



## RESEARCH ARTICLE

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

Fazal Raziq, Sarzamin Khan\*, Naila Chand, Asad Sultan, Muhammad Mushtaq, Rafiullah, Sayed Muhammad Suhail<sup>1</sup> and Alam Zeb<sup>2</sup>

Department of Poultry Science; <sup>1</sup>Department of Animal Breeding, Faculty of Animal Husbandry & Veterinary Sciences, Khyber Pakhtukhwa Agricultural University, Peshawar; <sup>2</sup>Livestock & Dairy Development Department, Peshawar, Pakistan  
\*Corresponding author: dr.zaminaup@gmail.com

#### ARTICLE HISTORY

Received: October 27, 2011  
Revised: December 27, 2011  
Accepted: April 06, 2012

#### Key words:

*Allium sativum*  
*Aloe barbedensis*  
*Berberis lycium*  
Broiler  
Cholesterol  
*Pimpinella anisum*  
*Trigonella foenum-graecum*

#### 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.

©2012 PVJ. All rights reserved

**To Cite This Article:** Raziq F, S Khan, N Chand, A Sultan, M Mushtaq, Rafiullah, SM Suhail and A Zeb, 2012. Effect of water based infusion of *Aloe barbedensis*, *Pimpinella anisum*, *Berberis lycium*, *Trigonella foenum-graecum* and *Allium sativum* on the performance of broiler chicks. Pak Vet J, 32(4): 593-596.

#### 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 Pakhtunkhwa 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 (Ilhami *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 gastro intestinal 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 6<sup>th</sup> (intra ocular) and infectious bursal disease (IBD, D 78, Salvoy, USA) at day 12<sup>th</sup> (drinking water). The birds were administered with boosting dose of IBD

vaccine at day 18<sup>th</sup> and ND vaccine at day 21<sup>st</sup> via drinking water.

Antibody titer against ND, IB (Alexander and Chettle, 1977) and IBD (Marquardt *et al.*, 1980) was determined. Liver Function Tests and glucose level were 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). Significantly high HDL was noticed in group-A (71.6 g/dl). Difference between the vaccinated and non-vaccinated sub-groups was 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

**Table 1:** Effect of water based infusion of *Aloe barbedensis*, *Pimpinella anisum*, *Berberis lycium*, *Trigonella foenum-graecum* and *allium sativum* on serum biochemistry of broiler chicks\*\*

Parameter	Main groups*				Sub-groups	
	A	B	C	D	Vaccinated	Non vaccinated
ND (Titer)	7.1±0.5a	6.6±0.3a	6.3±0.2a	3.3±0.8b	7.2±0.3a	1.5±0.3b
IB (Titer)	1628.0±74.7a	1663.8±83.8a	1647.1±35.9a	1496.5±105.3b	1796.2±41.7a	142.5±73.8b
IBD (Titer)	3300.5±255.3a	2890.6±246.7ba	2720.1±340.3ba	2223.5±420.4b	3202.8±140.3a	236.3±320.2b
Cholesterol (g/dl)	145.6±23.1a	149.6±17.2a	234.8±24.4b	247.1±24.5b	190.1±8.4	198.5±3.2
Triglyceride (g/dl)	145.8±17.16a	154.1±19.50a	232.0±23.2b	246.8±20.60b	191.2±3.4	198.1±6.1
HDL (g/dl)	71.6±8.2a	53.1±6.9b	36.1±6.3c	32.0±4.1c	50.5±3.2	46.0±1.6
LDL (g/dl)	57.5±15.5a	70.0±14.8b	125.5±13.9c	132.8±13.7c	94.2±2.3	98.6±2.1

\*\*Means in rows with different alphabets in main and sub-groups 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.

**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

Main-groups	Feed intake	Body weight gain	FCR
A	3258.33a	1739.74a	1.87c
B	3396.83ab	1496.47b	2.26b
C	3370.67ab	1402.29c	2.40b
D	3467.00b	1314.57d	2.63d
Sub-groups			
Vaccinated	3368.63	1589.60	2.12
Non-vaccinated	3299.93	1510.90	2.24

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 extract 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 secretions (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 Jinag *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 isoquinolone alkaloid present in *Berberis lycium* and is known to have anticholestereamic 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

- Ademola SG, 2004. Growth, hematological and biochemical studies on garlic and ginger-fed broiler chicken. Moor J Agric Res, 5: 122-128.
- Alexander DJ and NJ Chettle, 1977. Procedures of hemagglutination and the hemagglutination inhibition tests for avian Infectious Bronchitis Virus. Avian Pathol, 6: 9-17.
- Botsoglou NA, P Florou-Paneri, E Christaki, DJ Fletouris and AB Spais, 2002. Effect of dietary oregano essential oil on performance of chickens and on Iron-induced lipid oxidation of breast, thigh and abdominal fat tissues. Brit Poult Sci, 43: 223-230.
- Chand N, FR Durrani, S Ahmad and K Amanullah, 2010. Immunomodulatory and hepatoprotective role of feed-added *Berberis lycium* in broiler chicks. J Sci Food Agric, 91: 1737-1745.
- Chand N, FR Durrani, MS Qureshi and Z Durrani, 2007. Role of *Berberis lycium* in reducing serum cholesterol in broilers. Asian-Aust J Anim Sci, 20: 563-568.

