

Original Research Article

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Effect of Fenugreek (*Trigonella foenum-gracum L.*) Seed Powder as Natural Feed Additive on Performance and Blood Parameters of Broiler Chicks

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ABSTRACT

An experiment was conducted on the effects of Fenugreek (*Trigonella foenum-gracum.L*) seed powder as a natural feed additive on performance, hematological parameters and serum constituents of broilers. Fenugreek seed powder was supplemented standard broiler ration as a T₁ (control), T₂, T₃ and T₄ in the four different diets. Eighty, day-old broiler chicks were randomly divided into four equal groups having 20 chicks in each treatment and four replicate of 5 birds reared in deep litter system feed offered a standard broiler diet (T₁) and fenugreek seed powder addition in the diet of broilers @ 0.5% (T₂), 1.0% (T₃) and 1.5% (T₄) on dry matter basis by partial of control diet for 42 days. Fenugreek seed powder supplemented (T₄) 1.5 % highest live weight is observed (2636.12 g) in this group. Fenugreek seed powder at the 1.5% level significantly (P<0.05) improved the body weight, feed consumption but 1 % fenugreek seed powder improves hematological and serum profile of broilers. There was significant (P<0.05) hematological parameters WBC, Lymphocytes, Monocytes, MCH, MCHC in this parameters all values are increased as compare to control. But RBC, Hemoglobin decreases the value as compare to control group in fenugreek seed powder supplemented birds. However, non-significant (P>0.05) variation was observed in Granulocytes, PLT (platelet) values was increased but in MCV values are decreased as compare control group diet. There was significant (P<0.05) differences in serum profile observed in Glucose, HDL-Cholesterol values was increased but decreased in Triglycerides as compare to control group, however, non significant (P<0.05) observed Cholesterol values was decreased in 1 % supplemented group but LDL-Cholesterol, HDL-LDL ratio values were increased as compare to control group. The results from the present study, it could be concluded that the use of fenugreek seed powder as a feed additive at the level of 1 per cent as it improved the significantly hematological parameter and serum lipid profile.

Keywords

Growth performance, Hematological parameters, Serum lipid profile

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Introduction

The broiler sector has been the most dynamic sector of poultry production due to its marginal investments and quick returns.

Broiler is very fast growing birds. Because of fast growth rate the birds undergo in a heavy metabolic stress. To release the stress, some sorts of antioxidants are required, as antioxidant prevents cellular damage. Some of

the dietary plant sources have antioxidants such as carotenoids, phenolic acids, flavonoids.

Large number of feed additives available for inclusion in animal and poultry diets to improve animal performance. However, the use of chemical products especially hormones and antibiotics, may cause unfavorable side effects. Moreover, there is evidence indicating that this products could be considered as pollutants for human and threaten their health on the long-run. Attempts to use the natural materials such as medical plants could be widely accepted as feed additives to improve the efficiency of feed utilization and animal productive performance (Aboul-Fotouh *et al.*, 1999).

Fenugreek seed powder is used as a feed additive in the production of preserved meat.

Owing to the seed content of mucilage, it helps relieve sore throat and is useful in the treatment of asthma and difficult breathing and is considered an appetizer and helps in digestion. Fenugreek seeds have also been recognized as a potential source of diosgenin, a basic compound in the hemisynthesis of steroidal saponins such as cortisone and sex hormones.

Previously it has also been reported to have anti-microbial, hypoglycaemic, hypolipidemic, hypochloesteremic and antioxidant effects of an animal's. Duru *et al.*, (2013) and Nazar and Tinay (2007) reported that its seed contained 28.4%, protein, 9.3%, crude fibre and crude fat 7.1%. Fenugreek seeds contain 7.5% total lipids, of which neutral lipids constituted 84.1%, glycolipids 5.4% and phospholipids 10.5%. Whole fenugreek seed contains about 1.7-4.8% saponins. It also benefits the digestive system as a laxative, intestinal lubricant, carminative, anti-emetic, digestive and tonic helps to

dissolve fat and a cholesterol deposit prevent fat accumulation and water retention and helps to lower blood sugar levels.

Materials and Methods

Eighty, day old, commercial straight run broiler chicks (Vencobb-430) strain was obtained from Huma-hatcheries, Latur (Maharashtra). All the experimental chicks were individually weighed wing banded and then randomly distributed in to four treatments of 20 chicks with four replication of 5 chicks in each treatment on similar body weight basis. All the experimental chicks were reared for 42 days on deep litter system in a well-ventilated shed. Proper brooding of chicks was done by providing sufficient heat and light by using electric bulbs in each treatment for first three weeks of age. The standard temperature of brooding was 32–35⁰C for first week. A weekly reduction of 3⁰C was done till brooder temperature reaches to 27⁰C by third week of age. Afterward sufficient artificial light was provided during night hours throughout the experimental period.

