Effect of phytogenic mixture supplementation on meat quality and survivability of broilers during winter season

Vishal Sharma, Devender Singh Bidhan, Sanjay Yadav, Sandeep Dhillod and YC Bangar

Abstract
An experiment was conducted to study the effect of phytogenic mixture supplementation on the meat quality and survivability of broilers in winter season. Two hundred eighty eight day-old commercial chicks were subjected to eight dietary treatments consisting of three replicates of twelve chicks in each replicate were reared for a period of 6 weeks in winter season to find the effect of following treatments, namely; T0- Negative control, T1-control, T2-0.5% Amla + 0.5% Ashwagandha + 0.25% Turmeric powder,T3-0.25% Amla + 0.5% Ashwagandha + 0.25% Turmeric powder, T4-0.125% Amla + 0.5% Ashwagandha + 0.25% Turmeric powder, T5- 0.5% Amla + 0.25% Ashwagandha +0.25% Turmeric powder, T6-0.5% Amla + 0.125% Ashwagandha +0.25% Turmeric powder and T7-0.5% Amla + 0.5% ashwagandha + 0.125% Turmeric powder. The meat quality and survivability of broilers were studied. Standard managemental practices were followed during the experimental period. Supplementation of phytogenic mixture improved the meat quality and survivability in winter season. Better values were recorded in treatment groups supplemented with 0.5% amla and 0.5% ashwagandha with 0.25% or 0.125% turmeric powder (T7 and T2).
Addition of phytogenic mixture consisting of 0.5% amla and 0.5% ashwagandha with 0.25% or 0.125% turmeric powder can be effectively supplemented as an alternative to antibiotics growth promoter in poultry ration in winter for the production of lean and herbal meat with improved effect on the survivability of birds.

Keywords: Broilers, phytogenic mixture, amla, ashwagandha, turmeric, season

Introduction
Poultry production in India has undergone a paradigm shift, growing at around 8-12% annually over the last three decades with broiler meat volumes growing at more than 10%. The focus of modern broiler farming is on the production of quality meat with improved livability. Antibiotics, the major growth promoters also improve the production parameters and utilization of nutrients in meat producing chicks. But, due to negative effects on health, use of antibiotics in poultry is banned in many countries [1, 2, 3, 4]. In view of this, herbal and plant derivatives shall be valuable alternatives to promote growth and health in poultry as there is no residual toxicity. Phytopharmaceuticals are derived from herbs, spices or aromatic plants and have shown antimicrobial, antifungal, antiviral, antioxidant or sedative properties. These are generally recognized as safe both for animals as well as humans; environmentally friendly; can be applicable in the diets of poultry and thus, address organic livestock production [5]. Amla (Embllica officinalis), Ashwagandha (Withania somnifera) and Turmeric (Curcuma longa) have been a valuable ingredient of various medicines in India since times immemorial. Keeping in view the facts stated above, the present study was planned to observe the effects of supplementation of phytogenic mixture on the meat quality and survivability of broilers.

Materials and Methods
Location of study
The present investigation was conducted at the Poultry Farm of the Department of Livestock Production Management, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar. The experiment was approved by the Institutional Animal Ethics Committee.

Addition of phytogenic mixture consisting of 0.5% amla and 0.5% ashwagandha with 0.25% or 0.125% turmeric powder (T7 and T2).

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Experimental design

288 one-day-old broiler chicks of Ven-Cobb strain-400 were purchased from a reputed local hatchery. The chicks were randomly distributed into eight treatment groups each having 36 chicks namely; T<sub>o</sub>- Negative control, T<sub>1</sub>-control, T<sub>2</sub>-0.5% Amla + 0.5% Ashwagandha + 0.25% Turmeric powder, T<sub>3</sub>- 0.25% Amla + 0.5% Ashwagandha + 0.25% Turmeric powder, T<sub>4</sub>-0.125% Amla + 0.5% Ashwagandha + 0.25% Turmeric powder, T<sub>5</sub>- 0.5% Amla + 0.25% Ashwagandha + 0.25% Turmeric powder, T<sub>6</sub>-0.5% Amla + 0.125% Ashwagandha +0.25% Turmeric powder and T<sub>7</sub>-0.5% Amla + 0.5% Ashwagandha + 0.125% Turmeric powder. Further each group was further divided into three replicates of 12 chicks each.

