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Phytogenics: Their Roles and Safety over Antibiotics in Broiler Chicken Production-A Review

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Abstract

Sequel to the residual effect of antibiotics on animal and man, the crave for the use of organic or natural feed additives have been highly prioritized in the livestock industry. Phytogenics which are compounds derived from plant parts and extracts have been used in the poultry industry especially in broiler production due to its immense contribution to the production performance of birds. They provide antioxidation, antimicrobial, palatability and digestive effect, thereby enhancing the physiology and health of the bird as well as ensuring the availability of hygienic and wholesome chicken meat for human consumption. Although, several issues of concerns have ensued on the standardization of the dosage of phytogenics and its preservation among many, these could be attributed to the variation in the planting and harvesting seasons, soil nutrients and climatic condition. Hence, the benefits of phytogenics in the improvement of the weight gain, feed conversion ratio and retardation of lipid oxidation as well as microbial growth in the gut and carcass of broiler chicken cannot be overlooked.

Keywords: Phytogenics, antibiotics, broiler, chicken

Introduction

In Nigeria, improvement in the productivity of livestock is keen due to the ever rising population resulting in an upsurge in the demand for animal products and by products. Generally, the optimum performances of livestock require the use of wholesome diet which can be procured at least cost in order to ensure profit maximization for the farmer. Hence, the introduction of modern technologies in the manufacture of animal feed, synthetic amino acids, vitamins and other feed additives: some of whose effect on livestock and man has been mistrust and banned in certain production systems (Castanon, 2007).

Chickens are one of the most common and widespread domestic animal. Thus in Nigeria, the poultry industry and other countries of the world, consumer's preference which might be due to their exorbitant prices and the deleterious impact of antibiotics on livestock welfare and consumers health has influenced the falling-off its use (Adedoyin *et al.*, 2017). Consequently, the use of natural herbs, spices and their extracts (botanicals) which can be collectively regarded as phytogenics in chicken feeds does not only help to stimulate feed intake but also help to improve digestibility, antimicrobial, anti-inflammatory, anti-oxidant and immune-stimulant activity (Muneendra *et al.*, 2014) with no harmful effect on the final consumers.

Therefore, the review paper is focused on phytogenics: their role and safety over antibiotics in broiler chicken production.

Role of phytogenics in Chicken Production

Anti-oxidative effects: The anti – oxidant nature of phytogenics has been emphasized by numerous researchers as they reduce lipid oxidation rate, rancidity of chicken feeds and the formation of toxic oxidation products. The sulphur component of garlic and onions was revealed by Ahmed and Bassuony (2009) to lower the oxidation of low – density lipoprotein in poultry. Likewise, oxidative stability of refrigerated broiler chicken meat is improved by the practice of high level supplementary raw garlic (5000 mg/kg) in broiler diet (Onibi *et al.*, 2009). Onibi (2003) further reported another herb: Thyme (*Thymus vulgaris*) to inhibit oxidation of broiler chicken when its dried leaves are applied to either refrigerated fresh or cooked broiler chicken meat. *Labiatae* phenolic compounds has been found useful in improving the stability of products obtained from broiler chickens (Florou-Paneri *et al.*, 2006). Consequently, the use of phytogenics in chicken diet has helped to improve the health and oxidative stability of its meat.

Antimicrobial functions: Most gram positive bacteria are highly sensitive to phytogenics and increasing its dosage has been found to be effective in fighting against gram negative bacteria as the antimicrobial action of phytogenics greatly depend on the physico-chemical properties of the plant and bacterial strains for which it is used (Sari *et al.*, 2006). They cleanse the digestive tract of birds which is vital in the prevention of chicken diseases and parasites especially coccidia (*Eimeriaspp*) (Arczewska-Wlosek and Swiatkiewicz, 2012). Studies carried out by Ayachi *et al.* (2009) revealed the efficacy of thyme (*Thymus vulgaris*) against *Salmonella* and fungi

