ROLE OF ESSENTIAL OILS IN BROILER CHICKEN PRODUCTION

Introduction

The strict legislative ban over use of antibiotics as feed additive has lead to the research on alternative to antibiotics. Indiscriminate use of antibiotics leads to proliferation of antibiotic insensitive bacteria, thus posing a threat to human health. Alternates like organic acids, feed enzymes, probiotics and prebiotics have been extensively studied. On the other hand plant extracts especially essential oils (EO) are new to the poultry feed industry. The knowledge on effect of EO, mode of action and their toxicity are still rudimentary. Plant extracts and their oils are extensively used in pharmaceutical industry as natural therapy, however only in recent past aromatic EO is introduced in animal feed industry.

Essential oils

Essential oils are aromatic volatile liquid extract from various parts of the plants such as flowers, buds, seeds, leaves, twigs, bark, fruits and roots. EO's are complex mixture of hydrophobic liquids with variable amounts of terpenoids (monoterpenes and sesquiterpenes) and aromatic compounds (aldehyde, alcohol, phenol, methoxyderiva-tive, etc.,) (Nazarro et al., 2013). Terpenes on the basis of 5-carbon building block (isoprene unit) can be mono-, sesqui-, and di-terpenes in which the number of isoprene units is 2, 3 and 4, respectively, whereas phenylpropenes consists of 6-carbon aromatic ring.

Common essential oils used in poultry industry

The commonly used EO's include oregano (Origanum vulgare), onion (Allium cepa), tea tree (Melaleuca alternifolia), fennel (Foeniculum vulgare), turmeric (Curcuma longa), lemon balm (Melissa officinalis), peppermint (Mentha piperita), rosemary (Rosmarinus officinalis), cinnamon (Cinnamomum zeylanicum), thyme (Thymus vulgaris), ginger (Zingiber officinale), eucalyptus (Eucalyptus), garlic (Allium sativum), and clove (Syzygium aromaticum) (Gopi et al., 2014). EO are used as feed additive in feed and drinking water and it can also be used in maintaining hygiene (fogging and inhalation)

Biological activity of essential oils

Antimicrobial activity

Clostridium – E. coli – Staphylococcus aureus – Eimeria sp are the common disease causing agents in the poultry industry. EO contains components like phenols, alcohols, ketones and aldehydes which can exhibit antimicrobial action stronger than antibiotics (Nazzaro et al., 2013). The mechanism action of antimicrobial activity is still not fully understood as it involves cascade of reactions affecting bacterial cell. Carvacrol and thyme EO act by disintegrating membrane of bacteria. Cinnamaldehyde acts against fungal microbes by inhibition of cell division and thus interferes with cell metabolism as they react with sulfhydryl groups. EO are effective against gram positive bacteria like *Bacillus, Clostridium, Listeria, Staphylococcus and Streptococcus* (Zengin and Baysal, 2014).

Antioxidant activity

Essential oil can act as a natural antioxidant to chicken meat thereby increasing the shelf life. EO like thymol,

carvacrol, oregano or rosemary increased the oxidative stability of muscles in various studies (Hashemipour et al., 2013). The antioxidant property is due to the presence of phenolic OH groups (thymol) which act as hydrogen donors to the peroxy radicals produced during the first step in lipid oxidation. The retardation of hydroxyperoxide formation egg and meat of chickens is important in economic point of view. The action of antioxidant is comparable to α-tocopherol or synthetic antioxidant like BHA and BHT. Application of 2% rosemary oil extended the shelf life of chicken breast meat (Tongnuanchan et al., 2014). EO like thyme can also be used in the process of curing of chicken meat. This not only enchances the shelf life but also influences quality, including pH, flavor, or color. It also improves water holding capacity of the chicken meat.

Effect of Essential oils on the digestive and respiratory systems

Essential oil influences digestive processes positively, as they help in maintaining the favourable microbial load in chickens thereby increasing the nutrient absorption. They also boosts the activity of digestive enzymes which increases the HCl and pepsin secretion. They can also alter the flavour of the feed, which leads to increased feed intake. Some oils like garlic can also irritate the mucous membrane, therefore the choice of EO is more important in poultry industry. EO like Peppermint and eucalyptus influence

the respiratory system of chickens. The EO component like menthol has antispasmodic and expectorant effects thereby airways are cleared, thus breathing during inflammation becomes easier. Also EO like thyme and carvacrol can be used as respiratory support during summer season, when the infections are more prone. Terpenoids are known to reduce the microbial load in the bronchi thus preventing respiratory infections. EO of peppers and onion enhances blood circulation thereby allowing faster clearance of toxins from the chicken.

Growth performance in chickens

Some author's investigated the effect of EO on poultry production performance and reported positive effect in parameters like body weight, feed intake and feed conversion ratio (Zeng et al., 2015). Effect of EO on growth of chicken are either positive (Kamel, 2001) or non significant (Botsoglou et al., 2002) when included from 20 to 200 ppm in poultry diet. Essential oil not only acts on intestinal microflora but also on nutrient utilization which was evident from positive response in weight gain and feed intake.

Toxic and Residual effects

A number of toxicological studies have been conducted with carvacrol, cinnamaldehyde, and thymol EO. The acute oral LD50 (mg / kg of body weight) of carvacrol, cinnamaldehyde and thymol in the rat were found to be 810, 2220, and 980 respectively. Due to fast metabolic conversion and excretion of EO in the body accumulation of residues are meagre. However, feeding EO continuously can lead into deposition of EO components in various tissues. The impact of consumption of EO deposited poultry meat is minor, as EO has "Generally recognized as safe" status by Flavour and Extract Manufacturers Association and Food and Drug administration (FDA).

Conclusion

It can be concluded that antimicrobial effect of EO is well documented, also the toxic effect are only seen during very high doses. Antioxidant and hypercholesterolemic effect of EO play a vital role in enhancing flavour and keeping quality of chicken meat. The biological activity and effect of EO in broiler production greatly depends on individual chemical constituent. Other factors contributing to the varied effect are species, ecological factors, climatic conditions, harvest time, plant part used and method of isolation. This varied effect complicates the use of EO in poultry industry. In conclusion, dietary EO's may be used as alternatives to antibiotics, but their effects on growth performance need to be studied further.

K. Rajkumar, G.H.Hudson, V. Boopathi and M. Arul Prakash
Assistant Professor, Veterinary College and Research Institute, Orathanadu

The Official Exhibition Event Calender

AUGUST 2018

Event : **International Exhibition on Poultry, Livestock & Technologies**
Date : 31 Aug - 2 Sep, 2018
Web : www.iplexpo.com

SEPTEMBER 2018

Event : **XV European Poultry Conference**
Date : 17 - 21 September, 2018
Venue : Hotel Valamar Lacroma, Dubrovnik, Croatia
web : www.epc2018.com

OCTOBER 2018

Event : **Viet stock 2018**
Date : 17-19 October 2018
Venue : Saigan Exhibition & Convention Centre (SECC), Ho Chi,Minh City,Vietnam
Ph. : +84854012718
E-mail : chau.tran@uhm.com

NOVEMBER 2018

Event : **EuroTier 2018: EuroTier**
Date : 13-16 November 2018
Venue : Messegelände, 30521 - Hannover - Germany
Web. : https://en.engormix.com › Poultry Industry

NOVEMBER 2018

Event : **Poultry India 2018**
Date : 28-30 November 2018
Venue : Hitex Exhibition Complex, Hyderabad, INDIA
Ph. : +91 9490612032
E-mail : info@poultryindia.co.in