

BAP -13

Herbs and Spices as Natural Enhancers of Optimal Poultry Production in the Tropics - A Review

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Abstract

Recently, the process of using herbs and spices and other plant extracts in animal feeds is termed phyto-genic feed additives (PFAs). The recent ban on synthetic antibiotic usage as growth promoters and the increased awareness of consumers on the issue has instigated needs for natural alternatives and healthy feed additives to achieve optimal production results of farm animals. These feed additives are gaining popularity in livestock production. However, some studies have shown that some plant materials enhance the palatability of feed. There are indications that they tend to specifically improve digestive enzymes and nutrient intakes activities respectively. However, PFAs alternatives have been suggested since prolonged use of antibiotics has precipitated the growth and development of some resistant strains within groups of primary pathogenic or opportunistic bacteria and the degradation of the symbiosis which exist between animals and desirable flora. However, a wide array of non-therapeutic substitutes (prebiotics, probiotics and symbiotics), especially that of extracts from plants are already in use since antiquity. They have high significant aroma and medicinal properties. Recent studies on phyto-genic feed additives effects in the gut flora of the animal as antimicrobial, antioxidant and regulating agents have increased production generally. This indicates that herbs and spices and other plant derivatives can be considered as growth promoters. However, investigation and evaluation procedures of their therapeutic/substantial beneficial effects, their toxicity and interactions with prescription drugs are still unknown. Thus, to have an improved usage of those phyto-genic feed additives (PFAs) indigenous to the tropics these procedures should be considered.

Keywords: Antimicrobial, antioxidant, phyto-genic feed additive, poultry and performance

Introduction

High quality feed together with clean environment, clean water and subsequently good managerial qualities can ensure the production of nutritious animal products with desirable organoleptic characteristics for man consumption. The use of additives of natural origin as alternatives to antibiotics in animal and human nutrition has been encouraged recently. Feed additives like probiotics, prebiotics, organic acids and plant derivatives with their biochemical structures and physiological functions of various have been reported. The subsequent consumption of medicinal herbs, aromatic plants and spices in man's nutrition for improvement of taste, aroma and color of food, as additives have been carefully substituted into animal nutrition for growth and health of the animals. With the recent ban of antibiotics use in animal nutrition due to the emergence of microbes' resistance, alternative growth promoters must be evaluated. The removal of antibiotics as growth promoters has been reported Ceylan, and Fung (2004) to have led to poor performance, feed conversion ratio increment and relatively high incidence of infections and diseases to the animal.

A wide range of herbs, spices, and their extracts exert beneficial effects within the digestive tract, such as, laxative acid, spasmolytic effects and reduction of flatulence (Chrubasik *et al.*, 2005). These active components effects largely depend on its dosage administered. Increased in quantity of doses can even be detrimental to animal and subsequent dose reduction in quantity poses no effects to the animal. The search for alternative nutritive antibiotic in developing countries such as Nigeria has increased their awareness and concern of the consumers, further encourages researches on the possible uses of herbs, spices and other plants extract in animal nutrition. Good performance of farm animals and high quality animal products is achieved by keeping the health status of the animal which is vital in animal husbandry. In this aspect, herbs and spices are not assumed as appetite and digestion stimulants, but can also affect other physiological functions that enhance performance of the animal.

This paper reviews the importance of herbs and spices as natural products that could enhance poultry production in the tropics.

Properties of Phyto-genic Feed Additives

Some herbs and spices found in the tropics and their active compounds/functions are listed in Table 1 (Charalambous, 1994).

Antioxidant effects: Many phyto-genic compounds pose antioxidant effect in protecting feed lipids from oxidative damage; however synthetic antioxidants are added to diets (e.g., α tocopheryl acetate or butylated hydroxytoluene). However, its quantitative relevance under conditions of common feeding practice needs to be ascertained. Herbs and spices can protect the feed against oxidative deterioration during storage. Rosemary (*Rosmarinus officinalis*) has been commonly used for feed/food preservation. It can be used in combination with tocopherols or synthetic antioxidants or alone (Jacobsen *et al.*, 2008). However

phytogenic feed additives have the propensity to affect the carcass of an animal. Their effect is on the protein deposition resulting in carcasses with high meat percentage and also reducing lipid oxidation especially in pigs.

Table 1: Some herbs and spices found in the tropics and their active compounds/functions

