Use of Cinnamon in Diet of Broiler Chicken - A Review

Homseng Chowlu, V.K. Vidyarthi\(^1\) and R. Zuyie

Department of Livestock Production and Management Nagaland University, SASRD, Medziphema-797106, Nagaland.

Abstract

It can be concluded that use of cinnamon in the diet of broiler chicken at various level will have positive impact on the performance in terms of body weight gain, feed intake and FCE, overall performance index, carcass characteristics as well as net profit per birds over control group. It will also show significant impact on blood profile. So, dietary supplementation of cinnamon in no chemical era will be very effective particularly for the antioxidant, antimicrobial, anti-inflammatory, anticancer and anti-diabetic activities occur indirectly via receptor-mediated mechanisms. The significant health benefits of numerous types of cinnamon may be explored.

Keywords: Cinnamon, Anti-inflammatory, Anti-cancerous, Anti-oxidants, Anti-diabete.

1. Introduction

The term ‘poultry’ originated from the French/Norman word *poule*, itself derived from the Latin word *pullus*, which means small animals. Poultry farming refers to the raising of domesticated birds such as chickens, turkeys and geese for the purpose of meat or eggs. Poultry are farmed in great numbers with chickens being the most numerous. More than 50 billion chickens are raised annually as a source of food, for both their meat and eggs. Poultry farming has made a tremendous progress during the last few decades. It has developed the meagre backyard venture to a full-fledged, well-organized, scientific and technocommercial industry. Poultry is the second most widely consumed meat in the world, accounting for about 30 per cent of total meat production worldwide compared to pork at 38 percent. Poultry industry has registered growth of 8-10 percent per annum as compared to agricultural crops (1.5-2% per annum) and ranked 5th in egg production (Mehta and Nambiar, 2013). Poultry is the most organised sector in animal agriculture, worth rupees one lakh crores (Kotaiah, 2016). The poultry business in India provides the employment to around 1.6 million people in which 80 percent are directly employed, while the rest 20 percent is engage with its allied areas like feed, pharmaceuticals, equipment and other services required by the poultry industry (Ketharaj and Jeyakumar, 2009). Currently India is the 3rd largest producer of eggs in the world next to China and USA producing 45.2 billion eggs annually (Mehta and Nambiar, 2013). In India, Andhra Pradesh, Haryana, Tamil Nadu, Punjab, Maharashtra and West Bengal are the major egg producing states that accounts for more than 60-70 percent of the eggs produced in the country. Egg consumption in India has increased dramatically over the past 30 years. The poultry meat production increased 18 folds from 81,000 t in 1961 to 2.19 million tons in 2006 (Mehta and Nambiar, 2013). While in India, broiler production grew at an annual growth rate of 8.35 percent from 2001 to 2010 with a production of 1.25 million metric tons to 2.65 million metric tons (USDA, 2011). Currently, India is producing 2.75M tons of chicken meat. India ranks 6th in broiler production and is among the top 5 chicken meat producing countries in the world. The largest poultry meat producers are USA, China, Brazil and Mexico. As per the 19th Livestock census, total poultry population in the country increased from 307.07 million in 1992 to 729.21 million during 2012, in which 95 percent consist of fowl. Per capita consumption of poultry meat has grown from 1.22 kg in 2001 to 2.26 kg in 2010 against the ICMR recommendation of 10.8 kg (USDA, 2011). Poultry utilizes substantial quantities of non-edible agricultural and industrial by-products and converts into high quality nutritious protein rich food. It helps to bridge the gap between requirement and availability of high quality protein diet for the human population in the country. Eggs and meat are the cheapest source of animal protein. Further, poultry manure is one of the alternatives for chemical fertilizers. The poultry sector also provides a great employment opportunity even to
unskilled labourers and women thereby providing income to the vulnerable group. In broiler production, feed accounts for 65-70 percent of the cost of production, which is the major constraint in broiler enterprise. Therefore, every effort is directed to maintain feed quality, reducing the feed cost in order to ensure maximum conversion of feed to food of high biological value. To curtail the feeding cost, wastage of nutrients and to reduce soil pollution due to loss of the nutrients through excreta, it requires efficient utilization of raw materials, establishment of various nutrients updating nutritional establishments to keep up with genetic improvement and ensuring efficient utilization of nutrients through feed processing and use of feed additives. Presently use of feed additives in poultry feeding have assumed a position of prime importance and has become obligatory as it improves feed efficiency and growth rate which generally results in lowering the cost of egg or meat production. Besides, it also improves the physical appearance, consistency, nutritive quality, shelf life and texture of meat. Thus, feed additives are an ideal tool to boost the profits of poultry farmers. All over the world, studies are being undertaken for utilization of traditional and promising medicinal herb to test their efficacy in optimizing livestock and poultry production. Antibiotics have been used widely as growth promotant in poultry industry. However, keeping in mind the harmful effects of antibiotic residues in poultry products, the use of antibiotics is widely discouraged which necessitated for exploring a safe and effective alternative to antibiotics (Hashemi and Davoodi, 2010). Therefore, natural products have been studies to serve as alternatives to synthetic compounds with objective to provide safe and wholesome food to mankind. The natural antioxidants have been found effective in extending the shelf life and to increase the acceptability of meat by the consumers (Fellenberg and Speisky, 2006). Further, due to the health risks associated with animal fat, consumers demand carcasses and poultry meat with less fat contents. In these circumstances, search for safe growth promotants and carcass modifiers has become a priority research area. Natural medicinal products originating from herbs, spices have been used as feed additives for farm animals (Guo, 2003). Herbs, spices and various plant extracts have been received particular attention as possible alternatives to antibiotic growth promotants (Hernandez et al., 2004). Being natural, non-toxic, residue-free and easy availability makes them highly acceptable as natural feed additives for poultry. Natural products have been found to have beneficial effects viz. appetizer, increased digestive enzymes secretion, immuno-stimulant, bactericidal, antiviral and antioxidants in animals (Singh et al., 2014).

