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Original study

In vivo effect of *Berberis lyceum* and *Silybum marianum* on production performance and immune status of broiler chickens

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Abstract

We conducted an in vivo experiment to study the effect of water-based infusion of *Berberis lyceum* and *Silybum marianum* on production performance and immune level of broiler chicks. A total of 120 day old broiler chicks was obtained from the same parent flock, and divided into four experimental groups i.e., WBI-0 (control), WBI-5 (5 ml/l), WBI-10 (10 ml/l) and WBI-20 (20 ml/l). Each group was further divided into three replicates with 10 chicks per replicate in a completely randomized design. The birds were reared in separate pens for 35 days in an open sided house. Low feed intake ($P>0.05$) but higher weight gain ($P<0.05$), dressing percentage ($P>0.05$) and feed conversion ratio ($P>0.05$) were observed in group WBI-20. High level of antibody titre was also observed in group WBI-20 against the Newcastle and infectious bronchitis antigen, while significantly high ($P<0.05$) antibody titre against infectious bursal disease was recorded in WBI-10. Based on the experimental findings, it was concluded that water based infusion of 20 ml/l resulted as a valuable source to enhance production traits and to boost up immunity in broilers.

Keywords: *Berberis lyceum*, *Silybum marianum*, water based infusion, production, antibody titre

Abbreviations: FCR: feed conversion ratio, HI: haemagglutination inhibition, IB: infectious bronchitis, IBD: infectious bursal disease, ND: Newcastle disease

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Introduction

Antibiotic-based growth promoters have been commonly used as supplement in animal feed for many years because they help growing animals to digest feed more efficiently. The common antibiotics used in animal feed are virginmysin, salinomycin, neomysin, doxycyclin and avilamysin (Khan *et al.* 2012 a, b). The use of antibiotic-based growth promoters is presently facing serious criticism and global concern due to their unwanted effects like microbial resistance and their potential harmful effects on human health (Rehman *et al.* 2011, Manesh *et al.* 2012). These shortcomings lead to the search for alternative substances that eliminate these threats. Nowadays, there is increasing interest in the use of natural growth promoters like probiotics, prebiotics or their combination and medicinal plants as feed additives in poultry diets to enhance the performance of poultry (Khan *et al.* 2012c).

Berberis lycium (Barberry) has shown to exhibit multiple pharmacological values such as a potent vasodilatory and antiarrhythmic activity, anti-inflammatory and antinociceptive effects (Küpeli *et al.* 2002). Berberis lycium contains an alkaloid known as berberine. Berberis lycium is used as growth promoter in broiler ration to enhance the body weight gains and improve the feed conversion ratio (FCR) (Chand *et al.* 2007). Traditionally, the roots of Berberis lycium are used as tonic source, astringent, diaphoretic and in bleeding piles. Extract of Berberis lycium shows antihistaminic and anticholenergic activity and also possesses stomachic, astringent and antipyretic properties.

Silybum marianum (milk thistle) has been used in birds against the adverse effects of aflatoxin Bl (Tedesco *et al.* 2004). It plays a vital role in the treatment of hepatitis B and C in human (Torres *et al.* 2004, Gordon *et al.* 2006). *Silybum marianum* also serves as an immunosuppressant (Grizzle *et al.* 1999). Moreover, Suchy *et al.* (2008) reported that milk thistle helps in improving the FCR and promote the weight gain in poultry. *Silybum marianum* displays hepatoprotective properties in acute and chronic liver injury (Dehmlow *et al.* 1996). Silymarin, a commercial crude drug used as a hepatoprotective, was found to inhibit up to 53 % of β-glucosidase activity (Kim *et al.* 1994).

To the best of our knowledge, reports on combination of barberry and milk thistle in broilers are scarce. Rehman *et al.* (2011) also reported that extract of barberry, garlic and aloe vera resulted in improved haematological and lipid profile in broiler chicks. Javed *et al.* (2009) found that water based extract of *Zingiber officinale, Carum apticum, Withania somnifera, Trigonella Foenum-Graecum, Silybum marianum, Allium sativum* and *Berberis lyceum*, improved growth performance of broiler chicks.

Therefore, the objectives of the present study were to evaluate the effect of *Berberis lyceum* and *Silybum marianum* water-based infusion on the growth performance and immune status of broiler chicks.

Material and methods

The present research study was conducted at the research unit of University of Agriculture Peshawar, Pakistan. The preparation of the plant infusion was made according to the method described by Rehman *et al.* (2011). Briefly, the infusion was prepared by mixing *Berberis lyceum* and *Silybum marianum* in equal quantity (10 g each) in a non-metallic container. After

proper mixing, 1 litre of hot water was poured over the mixture. The container was kept at room temperature overnight and added into the drinking water for the treated groups at the rate of 5, 10 and 20 ml/l.

A completely randomized design was used to carry out the study. One hundred and twenty day-old broiler chicks of approximately the same mean weight and appearance were purchased from a local market. The chicks were randomly divided into four groups: WBI-0, WBI-05, WBI-10 and WBI-20. Each group had three replicates with 10 chicks per replicate. The treatment designated as the group WBI-5, WBI-10 and WBI-20 receives infusion at the rate of 5, 10 and 20 ml/l, while group WBI-0 was kept as control, respectively. All the chicks were reared in separate pens in an open sided house under similar environment conditions. The feed was provided ad libitum and the diet was formulated to meet or exceed the birds' requirements (NRC 1994). The experiment lasted until the 35th day of age and data were recorded throughout the experiment. Feed intake was recorded on daily basis for each group. Body weight was recorded once a week and FCR was calculated on the basis of feed intake and weight gain. Randomly 10 birds from each group were selected to evaluate broiler dressing percentage on the basis of live body weight and weight of the bird was calculated accordingly.