Scientific Name	Plant	Parts used	Major active component	Function
<i>Monodora mynstica</i>	African nutmeg	Seeds	Flavonoids	Digestion stimulant, antiseptic, anti-inflammatory and antidiarrhoeic
<i>Xylopia aethiopica</i>	African pepper,	Seeds	Lionleic	Digestion stimulant, antiseptic, anti-inflammatory and antidiarrhoeic
<i>Myristica fragans</i>	Nutmeg	Seed	Sabinene, eugenol	Digestion stimulant anti-diarrhoeic
<i>Elettaria cardamomum</i>	Cardamom	Seed	Cineol, Cinnamaldehyde	Appetite and digestion stimulant
<i>Tetrapleura tetraptera</i>	Arida	Seeds	Flavonoids	Appetite and digestion stimulant, antiseptic, anti-inflammatory
<i>Curcuma longa</i>	Turmeric	Seeds	Curcumin	Colouring and Anticoccidiosis
<i>Piper nigrum</i>	Pungent spices black pepper	Fruits, leaves	Piperine	Appetite stimulant, Digestion stimulant and anithelmith
<i>Aframomum danielli</i>	Alligator pepper	Seeds, fruits	phenolic and flavonoids	Appetite stimulant, Digestion stimulant and anithelmith, carminative
<i>Capsicum annum</i>	Red pepper	Fruit , seeds	Capsaicin	Appetite stimulant, Digestion stimulant and anithelmith
<i>Capsicum frutescens)</i>	Chill Pepper	Fruit	Piperine	Digestion stimulant, carminative,
<i>Zingiber afficinale</i>	Ginger	Rizom	Zingerone	Gastric stimulant
<i>Allium sativum</i>	Garlic	Bulb	Alicin	Digestion stimulant, antiseptic, anti-tumoral
<i>Vernonia amagdalina</i>	Bitter leaf	Leaves	Natural quinine	Digestion stimulant, antiseptic, carminative
<i>Laurus nobilis</i>	Laurel	Leaves	Cineol	Appetite and digestion stimulant, antiseptic
<i>Ocimum basilicum</i>	Basil	Leaves	Terpenoids	Digestion stimulant, antiseptic, antioxidant
<i>Ocimum gratissimum</i>	Scent leaf	Leaves	Eugenol	Appetite and digestion stimulant, antiseptic
<i>Mentha l.</i>	Mint	Leaves	Menthol	Appetite and digestion stimulant, antiseptic
<i>Gongronema latifolium</i>	Utazi	Leaves	Flavonoids	Appetite and digestion stimulant, antiseptic, anti-inflammatory
<i>Azadirachta indica</i>	Neem leaf	leaves	Isomeldenin	Appetite and digestion stimulant, antiseptic, anti-inflammatory

Source: Charalambous, 1994.

Palatability and digestion effects: The inclusion of phytogenic compounds in poultry feed reduce palatability of diet due to pungent odour, which depress the feed intake and less significant body weight gain, showing an enhance FCR (Windisch *et al.*, 2008; Brenes and Roura, 2010). Herbs and spices, plant extracts are exerting beneficial actions on the digestive gut, such as reducing flatulence, laxative and spasmolytic effects (Eli and Isikwenu, 2015, Chrubasik *et al.*, 2005). They has the propensity to affect the digestive enzymes from the pancreas, gut mucosa and increased bile flow in the digestive system in the animal (Platel and Srinivasan, 2004; Furthermore, it increases the absorption surface of intestine thereby increasing the apparent ileal digestibility (AID) of nutrients which favours the growth of broilers.

Antimicrobial effects: The antimicrobial action of (PFA) largely depends on the physico-chemical properties of plant compounds. Most of the studies showed plant extracts are highly active against Gram positive bacteria compared to Gram negative (Ceylan and Fung, 2004). This does not mean that the plant extracts are not active on Gram negative bacteria, but the dosage should be higher compare to Gram positive bacteria. Ayachi *et al.* (2009) observed the effects of berries, dates and thyme extracts against *Salmonella*. Walnut leaves (*Juglandaceae*) reduce the proliferation of *Clostridium perfrengens* in chickens (Mathis *et al.*, 2007). The essential oil of oregano contains about 60% carvacrol and 10% thymol active against salmonella in

chickens (Koscova *et al.*, 2006). Isikwenu (2015) also observed significant increase in performance of broiler finisher fed with *Xylopiya aethiopyca* in their drink water as possible substitute for commercial antibiotic.

Anticoccidial effects: Phytogetic feed additives are active against *Eimeria* species (Hume *et al.*, 2006). The use of betaine a by-product of the sugar beet industry in poultry feeds helps reduce coccidial infection associated with weight loss to an improved performance Waldenstedt *et al.* (1999). It protects dehydration and assists the metabolic activity of cells. However, active components of herbs and spices activities depend largely on numbers dosage administered. No effect whatever can be observed at small doses; on the other hand, large amounts can be even toxic. In this aspect, herbs and spices are not just appetite and digestion stimulants, but have massive impact on other physiological functions that ensure good health and welfare of the animals.

The importance and Effectiveness of (PFA)

They contribute to the final reduction of intestinal pathogen pressure, enhanced digestive enzyme activity and absorption capacity and also stimulate intestinal mucus production, which contributes to relieve pathogen pressure through inhibition of adherence to the mucosa.

Ways to improve and its challenges (PFA): To gain advantageous effects of herbs and spices, they can be added to feed as dried plants or parts of plants and as extracts. The composition of extracts from the same plant depends on the method of extraction and the properties of the extraction solvent used. It major challenges is the efficacy and mode of action of herbs and spices as well as dose of the active compound especially those indigenous to the tropics and the interaction of these plant materials with other feed ingredients.

Conclusion

There are strong indications that herbs, spices and their products exert antioxidative, antimicrobial and growth promoting effects in livestock. During the manufacturing processes identification, composition, effectiveness, toxicity and residues analysis, traceability and the risk of manipulation are the main factors to control. The active components of these phytogetic feed additives should also be evaluated before their usage.

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