Cinnamon (Cinnamomum zeylanicum) commonly known as “dalchini” is one of the oldest medicinal plants and widely used as condiment in India. It is a valued spice which is being used all over the world. C. zeylanicum is indigenous to Sri Lanka and South India (Jakheta et al., 2010). Various parts of the cinnamon are widely used Ayurvedic and ethno-medicine. Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into various foodstuffs, perfumes and medicinal product (Huang et al., 2007). The principal chemical constituents of cinnamon are cinnamaldehyde, trans-cinnamaldehyde (Cin) and eugenol, which are present in the essential oil and contribute to the fragrance and various biological activities (Chang et al., 2013). One of the major constituents of essential oil extracted from C. zeylanicum named (E)-cinnamaldehyde has an anti-tyrosinase activity (Marongiu et al., 2007), while cinnamaldehyde is the principle compound responsible for this activity (Chou et al., 2013). Cinnamon bark contains procyanidins and catechins (Nonaka et al., 1983). Cinnamon consists of a variety of resinous compounds, including cinnamaldehyde, Cinnamate, Cinnamic acid and numerous essential oils (Senanayake et al., 1978). The presence of a wide range of essential oils such as trans-cinnamaldehyde, cinnamyl acetate, eugenol, L-borneol, Caryophyllene oxide, b-caryophyllene, L-bornyl acetate, E-nerolidol, a-thujene, has been reported (Chang et al., 2008).

Studies have shown that Cinnamon possess appetite and digestion-stimulant properties (Taback et al., 1999), anti-bacterial properties (Chang et al., 2001), antioxidant properties (Singh et al., 2007) and other medicinal properties like anti-ulcer, anti-diabetic, anti-inflammatory (Jakheta et al., 2010). Recent studies have shown that cinnamon powder, cinnamaldehyde alone or in combination with other essential oils had a wide array of beneficial effects in poultry. Some of those effects include increased feed intake (Al-Kassie, 2009), improved growth performance and improved meat quality (Sang-Oh et al., 2013), improved performance and feed efficiency (Isabel and Santos, 2009; Al-Kassie, 2009; Kamel, 2001), increased pancreatic and intestinal lipase activity (Kim et al., 2010), increased breast meat yield (Isabel and Santos, 2009), improvement in health status (Al-Kassie, 2009; Kamel, 2001), protection against pathogens such as Escherichia coli, Pseudomonas aeruginosa, Enterococcus faecalis, Staphylococcus aureus, Staphylococcus epidermis, Salmonella sp., Helicobacter pylori and Parahemolyticus (Chang et al., 2001; Taback et al., 1999). Medicinal plants are -
2. Body Weight and Growth Rate

