used phytogenics, detailing their active ingredients and effects on poultry health and production. The study highlights the potential of phytogenics to improve feed conversion, boost immunity, and combat pathogenic infections while addressing consumer demands for antibiotic-free and environmentally sustainable poultry farming.

**Keywords:** Antibiotics, poultry farming, antibiotic resistance, phytogenics, plant-based alternatives, antimicrobial, antioxidant, sustainable poultry farming, animal welfare, feed additives.

### **What is the Purpose of Using Antibiotics on Farm Animals?**

Antibiotics are commonly used in poultry farming for treatment, prevention, and growth promotion, leading to the development of antibiotic resistance. This poses a threat to the nutritional and economic benefits of poultry and other animals, with a report predicting that almost 10 million people could die from antibiotic resistant bacteria by 2050. Mutations in genes allow bacteria to survive antibiotics and pass them on to their descendants. Chickens are growing twice as fast as they did 60 years ago (FCR 2.5 to 1.6) due to antibiotics, causing bone and joint problems.



## What Antibiotics are Used for Raising Chickens?

Chickens are fed a wide range of antibiotics, many of which are included in their regular diets of food and water. An overview of some of the more often used antibiotics in chicken farming as:

- Aminoglycosides (treat intestinal infections)
- Beta-lactams (two types: penicillins and cephalosporins)
- Ionophores (prevent intestinal infections)
- Lincosamides (combat joint and bone infections)
- Macrolides (treat a fatal condition called necrotic enteritis, which is caused by overeating)
- Quinolones (broad-spectrum drugs that affect a wide range of bacteria)
- Streptogramins (prevent cell wall formation and protein synthesis, used to treat and prevent necrotic enteritis)
- Sulfonamides (prevent and combat Salmonella, E. coli, and other pathogens)
- Polymyxin antibiotics as Colistin (treatment of infections caused by Gram-negative bacteria)

**Phytogenic Feed Additives** - Alternatives to Antibiotics Plant extracts, also known as phytobiotics or botanicals or phytogenics, are effective antibiotic substitutes due to their antibacterial, anti-inflammatory, antioxidant, and anti-parasitic properties. They have been used in chicken production for years.

### 1. Garlic (*Allium sativum*)

Garlic, a perennial bulb-forming plant, has been used for centuries as a flavouring agent, traditional medicine, and a functional food to enhance physical health.

**Active ingredients:** Garlic has Several sulphur-containing substances like sulphur containing compounds alliin, diallylsulphides and allicin, ajoene and allylcysteine, several enzymes, 17 amino acids, and trace minerals for example selenium. Allicin is unstable and poorly absorbable. On the other hand, garlic derivatives which are produced by means of heating or solvent extraction methods are usually contain alliin, however also are free of allinase; therefore, no allicin may be found in the final product.

**Effect:** Addition of up to 3% garlic improves weight, feed conversion, reduces mortality. It has anti- microbial properties and increases high-density lipoproteins which act as antibacterial, anti-fungal, antiviral and antioxidant.

### 2. Anise (*Pimpinella anisum*)

**Active ingredients:** The seeds of this plant contain trans-anethole eugenol, methyl-chavicol,



anisaldehyde, estragole, coumarins, scopoletin, umbelliferone, estroles, terpene hydrocarbons, polyenes and polyacetylenes.

**Effect:** The inclusion of anise seed in the feed improves weight gain, feed consumption and feed conversion, increases the quantity of antibodies against avian influenza virus and increases the number of immunoglobulins.

### 3. Cinnamon (*Cinnamomum zeylanicum*)

**Active ingredients:** Cinnamon contains many resinous substances, such as cinnamaldehyde, cinnamate, cinnamic acid, and other essential oils. It also contains a variety of essential oils including trans-cinnamaldehyde, cinnamyl acetate, alpha-cubebene, alpha-terpineol, caryophyllene oxide, terpinolene etc.

**Effects:** According to recent studies, cinnamaldehyde and cinnamon powder, alone or in combination with other essential oils, have a variety of advantageous benefits on chickens. It had had antioxidant effects, reducing oxidative stress in broilers. It also gives protection against *Escherichia coli*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, epidermal *Staphylococcus*, *Salmonella* sp., *Helicobacter pylori* and *Vibrio parahemolyticus*.

### 4. Coriander (*Coriandrum sativum*)

**Active ingredients:** *C. sativum* aqueous extract has relatively higher contents of total flavonoids and total phenolic acids, essential oil, tannins, terpenoids, reducing sugars, alkaloids, sterols and glycosides. The major compounds present in essential oil are linalool (67.70%);  $\alpha$ -pinene (10.5%);  $\gamma$ -terpinene (9.0%); geranylacetate (4.0%); camphor (3.0%); and geraniol (1.9%).

