Effect of Water Based Infusion of Aloe barbedensis, Pimpinella anisum, Berberis lycium, Trigonella foenum-graecum and Allium sativum on The Performance of Broiler Chicks

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ABSTRACT

Present study explored the potentials of medicinal plants (Aloe barbedensis, Pimpinella anisum, Berberis lycium, Trigonella foenum-graecum, Allium sativum) mixture in broiler chicks at a ratio of 1:3:1:2:1, respectively. For this purpose 240 chicks were randomly assigned into four major groups, namely; A, B, C and D. Each group was further divided into two subgroups with three replicates of 10 chicks each. One of the subgroups was vaccinated against Newcastle disease (ND), Infectious bronchitis (IB) and Infectious bursal disease (IBD) according to locally adopted vaccination schedule keeping the other subgroup as non vaccinated control. Experimental birds in groups A, B, and C were provided with mentioned infusion @ 20, 10 and 5ml per liter of drinking water while group D was maintained as control. Relevant data were recorded throughout the experiment and or at the termination of the experiment and subjected to statistical analysis. Significantly low mean feed intake (3258.3g) and better FCR (1.87) was recorded in group A. Other parameters like weight gain (1739.7g), antibody titer against ND (7.1), IBD (3300.5) and high density lipoprotein (71.6 g/dl) were significantly increased in chicks from group A. Similarly, blood cholesterol (145.6 g/dl), triglyceride (145.8 g/dl) and low density lipoprotein (57.5 g/dl) were significantly reduced in group A. Overall vaccinated group had higher (P<0.05) antibody titer 7.2, 1796.2, 3202.8 against ND, IB and IBD, respectively compared to non-vaccinated group and had no influence on lipid profile. It was concluded that the infusion from the above plants in mentioned composition may not only be effectively used for improved broiler performance and better immunity but also to reduce the cholesterol level.

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INTRODUCTION

Feed contribute 60-65% in the cost of poultry production. There is an immense demand to reduce feeding cost and to efficiently utilize nutrients for higher economic return. Different natural feed additives have gained considerable attention during last few decades to enhance feed utilization and growth performance of poultry birds. Moreover, these natural products are safe for human beings with no residual effect.

Generally, medicinal plants improve apparent whole tract and ileal digestibility of the nutrients (Hernandez et al., 2004; Dilshad et al., 2010) and increase the effect of pancreatic lipase and amylase (Ramakrishna et al., 2003). In addition to their antimicrobial activity, they possess biological activities such as antioxidants (Botsoglou et al., 2002) and stimulating effect on animal digestive systems (Jamroz and Kamel, 2002) to increase production of digestive enzymes and improve utilization of digestive products through enhanced liver functions (Hernandez et al., 2004; Sarikhan et al., 2010).

Aloe vera (Aloe barbedensis) gel, found in the southern districts of Khyber Pakhtunkwa province has been reported to possess anti-inflammatory and antiviral activities (Devaraj and Karpagam, 2011). Jinag et al. (2005) reported that aloe vera can enhance immunity and growth performance of broilers.

Aniseed (Pimpinella anisum), an annual plant is native to Egypt, Greece and Asia is cultivated in most parts of the Pakistan. Aniseeds exhibit growth promotion
and immune stimulant properties and resulted in better FCR and body weight gain in broilers (Durrani et al., 2008). Its antioxidant and antimicrobial properties have also been previously reported (Ihhami et al., 2003).

Berberis lycium contains berberine, a major alkaloid having antibacterial activity and has been used for diverse therapeutic purposes (Leng et al., 2004). Fenugreek (Trigonella foenum-graecum) can potentially be used for treating respiratory and gastrointestinal tract (GIT) infections (Viswanathan, 2001).

Garlic (Allium sativum) exhibits anti-microbial activities and can reduce cholesterol in broilers meat (Okpuzor et al., 2009). Endotoxin released by various microorganisms in the body can be detoxified by garlic. Moreover, its antimicrobial, antithrombotic, hypolipidemic, hypoglycemic, anticancer and antitumor properties have also been reported (Sankaranarayanan et al., 2007). The objective of the present study was to examine the efficacy of aqueous infusion of locally available herbs on broiler production, immunity and lipid profile.

**MATERIALS AND METHODS**

This study was undertaken at Poultry Unit of Khyber Pakhtunkhwa Agricultural University, Peshawar and was approved by the University Board of Studies.

