Opinion

Usage of antibiotics concerning animal nutrition and as antimicrobial growth promoters is undoubtedly beneficial for the improvement of zootechnical performance parameters and prevention of disease. Nevertheless, because of the bio-security threats for human and animal health which come from escalating resistance of pathogens to antibiotics and the accumulation of antibiotic residues in animal products and the environment, there is a global need to remove antimicrobial growth promoters from animal diets. The intensive broiler production sector of the poultry industry is keen to optimise performance and minimise economic losses as a result of antimicrobial growth promoter removal, as well as ensuring the safety of broiler meat via the control or elimination of foodborne pathogens. The beneficial potential of various microbes and bioactive compounds have been highlighted in enhancing animal performance and health [1]. Compared with synthetic antibiotics or inorganic chemicals, plant-derived products have proven to be less toxic, residue free and are thought to be ideal feed additives in food animal production [2]. Advances in chemistry and identification of plant compounds which are effective in the treatment of certain diseases have renewed interest in herbal medicines. Turmeric (Curcuma longa) is a rhizomatous herbaceous perennial plant of the ginger family, Zingiberaceae. The tumeric extract is a yellow-orange poly-phenol and its usual form is a dry yellow powder that is oil-soluble in its natural state. The active ingredients are tetrahydrocurcuminoids, curcumin, demethoxycurcumin and bisdemethoxycurcutumin [3]. Curcumin (diferuloyl methane) the natural yellow pigment in the roots of turmeric, is a poly-phenolic compound that is isolated from the rhizomes of tumeric. It represents about 4% of the dry weight of the extract. Curcumin, which gives yellow colour to tumeric rhizomes, is one of the most active ingredients, responsible for the biological activity.

Anti-Coccidial Effects of Tumeric

Avian coccidiosis is an intestinal disease caused by several species of Eimeria protozoa and represents an economically important parasitic infection for the poultry industry worldwide. Coccidiosis is one of the most detrimental and lethal management diseases of poultry. It causes high mortality in affected flocks. Researches [4] found maximum coccidiostatic effect with turmeric added at 3% levels in the diet as compared to other infected groups receiving turmeric containing rations, which were comparable with using a standard coccidiostat. In the same study, the peak excretion of oocysts was delayed about 1 or 2 days relative to the control infected group. Reports [5] showed that faecal oocyst shedding from birds experimentally infected with E. acervulina was significantly decreased when broiler chickens were fed with a diet containing tumeric, while others [6] reported that curcumin at concentrations of 25, 50, 100, 200 and 400 μM showed considerable effects on Emeria tenella sporozoite morphology and viability in a dose dependent manner after incubation over 3, 6, 18 and 24 hours. In the same experiment, in comparison to the untreated control, sporozoite infectivity was reduced at curcumin concentrations of 100 and 200 μM by 41.6% and 72.8%, respectively. Results of trials reported that midsmall intestinal lesion scores induced by Emeria maxima were reduced in broilers fed with 1% dietary turmeric during infection [7]. Diferent researches have suggested [6] that the ability of curcumin (diferuloylmethane) to kill extra cellular stages of E. tenella could be due to its cytotoxic damage affecting parasite...
viability, morphology and hence activity. Studies [7] have proposed the anticoccidial activity of turmeric is due to its antioxidant properties.

Antioxidant Effects of Turmeric in Poultry

Free radicals induce oxidative damage to macromolecules, cells and tissues that consequently leads to increased morbidity and mortality rates, with substantial economical losses. Reports suggested that turmeric neutralises superoxide radicals. Investigation [8] reported that catalase (CAT) and superoxide dismutase (SOD) concentration increased significantly when basal feed of broilers chicks was supplemented with 0.3 and 0.6g/kg turmeric powder. In the same experiment, the concentration of melanodealdehyde (MDA), an indicator of oxidative stress, decreased significantly when turmeric was added into the feed at the rate of 0.3g/kg. Aloso some researchers [9] showed that total antioxidant activity and SOD concentrations improved by addition of 0.5% turmeric powder in the diet. Several studies have shown that curcumin has a strong capability for scavenging superoxide radicals, hydrogen peroxide and nitric oxide (NO) from activated macrophages, reducing iron complex and inhibiting lipid peroxidation [10, 11]. Curcumin is known to augment antioxidant status especially through SOD which could be due to the increased expression of SOD gene in the chickens fed turmeric. Antioxidant enzymes, such as CAT within the peroxisomes and cytosolic GPx, are involved in the conversion of hydrogen peroxide, a powerful and potentially harmful oxidizing agent, into water and molecular oxygen [12]. Curcumin has a unique conjugated structure including two methoxylated phenols and an enol form of ß-diketone and the structure shows a typical radical trapping activity as a chain-breaking antioxidant. Investigations suggested that dietary turmeric lowers lipid peroxidation by enhancing the activities of antioxidant enzymes, also it has been reported that turmeric may help to prevent antioxidant deficiency with resulting protection of mitochondria against premature oxidative damage with loss of ATP synthesis and specialized cellular functions.

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References