**Effects:** Linalool is the main component that is characterised by antioxidant, antibacterial compounds.

### 5. Chili (*Capsicum annum*)

**Active ingredient:** Capsaicin represents 50% of the active compounds, capsaicin and capsanthin. It is also rich in vitamin C.

**Effects:** Several reports confirmed the activities of these compounds, including antimicrobial, anthelmintic, antioxidant, growth enhancer, and immune modulator activities, antioxidant capacity, increases weight gain, feed consumption and reduces feed conversion. Chili contains the terpenoid compound capsaicin, which has antibacterial properties.

### 6. Black cumin (*Nigella sativa*)

**Active ingredients:** The seeds contain alkaloids, essential oils, thymoquinone, dithymoquinone, thymol, carvacrol, nigellicine, nigellidin and hederin.

**Effects:** It may be a viable alternative to replace the use of antibiotics, growth promoter, antioxidant and immunoregulator. Black cumin increases the quantity of antibodies against



Newcastle, Gumboro and Bronchitis. It is an antibiotic alternative to promote growth and enhance health of broilers challenged with *Eimeria maxima* and *Clostridium perfringens*.

### 7. Sweet worm wood (*Artemisia annual*)

Dried leaves of *Artemisia* have long been used in oriental medicine for their antimicrobial properties.

**Active ingredients:** Essential oils like camphene,  $\beta$ -camphene and  $\beta$ -pinene etc, sesquiterpenoids such as artemisinin, flavonoids, phenols, purines and lipids.

**Effect:** Including sweet worm wood 2-4% in feed can acts as antiparasitic, antioxidant, coccidiostat reduces the number of enterobacteria and increases the number of lactobacilli in the intestine.

### 8. Turmeric (*Curcuma longa*)

**Active ingredients:** Turmeric contains a high level of beneficial phenolic compounds (curcuminoids) and terpenoids (sesquiterpenes). The main curcuminoids of the rhizome are curcumin, demethoxycurcumin, and bisdemethoxycurcumin. Whereas  $\alpha$ -turmerone, and  $\beta$ -turmerone are the major ketonic sesquiterpenes of turmeric essential oil.

**Effects:** Antioxidant, improves the immune response of chickens infected with Newcastle and *Eimeria*. Turmeric powder supplementation improves weight gain and feed conversion and decreases blood triglycerides. Turmeric has antibacterial, antifungal, and anti-inflammatory properties, showing its role in improving gut health and immunity, thereby reducing the need for antibiotics in poultry.

### 9. Eucalyptus (*Eucalyptus globulus*)

**Active ingredients:** It mainly contains phenolic compounds like eucalyptol globunol, flavonoids, tannins and hydroxybenzoic acids.

**Effects:** These have several biological activities, including anticarcinogenic, cardio protective, anti-inflammatory, antibacterial and antiviral properties. Extracts of leaves improve the intestinal microbiota and better immunity. The extract declines the bacterial growth and there was decline occurred in colony counting of *S. aureus*.

### 10. Ginger (*Zingiber officinale*)

**Active ingredients:** It has gingerdiol, gingerol, gingerdione and phenolic compounds.

**Effects:** Ginger has Antioxidant properties mainly. The addition of 0.02 to 1.5% to the feed improves weight gain, feed conversion, reduces mortality in chickens and stimulates the immune system. Ginger root extract supplementation. Faecal and caecal concentrations of total bacteria count (TBC), *Escherichia coli*, *Lactobacillus* spp., and *Bifidobacterium* spp significantly decline



and *E. coli* & the number of beneficial microorganisms such as *Lactobacillus* spp. and *Bifidobacterium* spp increases.

### **11. Bay leaves, *Laurel (Laurus nobilis)***

**Active ingredients:** It contains about 1.3% essential oils, flavonoids, sesquiterpenes, alkaloids, glycosylated flavonoids, megastigmane and phenolic components. Its essential oil contains eucalyptol,  $\alpha$ -terpinyl acetate, linalool, methyl eugenol, sabinene and carvacrol.

**Effect:** The essential oil contents of this plant have strong antibacterial activity against Gram-negative and Gram-positive pathogens as well as antifungal effects. By using 2 to 6 g kg<sup>-1</sup> of bay leaves in feed, the total of bacteria and aerobic bacteria in the colon is inhibited.

### **12. Moringa (*Moringa oleifera*)**

**Active ingredients:** It contains Polyphenols, vanillic-, ferulic-, melilotic- acids, vitamins A, E, C and complex B.

**Effects:** Extracts of the *M. oleifera* leaves have antimicrobial activities. The findings show that solvent extracts of *M. oleifera* components (leaves, flower, pulp, and seed) were effective against *E. coli* and *S. aureus*. The mycelia growth of *Aspergillus flavus* was shown to be suppressed by *M. oleifera* (bark seed and leaf) crude extracts.