such as *Candida albicans* due to the presence of the active compound: thymol and caryacrol. Moreso, walnut leaves (*Juglandaceae*) enhance the growth of chickens and reduce the multiplication of *Clostridium perfringens* in them (Mathis *et al.*, 2007). A spice called turmeric got from the rhizome of *Curcuma longa* has also been reported by Alloui *et al.* (2014) to possess anti-tumoral activities aside from its antioxidant and anti-inflammatory properties whereby its inclusion at 1% in chicken diet helped to improve weight gain, reduces intestinal lesions and oocyst excretion in infected chicken with *Eimeria maxima*. Onibi and Osho (2007) reported the effectiveness of feed supplemented with *Hibiscus sabdariffa calyces* in the diminution of the bacterial load of refrigerated fresh and cooked meat of broiler chicken. Likewise, *Piper guineense* extracts at the dose of 100 mg/Kg body weight administered to the drinking water of chickens' acts as prophylaxis and boost their immunity (Osho *et al.*, 2016). Hence, phytochemicals improve the microbial carcass hygiene thereby it highly safe for human consumption.

Palatability and Digestive Actions

Some phytochemicals tend to improve the taste of feed thereby promoting the chicken feed intake (Catala-Gregori *et al.*, 2007). They also enhance gastrointestinal tract functions such as spasmolytic and laxative effects. Some plant extracts such as cinnamon extract, thyme and clove accelerate the digestive secretions of bile, mucus, saliva (Platel and Srinivasan, 2004) as well as stimulate trypsin and amylase actions in chickens which are of tremendous benefit. Aside from the anti-tumoral and anti-oxidative properties of garlic oil (*Allium sativum*), it also improve feed intake and growth in chickens (Lewis *et al.*, 2003).

Effects of Phytochemicals on Performances of Broiler Chicken

The usage of phytochemicals in broiler chicken diet has been reported to significantly promote broiler feed intake, weight gain and feed conversion ratio (Cabuk *et al.*, 2006) which may be due to the tastiness impacted on the feed thereby increasing feed intake. They are a good source of dietary proteins to livestock and man. Fenugreek (*Trigonella foenum-graecum*) seed supplementation caused somewhat morphological changes in the gastrointestinal tissues of broiler chickens thereby improving their feed conversion ratio (Mamoun *et al.*, 2014). In addition, the weight gain, feed conversion ratio and other production performance parameters were improved through the use of garlic (*Allium sativum*), thyme (*Thymus vulgaris*) and cornflower (*Echinacea purpurea*) as feed supplements (Onibi *et al.*, 2009). The replacement of synthetic premix with leaf composite mix (*Moringa oleifera*, *Ocimum gratissimum*, *Manihot esculenta*, *Telfaria occidentalis* and *Vernonia amygdalina*) was also reported to improve the haematological indices of broiler chickens (Adegbenro *et al.*, 2012). Likewise, broiler chicken given 10 g bitter leaf extract (*Vernonia amygdalina*) orally had improved weight gain and body maintenance compared to those given plain water and antibiotics (neoceryl) mixed water (Osho *et al.*, 2014).

Merit of Phytochemicals on Broiler Chicken Meat

Generally, phytochemicals are organic products which have been established to be less toxic, free of side effects and apparently ideal feed additives in broiler and poultry production (Hashemi *et al.*, 2008). They reduce lipid oxidation, enhance microbiological safety and quality of meat stored either in the raw or cooked stages (Onibi *et al.*, 2009). Also, there is the accumulation of the active components of the phytochemicals in the metabolic tissues which helps to decrease pathogens in the gut thereby promote healthy gut environment which contribute to a reduction of carcass contamination at slaughter (Puvaca *et al.*, 2013). Hence, the European Food Safety Authority (EFSA) stated phytochemicals administration in livestock diet as one of the most effective ways of ensuring contaminant – free meat and elimination of food-borne diseases.

Conclusion

The vast benefits of phytochemicals in broiler production as well as to the final consumers have made it a better substitute over antibiotics. They do not only promote the production performance of broilers when used either singly or in a combined state as supplement in feed but are eco – friendly and has no negative side- effect on chicken thereby making their meat safe for consumption. It also contributes to a balanced microflora in broilers and protection against pathogenic organisms as they possess anti- microbial and immune – stimulatory functions thereby reducing the spread of food- borne diseases.

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