Experiments procedure

The chicks were reared under strict hygienic conditions. Chicks were vaccinated against new castle disease (F1 strain) on 5<sup>th</sup> day and Infectious Bursal disease (IBD) on 14<sup>th</sup> day of experiment through intra-ocular route. Standard management practices including brooding, proper lighting, raking of litter, cleaning of feeders, waterers, etc. were followed. Before formulation of broiler rations, the feed ingredients were analyzed for proximate composition. Based upon the proximate composition of feed ingredients, the broiler pre-starter, starter and finisher rations were formulated according to BIS [7] specifications (Table 1).

Table 1: Quantity of ingredients and chemical Composition (% DM basis) of experimental diet (kg/100 kg feed)

<table>
<thead>
<tr>
<th>Name of Ingredients</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-starter (0-1 week)</td>
</tr>
<tr>
<td>Maize</td>
<td>55</td>
</tr>
<tr>
<td>Soyabean meal</td>
<td>20</td>
</tr>
<tr>
<td>Ground nut cake</td>
<td>12.5</td>
</tr>
<tr>
<td>Fish meal</td>
<td>8</td>
</tr>
<tr>
<td>Mineral mixture</td>
<td>2</td>
</tr>
<tr>
<td>Vegetables oil</td>
<td>2.5</td>
</tr>
<tr>
<td>Feed additives (g/100kg of ration)</td>
<td>0-1 week</td>
</tr>
<tr>
<td>Spectromix (g)</td>
<td>10</td>
</tr>
<tr>
<td>Spectro BE (g)</td>
<td>20</td>
</tr>
<tr>
<td>Cocciwin (g)</td>
<td>50</td>
</tr>
<tr>
<td>Choline chloride (g)</td>
<td>50</td>
</tr>
<tr>
<td>Lysine (g)</td>
<td>50</td>
</tr>
<tr>
<td>DL - methionine (g)</td>
<td>80</td>
</tr>
<tr>
<td>Chemical composition</td>
<td>Pre-starter</td>
</tr>
<tr>
<td>Moisture%</td>
<td>10.54</td>
</tr>
<tr>
<td>Crude protein%</td>
<td>23.05</td>
</tr>
<tr>
<td>Crude fibre%</td>
<td>3.63</td>
</tr>
<tr>
<td>Ether extract%</td>
<td>6.96</td>
</tr>
<tr>
<td>Total ash%</td>
<td>6.32</td>
</tr>
<tr>
<td>Nitrogen free extract%</td>
<td>49.50</td>
</tr>
<tr>
<td>Metabolizable energy (Kcal/Kg)</td>
<td>2950</td>
</tr>
</tbody>
</table>

1. Mineral mixture (salt free): Ca (32%), P (6%), Mn (0.27%), Zn (0.26%), Iodine (0.01%), Fe (1000 ppm), Cu (100 ppm), and Co (50 ppm).
3. Intermix BE (DS) Powder: Each gm contained Vit.B<sub>12</sub>-16 mg, Vit.B<sub>1</sub>-16 mg, Vit.B<sub>12</sub>-80 mg, Niacin- 120mg, Vit. E-80 mg, folic acid-6 mg and Calcium pentothenate -80 mg.
4. Covicheck: Amprolium-200 mg, vitamin K<sub>1</sub>-10 mg
5. Lysine: Contained 98 per cent lysine.
6. DL- methionine: Contained 98 per cent methionine.
7. Choline chloride: Contain 60 percent choline.

Observations recorded

Meat quality

Samples of breast and thigh muscles were taken from each of the slaughtered birds and stored in deep-freeze separately for further analysis. These samples were analyzed for moisture, ash, protein and ether extract (fat) as per AOAC [6] and for WHC [8] & pH [9].

Mortality rate

The birds were reared with special care to observe any sign of stress and regular observations were made to record the occurrence of mortality in experimental birds to estimate the rate of mortality in percentage relative to different treatments. The dead birds were sent to the Department of Pathology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar for post-mortem examination to know the cause of mortality.

Statistical analysis

Data obtained were subjected to statistical analysis as per Snedecor and Cochran [10] using Completely Randomized Design (CRD). The mean differences among different treatments were separated by Duncan’s multiple range tests. Consequently, a level of (P<0.05) was used as the criterion for statistical significance [11].

Results and Discussion

Meat quality of broiler meat

The meat quality of broiler meat (leg and breast portion) supplemented with phytogenic mixture is presented in Table 2.