### **13. Neem (*Azadirachta indica*)**

**Active ingredients:** Biologically active principles isolated from different parts of the plant include: azadirachtin, meliacin, gedunin, salanin, nimbin, valassin and many other derivatives of these principles.

**Effects:** The growth-promoting effect of neem leaf extracts (NLM) is supported by different studies. NLM can be a substitute of antibiotic growth promoter (AGP). Neem extracts exhibited strong antibacterial activity against *Salmonella* and *E. coli*, providing a viable alternative to antibiotic use in poultry.

### **14. Black pepper (*Piper nigrum*)**

**Active ingredients:** The plant contains tannins, alkaloids, saponins, terpenes, steroids, flavones, flavonoids (catechin, myricetin, and quercetin), and piperine, among several others.

**Effects:** Black pepper improves the immune system through increasing the concentration of immunoglobulins in serum. A study reveals that black pepper as Phyto biotic growth promoter has the potential to replace the prevalent antibiotic growth promoters in broiler chickens.

### **15. Green tea (*Camellia sinensis*)**

**Active ingredients:** Green tea has over 200 bioactive compounds and contains over 300 different substances. The chemical composition of tea is multifaceted, consisting of polyphenols (catechins



and flavanoids), alkaloids (caffeine, theobromine, theophylline), volatile oils, polysaccharides, amino acids, lipids, vitamin C, minerals and other uncharacterised compounds.

**Effect:** Positive effects of green tea have been demonstrated in poultry diseases including coccidiosis and avian influenza.

## **16. Oregano ( *Origanum vulgare* )**

**Active ingredients:** It has terpinen-4-ol most abundantly along with  $\beta$ -caryophyllene, germacrene D and  $\alpha$ -humulene. Among the oxygenated sesquiterpenes, spathulenol is the most abundant in all oils and its content is greater in the dried samples. As for the phenol content, carvacrol is the main constituent.

**Effect:** Oregano essential oils have been shown to possess antioxidant, antibacterial, antifungal activity and improving growth performance in poultry.

## **Conclusion**

Many herbal remedies can be used as natural antibiotics and antivirals, growth boosters, and alternative sources of antioxidants for growing broiler chickens. These chickens can be grown safely from whole or partial diet replacement for antibiotics. Numerous reports indicate that consumers prefer chicken that is fed natural ingredients over antibiotics. The four factors that millennial foodies consider most crucial when choosing a brand of chicken or meat are “raised with good animal welfare practices”, “raised without antibiotics ever,” “raised in ways that reduce environmental impact” and “locally raised.” The benefits of feeding phytochemicals to animals such as enhanced gastrointestinal health, up to a 50% reduction in ammonia emissions, and a track record of success in antibiotic-free farming support an engrossing tale geared at millennial foodies.

## **References:**

1. Molla, A. E., et al. (2021). "Garlic (*Allium sativum*) Extract as a Natural Antibiotic Alternative in Poultry Nutrition: Effects on Growth Performance and Gut Microbiota." *Journal of Animal Science and Technology*, 63(5), 977–987
2. Khan, R. U., et al. (2020). "Effect of Cinnamon Supplementation on Growth Performance, Immune Response, and Antioxidant Status in Broilers." *Poultry Science*, 99(8), 3890–3895.
3. Al-Kassie, G. A. M. (2019). "Nigella sativa and Its Role as an Immunomodulator and Growth Promoter in Poultry." *Journal of Poultry Science*, 56(2), 123-131.
4. El-Hack, M. E. A., et al. (2022). "Turmeric (*Curcuma longa*) as a Phytochemical Feed Additive in Poultry: Evidence and Mechanisms of Action." *Animals*, 12(4), 599.
5. Abd El-Hack, M. E., et al. (2021). "Ginger and Its Derivatives as Promising Alternatives to Antibiotics in Poultry Feed." *Frontiers in Veterinary Science*, 8, 692837.
6. Dhama, K., et al. (2021). "Moringa oleifera as a Nutraceutical and Phytochemical Feed Additive in Poultry Nutrition." *Journal of Animal Health and Production*, 9(1), 18-27.
7. Dhama, K., et al. (2021). "Moringa oleifera as a Nutraceutical and Phytochemical Feed Additive in Poultry Nutrition." *Journal of Animal Health and Production*, 9(1), 18-27.
8. Rahman, M. S., et al. (2020). "Antibacterial Properties of Neem Extracts Against Pathogenic Bacteria in Poultry." *Veterinary World*, 13(1), 19-25.
9. Placha, I., et al. (2021). "Oregano Essential Oil as a Natural Feed Additive in Poultry Nutrition." *Animals*, 11(4), 952.
10. Handbook of Poultry Nutrition By V.Ram Subba Reddy & Dinesh T Bhosal