Fresh, clean and cool drinking water was provided to bird's *ad-labitum*. All the precautionary measures against diseases were taken throughout the experimental period of six weeks. The dietary treatments T₁- 100 parts of standard broiler ration without supplement (control group), T₂- 99.5 parts of standard broiler ration + 0.5 Parts of fenugreek seed powder, T₃- 99.00 parts of standard broiler ration + 1.00 Parts of fenugreek seed powder and T₄- 98.5 part standard broiler ration +1.5 Parts of fenugreek seed powder. All the broiler chicks were fed with ground maize first two days of age.

Chicks feed standard feed purchased from market for three periods of 2-10 days birds fed with pre-starter, 11-21 days birds fed with broiler starter and 22-42 days birds fed with

broiler finisher. The diets were fed *ad-libitum* to experimental groups by adding required amount of fenugreek seed powder as per treatment. The per cent ingredient composition of experimental broiler ration that is for pre-starter, starter and finisher in Table 1 respectively.

All birds were weighed individually after their arrival from the hatchery to the experimental farm (initial weight) and weekly body weights were recorded accurately in morning hours by withdrawing feeding troughs. At the end of experiment one bird was purposely selected from each replication based on average group weight. Three ml blood was collected from wing vein using vacuum tubes containing potassium salts of ethylene diamine tetra acetate (EDTA) as anticoagulant.

The hematological studies were carried out at local Pathological Laboratories and Diagnostic Institute. Estimate the following hematological parameters A) White Blood Cells 1) Lymphocytes 2) Monocytes 3) Granulocytes B) Red Blood Cells C) Hemoglobin D) Hematocrit E) Mean corpuscle volume F) Mean corpuscular Hemoglobin G) Mean corpuscular Hemoglobin Concentration H) Platelet. At the end of experiment three ml blood was collected from wing vein in syringe without any anticoagulant and kept in clot activator tubes.

The serum constituents parameter were determined, estimate following blood serum parameters. 1) Glucose 2) Serum Cholesterol 3) Serum Triglycerides 4) Serum HDL i.e. (High density Lipoprotein) 5) Serum LDL i. e. (Low density Lipoprotein) 6) HDL/LDL ratio. The treatment wise data on cumulative body weight, hematological parameters and blood serum constituents were subjected to analysis of variance of complete randomized design (Snedecor and Cochran 1982).

Results and Discussion

Growth performance of broilers

Cumulative body weights

The average weekly growth performance of experimental birds at body weight of broilers from day old to sixth weeks of age in all dietary treatments were subjected to CRD and the results are presented in Table 2. The statistical analysis on the weekly body weight of broiler birds under four different treatments during each week revealed significant ($P < 0.05$) difference during all the weeks except initial, first and second week. After the sixth week it was observed from the average cumulative body weights of broiler birds in the treatment group T_3 and T_4 were significantly ($P < 0.05$) higher as compared to those in T_1 and T_2 group. The average body weight of 2636.12 g obtained in T_4 group was significantly superior over T_1 (2536.47 g) and those in T_2 (2573.53 g) group. The growth pattern indicated that optimum beneficial effect of fenugreek seed powder supplementation as an herbal feed additive could be achieved at 1.5 per cent level of inclusion but 1 per cent was economical because 1 per cent and 1.5 per cent levels were at par with each other. The improvement in body weights of birds in all fenugreek powder diet group was observed. It may be due to the presence of essential fatty acids and high quality proteins in the fenugreek seeds and stimulating effect of the digestive system might in turn lead to improve body weights and performance.

The results of present study were similar with Elbushra. (2012) who showed that the weekly gain in body weight of broiler chicks receiving 1.5 per cent fenugreek seed powder was significantly ($P < 0.05$) higher as compared to control, group receiving 0.5 per cent and those in group receiving 1 per cent fenugreek seed powder.

Similar trend was also observed by Weerasingha and Atapattu (2013) who reported the same result as the weekly live body weight of fenugreek fed 1 per cent fenugreek seed powder group of broiler remained significantly ($P < 0.05$) higher than that of control group. Mamoun *et al.*, (2014) also revealed that chicks fed on 1% FSP recorded significantly ($P < 0.05$) higher body weight compared to all tested groups, while those fed on control diet recorded significantly lower body weight. Bhale (2015) also noticed similar results with present study that addition of 1 % germinated fenugreek seed powder in broiler ration exhibited better weight than without germinated fenugreek seed powder. Khadr and Abdel-Fattah (2007) indicated that addition of fenugreek seeds during the growing period had slightly increased body weight gain for chicks fed diets containing 1% fenugreek seeds followed by those fed 2% as compared to control diet.