In leg meat, moisture, ash, WHC and pH values were non-significantly (P<0.05) different ranging from 74.12 (T<sub>0</sub>) to 74.82 (T<sub>7</sub>), 1.21 (T<sub>0</sub>) to 1.31 (T<sub>2</sub>), 28.14 (T<sub>2</sub>) to 28.80 (T<sub>4</sub>) and 5.29 (T<sub>3</sub>) to 5.36 (T<sub>1</sub>) respectively. Protein and fat contents of leg portion differ significantly (P<0.05) among treatment groups ranging from 15.93 (T<sub>3</sub>) to 17.02 (T<sub>4</sub>) and 6.17 (T<sub>4</sub>) to 6.79 (T<sub>0</sub>).
7.66 (T1), respectively. Similarly, in breast portion moisture, ash, WHC and pH values were non-significantly (P > 0.05) different ranging from 75.31 (T0) to 75.88 (T2), 1.61 (T0) to 1.81 (T2), 27.40 (T0) to 29.30 (T2) and 5.13 (T0) to 5.45 (T4) respectively. Protein and fat contents of breast portion differed significantly (P < 0.05) among treatment groups ranging from 20.05 (T0) to 21.10 (T2) and 1.12 (T1) to 1.90 (T0), respectively. The mean values of protein and fat in leg portion of birds in T2, T3, T4, T5, T6 and T7 were significantly better than T0. The mean values of fat in breast portion of birds in T2, T3, T4, T6 and T7 were significantly better than T0. The mean values of protein in breast portion of birds in T1 and T2 were significantly better than T0. While the mean values of protein in breast portion of birds in T3, T4, T5, T6 were comparable to T1.

**Table 2:** Effect of phytochemical mixture on mean meat quality of broiler meat (leg and breast) in winter season

<table>
<thead>
<tr>
<th>Portion</th>
<th>Parameter</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
<th>T7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg</td>
<td>Moisture</td>
<td>74.12±0.85</td>
<td>74.43±0.82</td>
<td>74.79±0.93</td>
<td>74.52±0.81</td>
<td>74.71±0.84</td>
<td>74.57±0.93</td>
<td>74.66±0.85</td>
<td>74.82±0.81</td>
</tr>
<tr>
<td></td>
<td>Ash</td>
<td>1.21±0.12</td>
<td>1.24±0.11</td>
<td>1.31±0.13</td>
<td>1.29±0.13</td>
<td>1.29±0.15</td>
<td>1.26±0.14</td>
<td>1.29±0.12</td>
<td>1.28±0.12</td>
</tr>
<tr>
<td></td>
<td>Fat</td>
<td>7.68 ±0.07</td>
<td>7.66 ±0.07</td>
<td>6.14 ±0.06</td>
<td>6.74 ±0.05</td>
<td>6.48 ±0.08</td>
<td>6.58 ±0.09</td>
<td>6.33 ±0.05</td>
<td>6.13 ±0.07</td>
</tr>
<tr>
<td></td>
<td>Protein</td>
<td>15.09 ±0.31</td>
<td>15.91 ±0.33</td>
<td>17.08 ±0.34</td>
<td>16.35 ±0.34</td>
<td>16.58 ±0.37</td>
<td>16.67 ±0.36</td>
<td>16.52 ±0.36</td>
<td>17.11 ±0.35</td>
</tr>
<tr>
<td></td>
<td>WHC</td>
<td>28.52±0.71</td>
<td>28.31±0.77</td>
<td>28.19±0.85</td>
<td>28.60±0.87</td>
<td>28.14±0.76</td>
<td>28.50±0.81</td>
<td>28.33±0.74</td>
<td>28.80±0.73</td>
</tr>
<tr>
<td></td>
<td>pH</td>
<td>5.33±0.21</td>
<td>5.36±0.22</td>
<td>5.33±0.23</td>
<td>5.30±0.26</td>
<td>5.33±0.24</td>
<td>5.29±0.25</td>
<td>5.32±0.29</td>
<td>5.30±0.25</td>
</tr>
<tr>
<td>Breast</td>
<td>Moisture</td>
<td>75.31±0.85</td>
<td>75.76±0.78</td>
<td>75.88±0.83</td>
<td>75.61±0.72</td>
<td>75.43±0.81</td>
<td>75.39±0.94</td>
<td>75.71±0.81</td>
<td>75.78±0.92</td>
</tr>
<tr>
<td></td>
<td>Ash</td>
<td>1.61±0.52</td>
<td>1.73±0.42</td>
<td>1.71±0.49</td>
<td>1.78±0.53</td>
<td>1.81±0.44</td>
<td>1.77±0.55</td>
<td>1.65±0.43</td>
<td>1.79±0.43</td>
</tr>
<tr>
<td></td>
<td>Fat</td>
<td>1.90±0.07</td>
<td>1.87±0.03</td>
<td>1.12±0.04</td>
<td>1.17±0.04</td>
<td>1.25±0.02</td>
<td>1.34±0.05</td>
<td>1.43±0.02</td>
<td>1.13±0.02</td>
</tr>
<tr>
<td></td>
<td>Protein</td>
<td>20.05±0.49</td>
<td>20.31±0.47</td>
<td>21.00±0.48</td>
<td>20.54±0.51</td>
<td>20.34±0.47</td>
<td>20.78±0.53</td>
<td>20.69±0.42</td>
<td>21.10±0.46</td>
</tr>
<tr>
<td></td>
<td>WHC</td>
<td>27.40±0.86</td>
<td>28.11±0.88</td>
<td>29.30±0.91</td>
<td>28.40±0.84</td>
<td>28.80±0.96</td>
<td>27.90±0.85</td>
<td>28.10±0.87</td>
<td>29.00±0.86</td>
</tr>
<tr>
<td></td>
<td>pH</td>
<td>5.13±0.45</td>
<td>5.33±0.41</td>
<td>5.38±0.56</td>
<td>5.22±0.42</td>
<td>5.45±0.51</td>
<td>5.31±0.41</td>
<td>5.38±0.44</td>
<td>5.42±0.47</td>
</tr>
</tbody>
</table>

