

TURMERIC (*CURCUMA LONGA*) AS AN ALTERNATIVE TO IN-FEED ANTIBIOTIC ON THE GUT HEALTH OF BROILER CHICKENS

S.Namagirilakshmi, P.Selvaraj*, K.Nanjappan, S.Jayachandran and P. Visha

Department of Veterinary Physiology
Veterinary College and Research Institute, Namakkal- 637 002

ABSTRACT

A study was carried out to assess the effect of turmeric as an herbal feed on the small intestinal microbial count, organs weight and histological characteristics of broiler chickens from 0-6 weeks of age. Day old broiler chicks (120 No.) were randomly allotted to five treatment groups with three replicates of eight chicks each. The chicks were reared up to 42 days and slaughtered for collecting data on organ weight, small intestinal total microbial count and histological characteristics. The small intestinal total microbial count decreased significantly whereas the lactobacillus count increased significantly ($P < 0.01$) by turmeric supplementation. The weight (g/kg) of both pancreas and spleen increased significantly ($P < 0.05$) between turmeric fed groups and control. The intestinal villi length increased significantly ($P < 0.01$) in a dose related manner among the treatment groups compared to the control. Similarly, the bile duct epithelial primary and secondary fold count markedly ($P < 0.05$) increased in 0.75 and 1.0% turmeric fed groups than other groups. It can be concluded that turmeric powder can be used as an alternative to in-feed-antibiotics for improving gut health in broiler chickens.

Keywords: Turmeric, intestinal microbial count, visceral organs weight,
intestinal villi length

A variety of feed additives are being included in poultry diet to derive maximum growth of broiler chickens. Use of in-feed-antibiotics not only increases the cost of production but also leads to residues in meat and eggs (Yang *et al.*, 2009) and develop antibiotic resistance in microbes (Denli *et al.*, 2003). Turmeric powder (*Curcuma longa*) has long been used as antibacterial agent, antioxidant, growth stimulant etc for centuries in India. Hence, the present study was conducted to assess the

efficacy of turmeric as a nutraceutical to promote gut health and also to ascertain the optimal level of inclusion in the broiler diet.

Straight-run day old broiler chicks (120 No.) were wing banded and randomly allotted to five treatment groups with three replicates of eight chicks each. The chicks were reared in cages up to six weeks of age. The experimental standard diet

¹ Part of M.V.Sc., thesis of the first author submitted to Tamil Nadu Veterinary and Animal Sciences University, Chennai-51

* Corresponding author

was formulated (BIS, 1992) and fed to the birds as per the following treatment schedule. T₁ - standard diet (control) and in the diets T₂ – T₅, turmeric was added to the standard diet at 0.25, 0.5, 0.75 and 1.0% respectively without including regular feed antibiotics. Broiler starter and finisher diets were fed *ad libitum* to the birds from 1-21 and 22-42 days of age respectively.

Birds were slaughtered on day 42 and the ileal contents were collected for microbial count (Baker and Brench, 1980). Similarly, organs viz, heart, spleen, liver, gizzard, bursa of Fabricius, pancreas, thymus and abdominal fat pad were collected, weighed and expressed as g /kg live body weight. A small tissue piece from ileum, liver, pancreas and bile duct were collected for histomorphological studies (Bancroft and Stevens, 1996). All the data obtained were analyzed statistically using completely randomized design (Snedecor and Cochran, 1994).

The intestinal microbial count was significantly reduced (P<0.01) by 45, 54, 56 and 48 % in 0.25%, 0.50 % 0.75% and 1.0% turmeric fed groups respectively compared to control. The observation of the present study agrees with Samarasinghe *et al.* (2003) who observed that inclusion of turmeric at 1g/kg diet lowered microbial colony forming unit in the ileal content of broiler chickens. This reduction in microbial load of broiler chickens could be due to the antibacterial effect of turmeric on intestinal microbiota. Similarly, lactobacillus count was significantly higher (P<0.01) in 1.0% turmeric fed group compared to other groups. These observations differed from the reports of Araujo and Leon (2001) who found that turmeric alcoholic extract (10-200mg/ml) inhibited the growth of lactobacilli *in vitro*. The higher number of lactobacillus count in 1% turmeric fed chicks might be due to stimulatory effect at higher level of turmeric in feed.