- Devaraj A, and T Karpagam, 2011. Evaluation of anti-inflammatory activity and analgesic effect of aloe vera leaf extract in rats. *Int Res J Pharmacol*, 2: 103-110.
- Dilshad SMR, NU Rehman, N Ahmad and A Iqbal, 2010. Documentation of ethnoveterinary practices for mastitis in dairy animals in Pakistan. *Pak Vet J*, 30: 167-171.
- Durrani FR, N Chand, M Jan, A Sultan, Z Durrani and S Akhtar, 2008. Immunomodulatory and growth promoting effects of neem leaves infusion in broiler chicks. *Sarhad J Agric*, 24: 655-659.
- Hernandez F, J Madrid, V Garcia, J Orengo and MD Megia 2004, Influence of two plant extracts on broiler performance, digestibility, and digestive organ size. *Poult Sci*, 83: 169-174.
- İlhami G, M Oktay, E Kireççi and Öİ Küfrevioğlu, 2003. Screening of antioxidant and antimicrobial activities of aniseed (*Pimpinella anisum* L.) extracts. *Food Chem*, 83: 371-382.
- Jamroz D and C Kamel, 2002. Plant extracts enhance broiler performance. In non-ruminant nutrition: Antimicrobial agents and plant extracts on immunity, health and performance. *J Anim Sci*, 80: 41.
- Jastrzebski Z, H Leontowicz, M Leontowicz, J Namiesnik, Z Zachwieja, H Barton, E Pawelzik, P Arancibia-Avila, F Toledo and S Gorinstein, 2007. The bioactivity of processed garlic (*Allium sativum* L.) as shown *in vitro* and *in vivo* studies on rats. *Food Chem Toxicol*, 45: 1626-1633.
- Jinag L, FY Zhang, Y Xu, Z Xinting and DP Yang, 2005. Effect of gel polysaccharide and acemannan from Aloe vera on broiler gut flora, microvilli density, immune function and growth performance. *Chinese J Vet Sci*, 25: 668-671.
- Leng SH, FE Lu and LJ Xu, 2004. Therapeutic effects of berberine in impaired glucose tolerance rats and its influence on insulin secretion. *Acta Pharmacol Sin*, 24: 496-502.
- Marquardt WW, RB Johnson, WF Odenwald and BA Schlotthoken, 1980. An indirect enzyme linked immunosorbant assay (ELISA) for measuring antibodies in chickens infected with IBDV. *Avian Dis*, 24: 375-385.
- Narimani-Rad M, A Nobakht, HA Shahryar, J Kamani and A Lotfi, 2011. Influence of dietary supplemented medicinal plants mixture (Ziziphora, Oregano and Peppermint) on performance and carcass characterization of broiler chickens. *J Med Plants Res*, 5: 5626-5629.
- Okpuzor J, G Kareem and C Ejikeme, 2009. Lipid Lowering Activity of Globimetula braunii. *Res J Med Plant*, 3: 45-51.
- Quinteiro-Filho WM, A Ribeiro, V Ferraz-de-Paula, ML Pinheiro, M Sakai, LR Sa, AJ Ferreira and J Palermo-Neto, 2010. Heat stress impairs performance parameters, induces intestinal injury and decreases macrophage activity in broiler chickens. *Poult Sci*, 89: 1905-1914.
- Ramakrishna RR, K Platel and K Srinivasan, 2003. *In vitro* influence of spices and spice-active principles on digestive enzymes of rat pancreas and small intestine. *Nahrung*, 47: 408-412.
- Sankaranarayanan A, T Narender, S Kumar and M Dikshit, 2007. *Allium sativum* constituents: effect on free radical generation from rat neutrophils. *J Cell Mol Biol (Noisy-le-grand)*, 53: 63-67.
- SAS Institute, 1997. SAS User's Guide: Statistics. SAS Institute, Inc., Cary, NC.
- Sarikhan M, HA Shahryar, B Gholizadeh, MH Hosseinzadeh, B Beheshti and A Mahmoodnejad, 2010. Effects of insoluble fiber on growth performance, carcass traits and ileum morphological parameters on broiler chick males. *Int J Agric Biol*, 12: 531-536.
- Shikha B, NB Prakash and B Nikhil, 2011. Medicinal plants of Rajasthan (India) with antidiabetic potential. *Int Res J Pharmacol*, 2: 1-7.
- Viswanathan, 2001. Therapeutic Guide to *Trigonella foenum graecum*. *Eur J Clin Nutr*, 42: 51-66.
- Werner M, DG Gabrielson and G Eastman, 1981. Ultramicro-determinations of serum triglycerides by bioluminescent assay. *Clin Chem*, 21: 268-271.
- Zeybek A, F Ercan, S Cetine, E Cikler, B Saglam and B Sener, 2007. Protective effects of aqueous garlic extract in reducing water avoidance stress-induced degeneration of the stomach, ileum, and liver: morphological and biochemical study. *Dig Dis Sci*, 52: 2984-2992.