At the end of experiment, five blood samples were collected from each replicate in clean test tubes. Test tubes were then centrifuged at the rate of 4 000 rpm for about 15 min to get the serum. The serum was packed, labelled properly until analysis. Haemagglutination inhibition (HI) test against Newcastle disease (ND) was determined as described by Alexander & Chettle (1977). Antibody titre against infectious bronchitis (IB) and infectious bursal disease (IBD) were estimated using the method of Marquardt *et al.* (1980).

Statistical analysis

The data was statistically analysed using standard procedure of analysis of variance, using one way ANOVA as described by Steel & Torrie (1980). The statistical package SAS 7 (SAS Institute Inc., Cary, NC, USA) was used for the data analyses.

Results and discussion

Body weight was significantly high in WBI-20 group (Table 1). No significant difference was found in feed intake and FCR as well as dressing percentage between the control and treated groups. In the present study, there was no statistical difference in feed intake between the control and experimental groups although it was slightly lower in WBI-20 group. The extract of *Silybum marianum* is a potent antihepatotoxic agent in broiler chickens which leads to a lower feed intake in aflatoxin treated birds with respect to controls (Tedesco *et al.* 2004). Suchy *et al.* (2008) reported that the *Silybum marianum* treated groups of broilers showed a significantly better feed consumption compared to the untreated group. Chand *et al.* (2007) studied the effect of *Berberis lyceum* on the performance of broiler chicks and found that average feed consumption per chick was higher in the control group.

The mixture of medicinal plants (WBI-20) fed to broiler chicks significantly increased the weight of broiler chicks. Similarly, milk thistle significantly affected the live broiler weight

Table 1
Effect of water based infusions on feed intake, body weight, FCR and dressing percentage in broiler chicks

Variable	WBI-0	WBI-5	WBI-10	WBI-20	Pooled SEM	*P*-value
Feed intake, g	4 332.35	4 011.17	4 268.55	3 972.67	8.54	0.987
Body weight, g	1 527.00[b]	1 538.8[b]	1 528.98[b]	1 666.58[a]	5.43	0.054
FCR, g/g	2.85	2.75	2.68	2.78	0.21	0.321
Dressing percentage	51.08	51.21	49.65	54.26	3.24	0.061

WBI-5: water based infusion at the rate of 5 ml/l, WBI-10: water based infusion at the rate of 10 ml/l, WBI-20: water based infusion at the rate of 20 ml/l, Mean in the columns with superscripts are significantly different at $P<0.05$.

as reported by Suchy *et al.* (2008). The present study also suggested the same condition. The FCR is a tool to measure the ability of a flock to convert feed intake (feed usage) into live weight. Management practices should always ensure that feed intake is optimized and feed wastage is minimized. The conversion of feed to live weight is a complex process and the cause of a poor or high FCR is usually multi-factorial. In our experiment, we could not find significant difference in FCR between control and experimental groups. According to Zeybek *et al.* (2007) medicinal plants protect the gastrointestinal tract from harmful bacteria which enhance the digestive enzymatic activities and that lead to high metabolic rate (FCR) and feed converted to meat. Lewis *et al.* (2003) worked on a mixture of medicinal plants and found better FCR in broiler chicks throughout the experiment.

High level of antibody titre was observed in group WBI-20 against the ND and IB, while significantly high antibody titre against IBD was observed in WBI-10 group (Table 2).

Table 2
Effect of treatments on antibody titre of ND, IB and IBD in broiler chicks

Variable	WBI-0	WBI-5	WBI-10	WBI-20	Pooled SEM	*P*-value
New castle Disease	4.66	5.33	6.16	6.33	0.23	0.13
Infectious bronchitis	1 286.67	1 315.00	1 393.33	1 500.00	5.98	0.14
Infectious bursal disease	2 331.67[b]	2 396.33[b]	2 784.67[ab]	3 039.17[a]	9.76	0.02

WBI-5: water based infusion at the rate of 5 ml/l, WBI-10: water based infusion at the rate of 10 ml/l, WBI-20: water based infusion at the rate of 20 ml/l, Mean in the columns with superscripts are significantly different at $P<0.05$.

Dorhoi *et al.* (2006) assessed the effects of herbal extracts in layers and concluded that herbal plants have the potential to improve host resistance against infections. Sankar *et al.* (2007) reported that medicinal plant had no effect on immunity. This is in contrast to our findings which showed a significant increase in immunity against ND in broiler chicks. Maroof *et al.* (2012) reported that a water based mixture of medicinal plants containing *Berberis lyceum* improved the antibody titre against ND and IB in broiler chicks when the infusion was provided with the drinking water on alternate day. Similarly, Chand *et al.* (2011a) concluded that addition of *Berberis lyceum* at the level of 20 g/kg of diet enhanced immunity against ND and IBD in broiler chicks. In another study, Chand *et al.* (2011b) found that milk thistle given with the broiler's diet at the rate of 10 g/kg improved immune level against ND, IB and IBD.

Based on our findings, we can conclude that the infusion of *Berberis lyceum* and *Silybum marianum* improved production performance and host immunity in broiler chickens.

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