The weight (g/kg) of pancreas and spleen increased significantly (P<0.05) in all the turmeric fed groups than control. These results concur with Al-Sultan (2003) who reported higher spleen weight index in broilers fed turmeric at 0.5% of feed. However, feeding of turmeric did not alter the weight of the liver, heart, gizzard, thymus, bursa of Fabricius and abdominal fat pad. The weight and length of small and large intestine did not vary between turmeric fed and control.

Turmeric feeding to broiler chickens significantly increased (P<0.01) the intestinal villi length than control. However, villi width, crypt length and crypt width were not altered among the groups (data not shown). This increase in the intestinal villi length could be attributed to the turmeric effect on gut health by reducing intestinal pH, bacterial load and selectively increasing lactobacillus count (Siew *et al.*, 2005). The bile duct epithelial fold length was significantly increased (P<0.01) in broiler chickens fed turmeric. Turmeric has been known to produce hyperplasia of bile duct muscles and increase bile flow output.

There was no change in the histological structure of liver and pancreas among the treatment groups and control. Kumari *et al.* (2007) also observed no change in histomorphological structures of visceral organs in broiler birds fed *Curcuma longa* powder at 1g/kg diet. However, Al-Sultan and Gameel (2004) reported that turmeric at the rate of 10% in feed resulted in degenerative changes in the liver of broiler chickens. But, in our study the turmeric was included in diet to the maximum of 1% which might be the reason for no change in the structures of liver and pancreas. It can be inferred from the above findings, that turmeric powder up to 1% of diet may be used as an alternative to in-feed-antibiotic for improving gut health in broiler chickens.

ACKNOWLEDGEMENT

The authors express their thankfulness to the Tamil Nadu Veterinary and Animal Sciences University and Dean, Veterinary College and Research Institute, Namakkal for the facilities provided.

REFERENCES

- Al-Sultan, S.I. (2003). The effect of *curcuma longa* (turmeric) on overall performance of broiler chickens. *International Journal Poultry Science*, 3: 333-336.
- Al-Sultan, S.I. and Gameel, A.A. (2004). Histopathological changes in the livers of broiler chicken supplemented with turmeric (*Curcuma longa*). *International Journal Poultry Science*, 3: 333-336.
- Araujo, C. A. C. and Leon, L. L. L. (2001). Biological activities of *Curcuma longa* L. *Memorias do Instituto Oswaldo Cruz.*, 96:723-728.
- Baker, F.J. and Brench, M.R. (1980). Total and viable counts. In: *Medical Microbiological Techniques*. Butterworth and Co, Ltd., U.K.
- Bancroft, J.D. and Stevens, A. (1996). *Theory and Practice of Histological Techniques*. 4th edn., Churchill Livingstone, London.
- Barton, M.D. (2000). Antibiotic use in animal feed and its impact on human health to maintain poultry health, *Nutrition Research Review*, 13: 279-299.
- BIS, 1992. *Nutrient Requirements for Poultry*. Bureau of Indian Standards, I.S.13574.
- Denli, M., Ferda Okan and Kemal Celik. (2003). Effect of dietary organic acid and antibiotic supplementation to diets on broiler performance and carcass yield. *Pakistan Journal of Nutrition*, 2:89-91.
- Kumari, P., Gupta, M.K., Ranjan, R.K., Singh, K.K. and Yadava, R. (2007) *Curcuma longa* as feed additive in broiler birds and its pathophysiological effects. *Indian Journal of Experimental Biology*, 45: 272-277
- Samarasinghe, K., Wank, C., Silva, K. F. S. T. and Gunasekara, J. M. D. M. (2003). Turmeric (*Curcuma longa*) root powder and mannanoligosaccharides as alternatives to antibiotics in broiler chicken diet. *Asian –Australasian Journal of Animal Science*, 16: 1495-1500.
- Sieo, C.C., Abdullah, N., Tan, W.S. and Ho, Y.W. (2005). Influence of beta-glucanase-producing *Lactobacillus* strains on intestinal characteristics and feed passage rate of broiler chickens. *Poultry Science*, 84: 734-741.
- Snedecor, G. W. and Cochran, E. G. 1994. *Statistical Methods*, 9th ed, USA, Iowa State University Press, USA.
- Yang, Y, Iji, P.A. and Choct, M. (2009). Dietary modulation of gut microflora in broiler chickens: a review of the role of six kinds of alternatives to in-feed antibiotics. *World's Poultry Science Journal*, 65: 97-114.