**Experimental design:** The experiment was adopted in completely randomized design with two factors, i.e. 4 levels of infusion in ND and IBD vaccinated and non-vaccinated birds. A total of 240, day-old broilers were randomly allotted to four groups (A, B, C and D). Chicks in group A, B and C were given infusion @ 20, 10 and 5ml/L of drinking water respectively, while group D was kept as control. Each group was further divided into two sub-groups. Each sub-group was represented by three replicates having 10 chicks each. Chicks were reared in an open sided house in cages and had free access to feed and water. Optimum environmental conditions were maintained during the experimental period (35 days).

**Preparation of infusion:** To prepare the infusion the concentration of Aloe barbedensis (fresh gel), Pimpinella anisum (dried seed), Berberis lycium (dried stem), Trigonella foenum-graecum (dried stem) and Allium sativum (dried bulb) was 10, 30, 10, 20 and 10g/L water, respectively. These plants were mixed and soaked overnight in one liter water at room temperature. Next morning the mixture was squeezed and filtered through muslin cloth and the resultant infusion was refrigerated.

**Parameters studied:** Daily and cumulative feed intake was determined by offering known amount of feed and measuring feed refusal (Feed intake = Feed offered – Feed refused). Body weight gain was calculated on weekly basis and total body weight gain was recorded at the end of experiment. Feed conversion ratio (FCR) was measured on weekly basis.

Birds of one sub-group were vaccinated against Newcastle Disease (ND Lasota, Salvoy, USA) and infectious bronchitis (IB, Massachusetts, Salvoy, USA) vaccine at day 6th (intra ocular) and infectious bursal disease (IBD, D 78, Salvoy, USA) at day 12th (drinking water). The birds were administered with boosting dose of IBD vaccine at day 18th and ND vaccine at day 21st via drinking water.

Antibody titer against ND, IB (Alexander and Chettle, 1977) and IBD (Marquardt et al., 1980) was determined. Lipid profile (cholesterol, triglyceride, low density lipoprotein- LDL) and high density lipoprotein-HDL) was analyzed as described by Werner et al. (1981) using Elitch kit.

**Statistical analysis:** Data were subjected to two factorial completely randomized designs. SAS (SAS, 1997) was used to perform the analysis on computer.

**RESULTS**

**Feed intake, FCR and weight gain:** Group D (3467 g) had higher (P<0.05) feed intake and was lower (3258.33 g) in group (A). Body weight gain was higher (1739.74 g) (P<0.05) in group A (receiving 20 ml/L) compared to the other groups. Better FCR was observed in Group A (1.87) compared to other experimental groups. No difference was seen in vaccinated and non-vaccinated groups and interaction between main and sub groups were insignificant.

**Antibody titer:** Mean antibody titer was increased in all vaccinated sub-groups against different diseases. Birds in group A (7.1) and B (6.6) had higher antibody titer against ND as compared to control (3.3). Similar pattern in results was also observed for IBD. Antibody titer against IB was significantly higher in group B, while it was the same in all other groups. Antibody titer against IB was 11.18% higher in group B as compared to control. Mean antibodies titer against ND, IB and IBD was 380, 1160.49 and 1255.4% respectively, higher in vaccinated chicks as compared to non-vaccinated control groups.

**Lipid profile:** Significant difference in the mean serum total cholesterol and triglyceride values were observed. The difference between vaccinated and non-vaccinated sub-groups was non-significant. No interaction was seen in infusion (main groups) and vaccination (sub-groups) on lipid profile. Triglycerides were significantly reduced in group A (145.8 g/dl) and B (154.1 g/dl) in group (A). Body weight gain was higher (1739.74 g) (P<0.05) in group A (receiving 20 ml/L) compared to the other groups. Better FCR was observed in Group A (1.87) compared to other experimental groups. No difference was seen in vaccinated and non-vaccinated groups and interaction between main and sub groups were insignificant. Non-significant interaction of vaccination and infusion was observed. LDL values were significantly (P<0.05) affected by infusion and vaccination with no significant interaction between infusion and vaccination.

**DISCUSSION**

Medicinal plants can potentially be used as natural growth promoters due to their antimicrobial and nutrient digestion improving (Hernandez et al., 2004) properties. Improved feed intake, FCR and weight gain in present study could probably be the positive role of these medicinal plants on keeping a balanced microbial ecosystem in the digestive tract and stimulating digestive enzymes secretions (Ramakrishna et al., 2003) which in turn increased nutrient digestion and better body weight gain. Ademola
Group A, B, C & D received infusion @ 20, 10 and 5 ml/L of fresh drinking water, respectively, group-D was control; Interaction between main (infusion level) and sub groups (vaccinated and non-vaccinated) was non-significant.

