Effect of garlic and holy basil leaf powder supplementation on chemical composition and cholesterol content of breast and thigh muscles of broiler chicks

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Abstract
The purpose of this research work was to investigate the effect of dietary supplementation with different levels of garlic and holy basil leaf powder on chemical composition and cholesterol content of breast and thigh muscles of broiler chicks. A total of 280 day-old broiler chicks were procured and randomly distributed into 7 treatments, each treatment had 10 replicates with 10 chicks in each replicate. T1 was served as control and fed a basal diet formulated as per [3] standards. T2 and T3 were fed with garlic powder @ 0.5, 1% feed, respectively. T4 and T5 were given with holy basil leaf powder @ 0.5, 1% feed, respectively. T6 was fed with garlic powder and holy basil leaf powder @ 0.5% each. T7 was treated with garlic powder and holy basil leaf powder @1.0% each. The breast and thigh muscles were analyzed for moisture, crude protein, ether extract and cholesterol content. Present study depicted that the percent moisture, CP and EE contents of the muscles in broilers had no significant difference among the mean values of different treatments. Cholesterol content in thigh muscle was lowest (P<0.05) in T6 & T7 and highest in T1 treatment. Similarly, in breast muscle, was lowest (P<0.05) in T6, & T7 and highest in T1 group. Thus supplementation of garlic and holy basil powder @ 0.5% and 1.0% showed the best results in terms of decreasing cholesterol content.

Keywords: Garlic, holy basil, broiler, cholesterol

Introduction
Growth promoters are agents added to poultry feeds in order to enhance the feed conversion efficiency and body growth and broadly can be categorized as Antibiotic growth promoters (AGP) and Non–Antibiotic growth promoters (NAGP). Antibiotic growth promoters have been helpful in improvement of growth performance and feed conversion ratio in poultry [6, 8, and 13]. However, constant treatment of poultry by antibiotic may result in residues of these substances in poultry products and bacteria resistance against treatments in human body. Due to such threats to human health, use of antibiotics in poultry is banned in many countries [1, 4, and 17]. On the other hand use of NAGP is commonly regarded as favourable alternatives to AGP in poultry production. The main advantage of NAGP over AGP is that they usually do not bear any risk regarding bacterial resistance or undesired residues in meat. Addition of NAGP to feeds of poultry may have a number of beneficial effects, including rapid development of a healthy gut microflora and stabilization of digestion along with improved feed efficiency. NAGP include predominantly organic acids, probiotics, prebiotics, synbiotics, phytochemicals, feed enzymes and immune stimulants. Among these alternatives, phytogens are drawing much attention nowadays. Phytogens are derived from herbs, spices or aromatic plants and have shown antimicrobial, antifungal, antiviral, antioxidant or sedative properties. A complex mixture of bioactive compounds present in them is known for their appetizing effects, since they increase the palatability of the feed and stimulate endogenous digestive enzymes. Beneficial effects of bioactive plant substances in animal nutrition may include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune responses and antibacterial, antiviral and antioxidant actions [20]. The name “Allium sativum” is derived from the Celtic word “all”, meaning burning or stinging, and the Latin “sativum” “meaning planted or cultivated” [19]. Garlic is a member of the family Liliaceae [18]. Garlic contains at least 33 sulfur compounds, several enzymes, 17 amino acids and minerals such as selenium [11]. The sulphur compounds are responsible both for garlic’s pungent odour and many of its medicinal effects like lowering cholesterol level [5].
Garlic appears to enhance the synthesis of nitric oxide, which accounts for its antihypertensive and coagulant effects[10]. The purpose of this investigation was to find out the effect of dietary supplementation with different levels of garlic and holy basil leaf powder on chemical composition and cholesterol content of breast and thigh muscles of broiler chicks.

Materials and Methods
A total of 280-day-old commercial broiler chicks (Vencobb-400) were procured and randomly distributed into seven treatment groups of 40 chicks each. Each treatment group was further subdivided into four replicates of ten chicks each. The herbs used in the study were purchased from local market. The experimental diets (Table 1) were formulated to meet the nutrient recommendations[3]. Growth trial of 6 weeks was conducted in a complete randomized design comprising seven dietary treatments. T1 was served as control and fed a basal diet formulated as per standards. T2 and T3 were fed with garlic powder (GP) @ 0.5, 1% feed respectively. T4 and T5 were given with holy basil leaf powder (HBLP) @ 0.5, 1% feed respectively. T6 was fed with 0.5% GP and 0.5% HBLP. T7 was treated with 1.0% GP and 1.0% HBLP.

The chicks were kept hygienically on floor litter system in separate pens. All the birds were reared adopting uniform management conditions. The chicks were brooded at 35°C during the first week and thereafter the temperature was reduced by 3°C every week until the temperature reached 25±1°C. The birds were vaccinated against prevailing diseases adopting a standard protocol.

Procurement of feed ingredients, additives and supplements
All feed ingredients, additives and supplements were procured in one lot before the start of the experiment. The ingredients, additives and supplements used in the diet formulations were maize, soybean meal, rice polish, fish meal, ground- nut cake, soybean oil, mineral mixture, vitamin mixtures, coccidiostat, lysine, DL-methionine and choline chloride. The composition, mixing rate and cost of additives /supplements used in ration formulations are presented in Table 1.