Lee et al. (2003) found that the feeding of thymol, cinnamaldehyde or CRINA poultry did not affect growth performance, micronutrient digestibility or plasma lipids in female broiler chickens. Lee et al. (2004) reported that the addition of cinnamon to the diet of broilers improved their growth performance. Mull and Liebert (2007) found no significant effects of 2 commercial PFA containing 5% carvacol, 3% cinnamaldehyde and 2% capsicum oleoresin, or the alkaloids sanguinarin and chelerythrin on the growth performance in broiler chickens. Chang et al. (2008); Park (2008) reported that cinnamon extract supplementation had significantly higher daily gain and lower feed to gain ratio. Al-Kassie (2009) found positive effect of ground thyme and cinnamon on the live weight gain and improvement of the health of broiler chickens, in addition to the other performance traits, feed conversion ratio and feed intake. Al-Kassie (2009) reported that chicks fed with 200 ppm EO derived from thyme and cinnamon had significantly (P<0.05) higher body weight gain followed by chicks fed with 100 ppm EO derived from thyme and cinnamon and the least with control group chicks. Koochaksaraie et al. (2011) reported that addition of cinnamon at 500 to 2000 mg/kg diet had no effect on growth of the broiler chicken. Toghyani et al. (2011) reported that dietary inclusion of cinnamon @ 2 g/kg diet improved body weight significantly and suggested that it could be as alternative to antibiotic growth promoters in broilers. Ebrahimi et al. (2013) found that the body weight of the broilers was significantly higher in the group supplemented with cinnamon diet. Sang-Oh et al. (2013) reported that growth performance and meat quality improved significantly when diets were supplemented with 3, 5 and 7 percent of cinnamon powder compared to the control birds. Sampath and Atapattu (2013) found that supplementation of cinnamon powder had no effect on final live body weight of the broiler chickens. Najafi and Taherpour (2014) found that the inclusion of ginger (Zingiber officinale) and cinnamon (Cinnamomum) in addition to the broiler diet enhanced the growth and could also improve the health statue. Safa-Eltazi (2014) reported that dietary inclusion of cinnamon at 5% had significantly (P<0.05) higher body weight gain, feed intake and best feed conversion ratio. Singh et al. (2014) reported that the dietary inclusion of cinnamon might improved the growth performance of broilers. Symeon et al. (2014) reported that body weight, feed intake and feed conversion ratio of broiler chicken had no significant effect with cinnamon oil supplementation. Shirzadegan (2014) observed that supplementing different concentrations of cinnamon powder in the diet (especially at a level of 0.50%) increased the final body weight of broiler chickens.

3. Feed Intake and Feed Conversion Efficiency

Jamroz and Kamel (2002) reported that broilers fed with combination of essential oils like capsaicin, carvacrol and cinnamaldehyde showed higher weight
gain and better feed conversion ratio. Hernandez et al. (2004) reported no difference in the feed intake or FCR in broilers fed 200 mg/kg of diet with essential oils extracted from oregano, cinnamon and pepper or 5000 mg/kg of diet with a labiates extract from sage, thyme and rosemary. Jamroz et al. (2005) showed that the supplementation of feed mixtures with plant extract consisting of capsaicin, cinnamaldehyde and carvacrol improved feed conversion by 4.1% with a maize diet and 2.0% with a wheat and barley diet, whereas the BW was not affected. Garcia et al. (2007) reported that the dietary supplementation with a blend of oregano, cinnamon and pepper essential oil (200 ppm) improved the FCR (0-42 days). Al-Kassie (2009) study showed that the supplementation of 200 ppm oil derived from thyme and cinnamon in broiler diets significantly improved the live weight gain and feed conversion ratio during a growing period of 6 weeks. Toghyani et al. (2011) found no difference in feed intake and FCR of broilers after the dietary incorporation of cinnamon powder. Sampath and Atapattu (2013) found that supplementation of dietary CNPW tends (P=0.09) to increase the feed intake and feed conversion ratio (FCR) but had no effects on final live weight, weight gain, visceral organ weight, and gizzard, cloaca and total fat contents or serum cholesterol level. Hossain et al. (2014) found significantly (P<0.005) better FCR and body growth on supplementation with 1% cinnamon, 1% black cumin and 1% chilli powder. Shirzadegan (2014) found that the administration of cinnamon powder (CP) had significant effects (P<0.05) on final body weight, body weight gain, feed intake, feed conversion ratio (FCR), liver weight, glucose level, thiobarbituric acid (TBA) and breast fat percentage of broiler chicks. Najafi and Taherpour (2014) showed that broilers birds supplemented with feed additives decreased (P<0.05) feed intake and body weight gain, but improved (P<0.05) feed conversion ratio as compared to the control group during the whole experimental period (1-42 days).