Table 2: Effect of water based infusion of *Aloe barbedensis*, *Pimpinella anisum*, *Berberis lycium*, *Trigonella foenum-graecum* and *Allium sativum* on mean feed intake, body weight gain and FCR of broiler chicks

<table>
<thead>
<tr>
<th>Parameter</th>
<th>A (Feed intake)</th>
<th>B (Body weight gain)</th>
<th>C (FCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND (Titer)</td>
<td>7.1±0.5a</td>
<td>6.6±0.3a</td>
<td>6.3±0.2a</td>
</tr>
<tr>
<td>IB (Titer)</td>
<td>1628±0.747a</td>
<td>1663.8±83.8a</td>
<td>1647.1±35.9a</td>
</tr>
<tr>
<td>IBD (Titer)</td>
<td>3300.5±255.3a</td>
<td>2890.6±246.7a</td>
<td>2720.1±340.3a</td>
</tr>
<tr>
<td>Cholesterol (g/dl)</td>
<td>145±6.223a</td>
<td>149±6.172a</td>
<td>234.8±224.4b</td>
</tr>
<tr>
<td>Triglyceride (g/dl)</td>
<td>145.8±17.16a</td>
<td>154.1±19.50a</td>
<td>232.0±23.2b</td>
</tr>
<tr>
<td>HDL (g/dl)</td>
<td>71.6±8.2a</td>
<td>53.7±6.9b</td>
<td>36.1±6.9c</td>
</tr>
<tr>
<td>LDL (g/dl)</td>
<td>57.5±15.5a</td>
<td>70.0±14.8b</td>
<td>125.5±13.9c</td>
</tr>
</tbody>
</table>

Means in columns with different alphabets differ significantly (P<0.05); *Group A, B, C & D received infusion @ 20, 10 and 5 ml/L of fresh drinking water, respectively, group-D was control; Interaction between main (infusion level) and sub groups (vaccinated and non-vaccinated) was non-significant.

(2004) worked on garlic and ginger extract and observed significant increase in feed intake and body weight gain that was assumed to be growth promoting effect of herbal infusion in broiler birds and support present findings. Zeybek et al. (2011) investigated that herbal extract reduced the number of harmful bacteria in the gastrointestinal tract of chickens and enhance nutrient digestion and absorption and can result in better body weight gain (Narimani-Rad et al., 2011).

Better FCR in treated group in present study might be the result of effective utilization and absorption of nutrient due increased digestive enzymes secretion (Jamroz and Kamal, 2002). In line to the present findings improved FCR were reported previously (Narimani-Rad et al., 2011) when broiler chicks were supplemented medicinal plant extracts. This may be associated with the dose and source of the herbs used.

Broiler birds are prone to various environmental stressors that negatively affect bird’s immunity (Quinteiro-Filho et al., 2010) and minimize their resistance to different diseases probably due to oxidative damage of lymphoid tissues that result in impaired antibodies production. The antioxidant nature of medicinal plants (Botsoglou et al., 2002) can alleviate the negative influence of environmental stressors and can improve immune function to combat different types of diseases. Present work demonstrated that antibody titer against Newcastle disease was significantly increased probably due to immune stimulant and antioxidative function of medicinal plants used. These findings can be supported by the work done of Jing et al. (2005) of significant increase in antibody titer against Newcastle disease in broilers supplemented with medicinal herbs. Similarly, antibody titer against IBD was also improved and can be correlated to findings reported by Chand et al. (2011) who assessed the immune stimulant effect of medicinal herbs in broiler chicks.

Lower level of cholesterol and triglyceride may be attributed to the action of berberine which is an isooquinolone alkaloid present in *Berberis lycium* and is known to have anticholesteremic effect (Chand et al., 2010). The findings of present study also support the findings of Shikha et al. (2011), who reported that medicinal plants extract significantly lowered (P<0.05) total triglyceride level of broiler chicks.

HDL (high density lipoprotein) is known as good cholesterol because it assists to clear the blood of cholesterol and may even remove cholesterol from atherosclerotic blood vessels and thus preventing cardiovascular diseases. Jastrzebski et al. (2007) evaluated the effect of garlic on lipid profile and found that garlic had significantly increased HDL intensity and found almost similar findings those were similar to the present findings. Similarly, Leng et al. (2004) reported significant increase in HDL level by berbery.

Low level of LDL may be associated to the cholesterol lowering features of medicinal plants especially *Allium sativum*, *Berberis lycium* and *Trigonella foenum-graecum*. The findings of present study are supported by Chand et al. (2007), who reported that *Berberis lycium* significantly (P<0.05) reduced in LDL intensity in broiler chicks.

Conclusion: Findings from present research study revealed that herbal infusion of different medicinal plants can be effectively used in broiler production to stimulate immunity and improve growth performance. Further research work is however needed to examine the efficacy of these and other plant extracted by different methods and at different doses.

REFERENCES