Table 1: Composition, rate of mixing and cost of feed additives/supplements.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Additive/supplement</th>
<th>Composition</th>
<th>Rate of mixing (g/100 kg)</th>
<th>Cost (Rs/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vitamin mixture-1 (Spectromix)</td>
<td>Each gm contained vitamin A-82500 IU, vit. D3-12000 IU, vit. B12-50 mg and vit. K-10 mg</td>
<td>10</td>
<td>930.60</td>
</tr>
<tr>
<td>2</td>
<td>Vitamin, amino acids and Ca mixture- II (Spectrum-BE)</td>
<td>Each gm contained vitamin B1-8 mg; vit. B6-16 mg, vit. B12-80 mg, niacin-120 mg, calcium pantothenate-80 mg, vit. E-160 mg, L-lysine hydrochloride-10 mg, DL-methionine-10 mg and calcium-260 mg</td>
<td>20</td>
<td>697.50</td>
</tr>
<tr>
<td>3</td>
<td>Coccidiostat (Cocciwin)</td>
<td>Dinitro-O-Toluidide 25% (coccidiostat)</td>
<td>50</td>
<td>290.00</td>
</tr>
<tr>
<td>4</td>
<td>Choline chloride</td>
<td>60 percent choline chloride</td>
<td>100</td>
<td>130.00</td>
</tr>
<tr>
<td>5</td>
<td>Lysine</td>
<td>98 percent lysine</td>
<td>50</td>
<td>271.80</td>
</tr>
<tr>
<td>6</td>
<td>DL-methionine</td>
<td>98 percent methionine</td>
<td>80</td>
<td>850.00</td>
</tr>
<tr>
<td>7</td>
<td>Chlorotetracycline (CTC)</td>
<td>Powder form</td>
<td>33.5</td>
<td>245.00</td>
</tr>
<tr>
<td>8</td>
<td>Mineral mixture</td>
<td>Moisture maximum 3%, calcium minimum 32%, phosphorus minimum 6%, manganese- minimum 0.27%, iodine minimum 0.01%, zinc minimum 0.26%, copper minimum 0.001%, iron minimum 0.001% and fluorine maximum 0.03%</td>
<td>2000</td>
<td>55.00</td>
</tr>
<tr>
<td>9</td>
<td>Soyabean oil</td>
<td>Ether extract 99.4%</td>
<td>5000</td>
<td>125.00</td>
</tr>
<tr>
<td>10</td>
<td>Garlic powder</td>
<td>Powder form</td>
<td>500 and 1000 as per treatment</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Holy basil (Tulsi) powder</td>
<td>Powder form</td>
<td>500 and 1000 as per treatment</td>
<td>1020</td>
</tr>
</tbody>
</table>

Cholesterol composition in breast and thigh muscles

Extraction of lipids
Total lipids from sample from breast and thigh muscles were extracted according to the method of[2] with slight modification. Meat sample (25 g) was homogenized with 100 ml solvent (chloroform: methanol, 3:1) for 5 minutes. It was kept for 10 minutes and then this mixture was put on Buchner suction filter. Residue was homogenized two times again as above. Combined organic filtrates were transferred to separating funnel. Two volumes of 0.88% aqueous potassium chloride were added and the funnel was shaken vigorously. Non lipid material was partitioned to upper aqueous phase by keeping the funnel undisturbed for 12 hours. Lower layer was drawn off and dried over sodium sulphate. Lower phase after removing upper phase, if cloudy was made clear by addition of a few drops of methanol. Lipid extract was dried to a constant weight at 60°C, first in water bath and then in hot air oven. Cholesterol, HDL and LDL of extracted fat from breast and thigh muscles was estimated by using “ERBA Kit” in Automatic Analyzer from this lipid extract.

Statistical analysis
Data was analysed statistically as described by[19]. Analysis of variance was used to study the differences among treatment means and they were compared by using Duncan’s Multiple Range Test (DMRT) as modified by[19].

Result and discussion

Thigh and breast muscle cholesterol (mg/dl)
Data pertaining to cholesterol in thigh and breast muscles of broilers under different dietary treatments at the end of experimental period (42 days of age) are presented in Table 2 and Fig. 1.

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The reduction in cholesterol might be attributed to the organic tellurium compounds that are found in high concentration in garlic buds, which may be inhibiting squalene epoxidase, the penultimate enzyme in the synthetic pathway of cholesterol \[18\]. Reduction in cholesterol with herbal supplementation has also been reported previously by \[7, 12, 18\].

### Conclusion

Thus from this study we can conclude that the supplementation of garlic powder and holy basil leaf powder at 0.5% and 1.0% showed best result in terms of decreasing the cholesterol content of breast and thigh muscles. Whereas there is no significant effect of supplementation on moisture, crude protein and ether extract content of both types of muscles.

### References

5. Chowdhury SR, Chowdhury SD, Smith TK. Effects of...