Values are means ±standard errors.
Means bearing different superscripts, differ significantly (P < 0.05) row wise.

Analogous to the findings of the present study Daneshyar et al. (2011) observed non-significant differences between the treatments for pH and ash of the thigh meat [12]. Furthermore, as compared to the control diet, turmeric rhizome powder supplementation increased the protein content of thigh meat. Mondal et al. (2015) observed a significant decrease in fat content of broiler with supplementation of turmeric powder in diet [13]. Divergent to present findings Al-Sultan (2003) observed non-significant difference in protein percent of breast and thigh in birds receiving diet containing 0.5% turmeric. Daneshyar et al. (2011) [14] observed non-significant differences between the treatments for concentrations of fat of the thigh meat in turmeric rhizome powder supplemented diet [12]. It may be inferred that the better meat quality parameters are observed due to better utilization of feed due to antiostress, anti-oxidative and immunomodulatory properties of phytochemical mixture. The decreased fat content in meat of phytochemical supplemented treatment groups support the beneficial properties such as anti-cholesterogenic, anti-lipidemic etc. of phytochemical mixture while increased protein content may be attributed to increased muscle mass formation facilitated by anabolic properties of phytochemical mixture supplementation.

**Mortality**

The birds were observed regularly for any abnormal behaviour and mortality during the experimental period. Post-mortem findings of dead birds were recorded. The dead birds were sent to the Department of Pathology, College of Veterinary Sciences, LUVAS, Hisar for post-mortem examination to know the cause of mortality. Per cent mortality recorded has been presented in Table 3.

**Table 3:** Effect of phytochemical mixture on mortality of broilers in winter season

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Age in weeks</th>
<th>Total Mortality</th>
<th>Mortality Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0 (Negative Control)</td>
<td>II I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 (Control)</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>T2 (0.5% Amla + 0.5% Ashwagandha+ 0.25% Turmeric powder)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T3 (0.25% Amla + 0.5% Ashwagandha+ 0.25% Turmeric powder)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T4 (0.125% Amla + 0.5% Ashwagandha+ 0.25% Turmeric powder)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T5 (0. 5% Amla + 0.25% Ashwagandha + 0.25% Turmeric powder)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T6 (0.5% Amla + 0.125% Ashwagandha+0.25% Turmeric powder)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>T7 (0.5% Amla + 0.5% Ashwagandha + 0.125% Turmeric powder)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

The results of present study are comparable to that of Pande (2000) and Rajeshwar et al. (2001) who recorded better livability in polyherb supplemented birds [15, 16]. Narahari and Ahmed (2003) and Narayanswamy and Santhosh Kumar (2004) reported reduced mortality in the birds supplemented polyherbal mixture [17, 18]. The results of the present experiment revealed that supplementation of phytochemical mixture in the ration of broilers had improved effect on survivability as compared to the control group. Mortality in control group is higher than the phytochemical supplemented diets.
Conclusion
It can be concluded that supplementation of phytogenic mixture improved the meat quality and survivability in winter season. Better values were recorded in treatment groups supplemented with 0.5% amla and 0.5% ashwagandha with 0.25% or 0.125% turmeric powder (T2 and T3). So, the Phytogenic mixture consisting of 0.5% amla and 0.5% ashwagandha with 0.25% or 0.125% turmeric powder can be effectively supplemented as an alternative to antibiotics growth promoter in poultry ration in winter for the production of lean and herbal meat with improved effect on the survivability of birds.

Acknowledgments
Authors are thankful to the Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, for providing facilities to carry out the present study.

References