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Full Length Research Paper

Effect of *foenum-graecum* on immune response and some blood parameters of broilers

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The present experiment was performed to study the effects of *Trigonella foenum-graecum* (fenugreek) extract in drinking water on growth performance, immune response and some blood parameters in broilers. In a completely randomized design, 160 one-day old Ross, 308 broilers were randomly assigned in 4 treatments containing: 1) control group without fenugreek extract (FE); 2) control group + 0.05% extract; 3) control group + 0.1% extract and 4) control group + 0.2% extract. 4 replicate of 10 birds each were carried out. Feed and water were provided for *ad libitum* consumption. Average of feed intake, body weight gain, and feed conversion ratio were measured weekly. Whereas, average antibody titer against Sheep Red Blood Cell (SRBC), heterophil-lymphocyte ratio, weight of bursa of fabricius and some blood parameters such as cholesterol, triglyceride and glucose levels were measured on the 42nd day. The results obtained in this experiment showed that this plant supplementation had improved significantly Body Weight Gain (BWG) and Feed Conversion Ratio (FCR) of broilers among treatments in total period ($p<0.05$). However, it had no significant effect on Feed Intake (FI) of broilers ($p>0.05$). In addition, results showed that using this extract in drinking water had significant effect on immune response as compared to the control group. The highest value of antibody titer against SRBC and weight of bursa of fabricius and the lowest ratio of heterophil- lymphocytes were absorbed in treatment 3 ($p<0.05$). Furthermore, this plant had significant effect on cholesterol, triglyceride, and glucose levels among the groups. The lowest value of cholesterol, triglyceride and glucose levels was observed in treatment 4.

Key words: *Trigonella foenum-graecum*, performance, immune response, blood parameters, broiler.

INTRODUCTION

Today, the use of medicinal plant is a good alternative to antibiotics because of the residual effects of antibiotics in poultry meat which has resulted in pathogens developing resistance to antibiotics. Polyphenol compounds such as flavonoids groups widely distributed in plants which have been reported to exert multiple biological effects, including antioxidant property (Irshad and Chaudhuri, 2002). Medicinal plants have immune-modulatory effects on both cell mediated and humoral immunities *in vitro (*Niizawa et al., 2003). In addition, supplemented broilers' diet with plant extracts has some effects on the performance and microbial population of intestinal tract. One of the valuable medicinal plants is fenugreek, that is, a legume plant cultivated throughout India and in certain regions of China. It is also added as an aromatic condiment to different kinds of manufactured foods.

Fenugreek is generally considered safe for human consumption (Rao et al., 1996). Medicinal plants have antioxidant role and could improve cardiovascular health and inhibit liver disease (Pouramir, 2006).

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Table 1. Ingredients and nutrient composition of experimental diets.

Nutrient (%)	1-10 days	11-24 days	24-42 days
Corn	52.67	55/76	60.37
Soybean meal	36.28	34.21	29.27
Gluten corn	3.00	1.40	1.00
Corn oil	3.48	4.48	5.37
Dicalcium phosphate	2.08	1.83	1.86
Oyster shell	1.20	1.07	0.97
Salt	0.34	0.25	0.25
Methionine	0.16	0.16	0.16
Lysine	0.29	0.14	0.11
Minerals	0.25	0.25	0.25
Vitamins[1]	0.25	0.25	0.25
Total	100	100	100
Metabolizable energy (ME) (kcal/kg)	3010	3150	3200
Crude protein (CP)	23	21	19

[1]Vitamin-mineral premix (each kg contained): calcium (Ca), 195 g; potassium (K), 70 g; sodium (Na),18 g; magnesium (Mg), 6 g; zinc (Zn), 1,200 mg; iron (Fe), 2,000 mg; copper (Cu), 400 mg; manganese (Mn), 1,200 mg; selenium (Se), 8 mg; cobalt (Co), 20 mg; iodine (I), 40 mg; vitamin A, 200,000 IU; vitamin D3, 80,000 IU; vitamin E, 1,072 IU; vitamin K3, 34 mg; ascorbic acid, 1,300 mg; thiamine, 35 mg; riboflavin, 135 mg; niacin, 1,340 mg; vitamin B6, 100 mg; folic acid, 34 mg; vitamin B12, 670 µg; and biotin, 3,350 µg.

Hypocholesterolaemic effects of fenugreek (Singhal, 1982; Sharmal, 1984) and hypoglycemic property of it was observed in diabetic patients. Shamony (1994); Haeri (2009); and Sharma (1984) demonstrated that fenugreek administration increased excretion of bile acids and neutral sterols in faeces, thus, depleting the cholesterol stores in the body in experimental rats. Awal et al. (1999) and Amooz et al. (2009) has studied the effects of fenugreek and karela on lipid profile in hyper-cholesterolemic diabetic patients and shown that fenugreek significantly reduces the lipid level. In some studies, using fenugreek extract (FE) as feed supplement did not alter the feed intake of some animals such as pigs (Sesikeran et al., 1996) but Mazza et al. (2000) reported that fenugreek increase feed intake in humans and rats.

FE widely used as a medicinal and dietary herb, significantly stimulated humoral immune response in mice (Bin et al., 2003). The effects of fenugreek in broilers have not been reported clearly, so we intended to investigate the effects of FE in drinking water on growth performance, immune response and some blood parameters of broilers.

