



## Phytogenic Feed Additives as a Coccidiostat in Poultry

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### ABSTRACT

*Coccidiosis is a parasitic disease that influences farm animals. The disease severely affects poultry leading to real economic losses. This occurs by affecting growth and feed efficiency, causing death of birds and expending a lot of money for vaccination and inclusion of anticoccidial drugs into the diet for the long period. In the last years development of resistance against anticoccidial drugs was the problem that disquieting poultry producers and researchers. Above issues were encouraging researchers to looking for natural, cheap alternatives to control coccidiosis. Anticoccidial properties of various natural products such as Ageratum conyzoides extract (Billy goat weed), green tea, maslinic acid (found in leaves and fruit of olive tree), extract of Musa paradisiacal root, coumestans from Eclipta alba, extract of a wild mushroom (Ganoderma lucidum), extract of Artemisia sieberi, extract of Neem (Azadirachta indica) leaves, leaves of Artemisia annua and Aloe vera-based diet were reported. Ability of other materials to improve the resistance of birds against coccidiosis was demonstrated, such as commercial probiotic (MitoMax) and Lactobacillus-based probiotic. These findings give hope to producers and researchers regarding the control of coccidiosis without the risk of drug resistant. Therefore this research aims to exhibit scientific literature that discussed the use of phytogenics as natural coccidiostat in poultry diet with focus on their mode of action.*

**Key words:** Anticoccidial, Broilers, Coccidiosis, Eimeria, Layers, Phytogenic.

### INTRODUCTION

Coccidiosis is a protozoan disease, that affects different parts of the intestine therefore impairs feed utilization, decreases broilers growth and egg production of laying hens and causes death of birds [1]. The causative agent is Eimeria, and birds become infected when they ingest the oocysts [2]. Drugs and live vaccines are the control measures used recently in the poultry farms. However, producers are faced with expensive vaccines and use of drugs for long periods, hence necessity for cheap and safe alternatives rises up [2-3].

### PHYTOGENIC FEED ADDITIVES

Phytogenic feed additives are products of plant origin such as herbs, spices and essential oils used in animal feeding as non-nutrient substances to enhance their performance and health. Recently phytogenic feed additives gained importance due to the restriction of using antibiotics as growth promoters by European Union, but there is a lack of knowledge about their mode of actions [4]. It was reported that these products of plant origin are natural, less toxic, residue free and ideal feed additives for animal when compared to synthetic antibiotics or inorganic chemicals [5]. Antimicrobial and antifungal properties of phytogenic substances [6-7] and antiparasitic effects [8] were approved.

### ANTICOCCIDIAL PROPERTIES OF PHYTOGENICS

Anticoccidial properties of different natural products of plant origin were examined. Allen *et al.*, [9] examined the effect of *Artemisia annua* and its components on chickens infected with coccidia. Authors found that when a dried *Artemisia annua* leaves offered to infected chicks at a level of 5% over a period of 3 weeks resulted in a significant protection against lesions due to *E. tenella* but not due to *E. acervulina* or *E. maxima*. When this product given to chicks immunized with a live vaccine at a level of 1% over a period of 5 weeks it produced a significant protection in partially immunized chicks against *E. acervulina* and *E. tenella* lesions from a dual species challenge infection. When a pure compound of artemisinin which is one of the components of *A. annua*, was offered at a level of