4. Carcass Traits and Organ Weight

Lee et al. (2003) reported no significant differences in the internal organs of the broiler chickens when incorporated with cinnamaldehyde (100 ppm). Hernandez et al. (2004) concluded that the Labiatae extract and the blend of carvacrol, cinnamaldehyde and capsaicin improved the digestibility of the feeds but no effects were noted on organ weight. Garcia et al. (2007) observed that a blend of oregano, cinnamon and pepper oil (200 ppm) had no influence on carcass weight of broilers. However, breast weight (%) of carcass appeared to increase after the incorporation of a plant extract based on a blend of clove and cinnamon oil (100 ppm). Byung-Sung (2008) reported that the sensory evaluation of the taste and savour in fried and boiled chicken meat were better from broiler chicken fed with diets containing cinnamon powder. Al-Kassie (2009) found that different levels of oil extract derived from thyme and cinnamon had significant effects on dressing percentage, abdominal fat, and internal organs percentage (liver, heart and gizzard). Cifci et al. (2009) reported that supplementation of cinnamon oil (500, 1000 ppm) in diet decreased the cholesterol levels of serum and chicken meat. But they also suggested that dietary cinnamon supplementation would improve the nutritional quality of chicken meat as cinnamon oil plays an important role as an endogenous antioxidant and could be applicable as a protective agent against tissue damage. Isabel and Santos (2009) found no effect on dietary supplementation with plant extract based on a blend of clove and cinnamon oil (100 ppm). Stefan et al. (2009) did not observe any effect of cinnamon on the concentration of MDA in the liver and kidney tissues. Koochaksaraie et al. (2011) revealed that supplementation of cinnamon powder at the dose of 250 to 2000 mg/kg broiler diets did not have any influence on the carcass parameters. Toghyani et al. (2011) observed no impact of diets on carcass parameters supplemented with 2 and 4 g/kg of cinnamon powder in broilers. He also found that the sensory evaluation showed no change in meat flavour and odour intensity or desirability after the dietary supplementation. Sampath and Atapattu (2013) reported that the dietary supplementation of CNPW at 0.1 and 0.4 percent increased the abdominal fat content as compared to control. It was concluded that dietary CNPW used had no growth promoting or fat reducing effects in broiler chicken. Sang-Oh et al. (2013) reported that dietary supplementation of cinnamon powder at 5 percent level to broilers improved the quality of chicken meat including colour, flavour, texture and overall acceptability and shelf life. Safa-Eltazi (2014) reported that the broiler chicken fed with cinnamon showed significantly (P<0.05) higher flavour scores for breast and thigh meat and also improved the dressing percentage significantly (P<0.05). Singh et al. (2014) reported that the supplementation of dietary cinnamon improved (P<0.05) the sensory attributes of the meat as compared to control group. Symeon et al. (2014) reported that carcass and meat characteristics of the broilers chickens had no significant effect with cinnamon oil supplementation at the concentrations of 0.5 and 1 ml/kg feed. Shirzadegan (2014) observed that the addiction of CP to the diets of broiler chicks had no significant effects (P>0.05) on cholesterol, triglyceride, low density lipoproteins (LDL), abdominal fat, gizzard and heart weights and on breast protein percentage. Najafi and Taherpour (2014) reported no significant
effect (P<0.05) on the relative weights of spleen, bursa of Fabricius and thymus with dietary treatment of cinnamon.

5. Economics
Safa-Eltazi (2014) reported that the highest profitability ratio was obtained by the diet supplemented with 5% cinnamon powder in the broiler diet. Singh et al. (2014) revealed that dietary inclusion of cinnamon powder at 0.5 percent level had the potential to act as a natural alternative to antibiotic growth promoters in respect of cost. Hossain et al. (2014) concluded that addition of cinnamon powder at 1 percent dose resulted in significantly (P<0.05) higher BCR than the control.

6. Conclusion
It can be concluded that use of cinnamon in the diet of broiler chicken at various level has positive impact on the performance in terms of body weight gain, feed intake and FCE, overall performance index, carcass characteristics as well as net profit per birds over control group. It has positive impact on blood profile and is also effective for the antioxidant, antimicrobial, anti-inflammatory, anticancer and antidiabetic activities via receptor mediated mechanisms.

References


Livestock Research International | April-June, 2018 | Volume 06 | Issue 02 | Pages 42-47
© 2018 Jakraya