

USE OF PHYTOGENIC FEED ADDITIVES IN POULTRY INTENSIVE FARMING

Phytogenic feed additives (PFA) are commonly defined as plant derived compounds incorporated into diets to improve the productivity of livestock through amelioration of feed properties, promotion of the animal's production performance and improving the quality of food derived from.

Growth-promoting efficacy

Several authors have indicated that the use of PFA-containing compounds, such as essential oils or botanical extracts may positively affect poultry health and productivity.

Essential oils used as feed additives for broilers enhanced the activities of trypsin and amylase (1, 2). It's suggested that dietary spices induce changes in cell membrane fluidity and permeability properties, resulting in increased absorption of micronutrients from the small intestine (3).

Positive effects were observed on the daily weight gain and feed conversion ration of chickens when fed a diet supplemented with a mixture containing capsaicin, cinnamaldehyde and carvacrol (4, 5).

Phytogenic feed additives were also reported to stimulate intestinal secretion of mucus in broilers, an effect that was assumed to impair adhesion of pathogens and thus to contribute to stabilizing the microbial eubiosis in the gut of the animals (6).

It's shown that broilers fed with a PFA containing essential oils of thyme and anise had an improved feed conversion ratio, related to a higher ileal nutrient digestibility of protein, fat and minerals.

These effects can result in higher economical efficiency in broiler meat production (7).

Antioxidative action

Antioxidative properties are well described for herbs and spices; among a variety of plants bearing antioxidative constituents, the volatile oils from the Labiatae family (mint, rosemary, thyme, oregano) have been attracting the greatest interest, for the large amounts of the monoterpenes thymol and carvacrol.

Plant species from the family of Zingiberaceae (Turmeric) and Umbelliferae (Anise) are well known for exerting strong antioxidative properties (8, 9).

Turmeric and thyme are able to reduce oxidative stress in broiler chickens and may represent a novel mechanism to improve the health of farm animals (15).

Antimicrobial action

Botanical extracts are well known to exert antimicrobial actions in vitro against important pathogens, including fungi (10, 11).

The antimicrobial mode of action is considered to arise mainly from the potential of the hydrophobic essential oils to intrude into the bacterial cell membrane, disintegrate membrane structures and cause ion leakage.

High antibacterial activities are also reported from a variety of phenolic and terpenic substances from thyme, cinnamon, anise.

In some reports the results demonstrated that broilers fed with a blend of capsaicin, cinnamaldehyde and carvacrol, had significantly greater liveweight, better weight gains and feed efficiency than broilers fed a control diet with avilamycin during the experimental period. In addition the broilers showed lower caecal count for E.coli and C.perfringens (12, 13).

A mixture of two plant-derived phytonutrients, Capsicum oleoresine and turmeric oleoresine, was evaluated for its effects on necrotic enteritis in broiler chickens, showing molecular and cellular immune changes following dietary supplementation with extracts of capsicum (rich in capsaicin) and turmeric (rich in curcumin) that may be relevant to protect immunity against avian necrotic enteritis (14).

Hepatoprotection – antihepatotoxic action

The liver, due to the vital role it plays in metabolism, is particularly exposed to the harmful action of exogenous toxic substances, aflatoxins in feed especially.



Derivatives of the traditionally used plant *Silybum marianum* (Milk thistle) occupy an eminent position in liver protection. The complexation of the extract in a phospholipid complex improves the bioavailability of the active ingredients silymarin, silybin, silydianin, silychristin. Results suggest that silymarin-phospholipid complex can provide protection against the negative effects of aflatoxins on performance of broiler chicks (16, 17)

Bibliography

1. Lee K.W. et al. Essential oil in broiler nutrition Int. J.Poult. Sci. 2004 3:738-752
2. Lee. K.W. et al. Effects of dietary essential oils components on growth performance, digestive enzymes and lipid metabolism in female broiler chickens. Br.Poult. Sci. 2003 44:450-457
3. Prakash U.N. et al. Beneficial influence of dietary spices on the ultrastructure and fluidity of the intestinal brush border in rats. Br. J. Nutr 2010 104:31-39
4. Jamroz D., Kamel C. Plant extract enhance broiler performance. J. Anim Sci. 2002 80:41
5. Williams P., Losa R. The use of essentials oils and their compounds in poultry nutrition 2001 World Poult 17:14-16
6. Jamroz D. et al. The influence of plant origin active substances on morphological and histochemical characteristics of the stomach and jejunum wall in chicken. J.Anim hysiol Anim Nutr 2006 90:255-268
7. Arnad A.A. et al. Effects of a phytogetic feed additive on growth performance and ileal nutrient digestibility in broiler chickens. 2011 Poult Sci 90:2811-2816
8. Wei A., Shibamoto. Antioxidant activities and volatile constituents of various essential oils. J. Agric. Food Chem 2007 55:1737-1743
9. Cuppett S.L et al. Antioxidant activity of labiateae 1998 Adv. Food. Nutr. Res. 42:245-271
10. Hammer K.A. et al. Antimicrobial activity of essential oils and other plant extracts. J.appl.Microb 1999 86:985-990
11. Si W. et al. Antimicrobial activity of essential oils and structurally related synthetic food additives towards selected pathogenic and beneficial gut bacteria .J.Appl. Microb 2006 100:296-305
12. Jamroz, D. and C. Kamel. Plant extracts enhance broiler performance. Poult. Sci. Assoc. 91st Annu. Meeting, 11-14 Aug., 2002, Newark, Delaware. Poult. Sci. 80 (Suppl. 1) 2002
13. Bravo D. Pirgozliev V, Rose SP. A mixture of carvarcol, cinnamaldehyde and capsicum oleoresin improves energy utilization and growth performance of broiler chickens fed maize-based diet. J.Anim. Sci. 2014 92:4-131-6
14. Lee SH et al. Dietary supplementation of youngh broiler chickens with capsicum and turmeric oleoresins increases resistance to necrotic enteritis. Br. J. Nutr 2013 110(5) 840-7
15. Mueller K. et al. Influence of broccoli extract and various essential oils on performance and expressions of xenobiotic and antioxidant enzymes in broiler chickens. Br. J. nutr. 2012 108(4) 588-602
16. Khatoon A et al. Amelioration of Ochratoxin-A induced immunotoxic effects by silymarin and Vitamin E in white leghorn cockerels. J.Immunotoxicol 201310(1)25-31
17. Tedesco D. et al. Efficacy of silymarin-phospholipid complex in reducing the toxicity of aflatoxin B1 in broiler chicks. Poult sci. 2004 83(11)1839-43.