17 ppm over a period of 3 weeks it maintained weight gain and significantly lowered lesions due to *E. tenella* but not due to *E. acervulina*. Camphor and 1, 8-cineole are other components of *A. annua*, when fed to chicks also maintained weight gain and decreased *E. tenella* lesions. Camphor lowered *E. acervulina* lesions. Finally, when artemisinin given at levels of 2, 8.5 and 17 ppm for 4 weeks decreased oocysts shed by separate *E. acervulina* and *E. tenella* infection and a dual species infection. Jang *et al.*, [10] reported that supplementation of 0.5% and 2.0% ground green tea to the diet of five-week-old chickens for 2 weeks prior infection with *Eimeria maxima* (10,000 sporulated oocysts per birds) significantly ( $P < 0.05$ ) decreased shed of oocysts in faeces by 38.5% and 51.5% respectively. However, it did not compensate loss in body weight due to the infection of *E. maxima*. Absence of improvement in body weight following addition of green tea is expected because it was noticed that green tea and caffeine used for weight maintenance [11]. Basu *et al.*, [12] also, reported that consumption of green tea beverage (4 cups/d) or intake of its extract (2 capsules/d) for 8 weeks produced significant reduction in body weight and body mass index. Nweze and Obiwulu, [13] observed an effect of treatment of broilers with 500 or 1000 mg/kg of *Ageratum conyzoides* extract which is an annual herbaceous plant [14] in comparison with amprolium after infection of birds with 8000 oocysts of *E. tenella*. Authors reported that *Ageratum conyzoides* extract produced similar effect of amprolium on infected groups. A steadily decrease in faecal oocysts was observed in all treated groups. Toxicity test revealed absence of signs of toxicity in birds treated with levels up to 3000 mg of extract per kg body weight. De Pablos *et al.*, [15] compared the effect of maslinic acid (found in the leaves and fruits of olive tree) as a natural coccidiostatic product in animal infected with *Eimeria tenella* with animals treated with sodium salinomycin. Authors observed increase in weight and decrease in lesion index, oocyst index and infection rate in chicks treated with maslinic acid (90 ppm) compared to those treated with sodium salinomycin. Anosa and Okoro [16] performed an experiment to compare the anticoccidial effect of methanolic extract of *Musa paradisiaca* root with amprolium (conventional drug) in chickens infected with 8,000 *Eimeria tenella*. Authors found that addition of *Musa paradisiaca* root extract reduced severity of clinical symptoms and oocyst count per gram of faeces and gradually increased packed cell volume in a dose-dependent pattern. At a level of 1000 mg/kg b.w. *Musa paradisiaca* root extract produced a similar effect as amprolium did. Even at the highest dose of 4000 mg/kg b.w. the extract was found non toxic to the chickens.

#### MODE OF ACTION OF PHYTOGENICS

There is a little about the mode of action of phytochemicals as coccidiostat. Allen *et al.*, [17] mentioned that *E. tenella* devastates host cells causing oxidative stress and lipid peroxidation in the end parts of the intestine and caecum leading to bacterial infection such as salmonella which exacerbate the condition. Some phytochemical products such as maslinic acid [17-18] reduce lipid peroxidation and overcome oxidative stress of *E. tenella* in animals. Green tea also can reduce lipid peroxidation [12] hence it may act similarly like maslinic acid. De Pablos *et al.*, [19] attributed the antiparasitic property of maslinic acid to its effect on protease activity of the *Toxoplasma gondii* that required to invade host cells therefore preventing entrance of infective agent, in addition to its anti-inflammatory and antioxidant effects. Furthermore, Moneriz *et al.*, [20] noticed that maslinic acid ceases the development of the *Plasmodium falciparum* erythrocytic cycle in a dose-dependent pattern, and at higher doses cause accumulation of trophozoites and pycnotic forms.

#### CONCLUSION

Researchers assured anticoccidial properties of phytochemicals (*Artemisia annua*) compared to conventional drugs and explained the dose required and the active ingredient. Others informed anticoccidial properties of phytochemicals (*Ageratum conyzoides* extract and extract of *Musa paradisiaca* root) compared to conventional drugs and explained the dose required and absence of toxicity. Finally, anticoccidial properties of phytochemicals (maslinic acid) compared to conventional drugs was noticed in addition to the dose required and its mode of action. In spite of the progress in the

literature regarding systematic approach, safety and mode of action of phytochemicals as coccidiostats still further researches are required.

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