MATERIALS AND METHODS

This study was conducted in the poultry farm in Golpayegan city during spring months to study the effects of FE in drinking water on growth performance, immune response and some blood parameters of broilers. A total of 160 one-day-old including males and females of Ross 308 broilers were randomly allocated in a Completely Randomized Design (CRD) that consisted of 4 treatments. Ingredients and nutrient composition of experimental diets are presented in table 1. At 1 day old, experimental birds were weighed individually and randomly assigned to floor pens. Chickens had free access to water and feed *ad libitum*. Temperature was gradually decreased from 32°C on day 1 to 22°C on day 21 and then kept constant. The lighting regime provided 24 h of continuous light per day. All chickens were fed with starter, grower, and finisher diets but supplemented with different levels of this extract in drinking water. EF liquid was purchased of safe drug company in Iran. Treatments were: 1) control group (without FE); 2) control group + 0.05%FE; 3) control group + 0.1% FE and 4) control group + 0.2% FE. Four replicates of 10 birds each were carried out. Average FI, BWG and FCR (total feed: total gain) were measured weekly. At the 27th day of age, SRBC suspension (5% in sterile PBS) was injected in breast muscle of birds and Total antibody (Ab) titers to SRBC were determined by agglutination according to Van der Zijpp and Leenstra (1980) in bird's serum. Therefore, 7 days after each sensitization (34 day), antibody titers against SRBC were measured and expressed as the log 2 of the reciprocal of the highest serum dilution giving complete agglutination. In addition, two birds per replicate were randomly chosen and weight of bursa of fabricius was measured by digital scale on the 42nd day. In order to measure some blood parameters on

Table 2. Effects of EF in drinking water on growth performance in total period[1].

Experiment	FI (g)	BWG (g)	FCR
T1	3327	1720[a]	1.93[c]
T2	3334	1738[ab]	1.91[b]
T3	3359	1903[c]	1.76[a]
T4	3363	2060[d]	1.63[a]
SEM	32.70	26.43	0.0122

[1]Differences between the treatment groups are statistically different at $P \leq 0.05$.

Table 3. Effects of EF in drinking water on immune response of broilers at 42 day[1].

Experimental treatments	T1	T2	T3	T4	SEM
Antibody titer against SRBC	5[c]	6.13[b]	10.25[a]	8.17[d]	0.8266
Weight of Bursa Fabricius (% of BW)	1.30[c]	1.34[a]	1.48[b]	1.37[bc]	0.057
Heterophil (%)	21.91[a]	20.8[b]	18.05[c]	19.93[c]	2.33
Lymphocyte (%)	65.1[a]	68.2[b]	75.01[c]	78.88[d]	2.45
H/L	0.29[ac]	0.30[c]	0.25[b]	0.32[ab]	0.045

[1]Differences between the treatment groups are statistically different at $P \leq 0.05$.

Table 4. The effects of EF in drinking water on some blood parameters of broilers at 42 day[1].

Experimental treatments[1]	T1	T2	T3	T4	SEM
Cholesterol (mg/dl)	151.7[c]	133.7[a]	110.4[ab]	91.3[d]	6.01
Triglyceride (mg/dl)	64.5[d]	56.08[b]	52.7[c]	49.1[ac]	3.18
Glucose (mg/dl)	216[b]	215.6[b]	210.3[ac]	201.9[c]	7.13

[1]Differences between the treatment groups are statistically different at $P \leq 0.05$.

the same day, the bird blood serum were taken of two birds per cage from their wing vein and samples were sent to Pasteur veterinary laboratory for analysis of triglycerides, cholesterol, and glucose. Analysis was done through SAS (statistical analyses software) in the statistical level of 5%.

RESULTS AND DISCUSSION

Table 2 shows the effect of different FE in drinking water on growth performance in broilers. According to table 2, there are significant differences in BWG and FCR. The highest amount of body weight gain and the lowest level of FCR were observed in treatment 4. There were no feed intake differences among the treatments ($p>0.05$), whereas, Mazza et al. (2000) have reported that fenugreek increased feed intake in human and rats due to saponine fraction from the seed.

We can conclude that herbal medicines such as FE are beneficial for performance of poultry due their stimulatory secretion of digestive enzymes and intestinal mucous to stabilized microbial balance and feed digestion in the gut (Bin et al. 2003) and as such, dietary supplementation with 0.2% FE in drinking water can improve BWG and FCR of broiler chicks.

The effects of EF extract in drinking water on average antibody titer against SRBC, weight of bursa of fabricius on the 42nd day and heterophil- lymphocyte ratio are presented in table 3. In Anti-SRBC titer values, weight of bursa of fabricius and heterophil- lymphocyte ratio were observed to have significant difference among treatments as compared to the control group and the best improvement in safety indicators were observed in treatment 3. This result is in line with the report of Bin et al. (2003). This result suggests that 0.1% of EF was able to promote immunity response in broilers.

The effects of FE in drinking water on some blood parameters are presented in table 4. According to this table, triglyceride, cholesterol and glucose levels were significantly different among the treatments when compared to the control group. Maximum decreases of

them were found in experimental T4 group. Based on these results, it can be concluded that Fenugreek has hypocholesterolemic potency and hypoglycemic effects in broilers. These results are close to reports of Sharma et al. (1984, 1986) that demonstrated fenugreek administration increased excretion of bile acids and neutral sterols in faeces, thus, depleting the cholesterol stores in broilers. This result is in line with reports of Awal et al. (1999) and Al- Shamony (1994) who observed that fenugreek significantly reduces the lipid level and glucose levels in diabetic patients.

We therefore, conclude that supplementation of EF reduces serum triglycerides and cholesterol in broilers which significantly inhibits atherosclerosis in poultry, thus, its use is recommended in patients with diabetes because of its blood glucose lowering properties.

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