Hematological parameter

The results are presented in Table 3. The analysis of variance showed significant ($P < 0.05$) effect of feeding fenugreek on the hematological parameters at the end of sixth week for treatment groups T₁, T₂, T₃ and T₄. The WBC (White blood cells) count in blood of broilers was 121.83, 122.28, 129.68 and 130.51 ($\times 10^3/\mu\text{l}$) in T₁, T₂, T₃ and T₄ groups respectively. Out of these broiler birds of T₄ (1.5%) showed significant superior over than other groups.

The LYM (Lymphocytes) (Volume) values in broilers of T₃ and T₄ group showed significantly higher LYM than other groups. In case of MON (Monocytes) (Volume) birds of T₃ group had significantly ($P < 0.05$) higher volume than T₁, T₂ and T₄ groups. In case of GRA (Granulocytes) (Volume) birds of T₄ group had higher volume than T₁, T₂ and T₃ groups.

The RBC (Red blood cells) count was 2.44, 2.14, 2.10 and 2.05 ($\times 10^6/\text{ul}$) in T₁, T₂, T₃ and T₄ groups respectively. Out of which the T₁ showed significantly higher RBC than other groups. The Hb (Hemoglobin) value in T₁ control group showed significantly higher Hb than other groups. The HCT (Hematocrit) value in blood parameter T₁ control group was significantly superior than other groups. The MCV (Mean corpuscle volume) value was 137.96, 134.58, 133.55 and 133.11 (fl) in T₁, T₂, T₃ and T₄ groups, respectively.

The MCH (Mean corpuscle hemoglobin) value was 32.06, 39.73, 39.85 and 32.14 pg in T₁, T₂, T₃ and T₄ groups respectively out of which birds of T₂ and T₃ showed significantly higher MCH than other groups. The MCHC (Mean corpuscle hemoglobin concentration) value was 37.76, 37.50, 37.86 and 39.35g/dl in T₁, T₂, T₃ and T₄ groups, respectively out of these T₄ showed significantly higher MCHC than other groups. The PLT (Platelet) count in blood of broilers was 187.50, 318, 225.63 and 245.25 ($\times 10^3/\text{ul}$) in T₁, T₂, T₃ and T₄ groups, respectively. Out of which T₂ showed higher PLT than other groups.

The present results were similar to Yattoo *et al.* (2012) who reported that there were significantly ($P < 0.05$) higher values of all the blood parameters in treatment groups provided with fenugreek seed powder compared to control group. Similar results were obtained by Abdul-Rahman (2012), and Bhaisare *et al.*, (2014) who suggested that there were significantly ($P < 0.05$) higher values of blood parameters such as Hb, PCV and TEC in treatment groups over control group. However the results disagreed with Javed Yasar *et al.*, (2012) who reported that total leukocyte count (TLC) remained unaltered after supplementation of fenugreek in the broiler ration.

Table.1 Chemical composition of experimental broiler ration

Sr. No.	Nutrients	Per cent in ration		
		Pre-starter	Starter	Finisher
1	Crude protein	23.35	21.64	20.20
2	Crude fibre	3.92	3.96	3.99
3	Ether extract	4.95	5.08	5.12
4	Total ash	6.2	6.1	5.93
5	Acid insoluble ash	1.57	1.60	1.62
6	Nitrogen free extract	61.58	63.22	64.76
7	Metabolizable energy (kcal/kg)	2982.5	3065.7	3198.8
8	E/P ratio	127.73:1	141.66:1	158.35:1

Table.2 Average weekly cumulative body weight (g) per bird

Items	Fenugreek seed powder levels					SE	CD
	0% (T ₁)	0.5% (T ₂)	1% (T ₃)	1.5% (T ₄)			
Initial	47.33	47.28	47.28	47.43	0.08	NS	
1 st week	189.50	189.25	190.15	190.25	0.86	NS	
2 nd week	443.33	438.38	441.56	442.47	2.63	NS	
3 rd week	877.50 ^a	884.54 ^a	897.48 ^b	903.44 ^b	2.76	8.51	
4 th week	1388.25 ^a	1404.57 ^b	1427.17 ^c	1428.48 ^c	2.79	8.60	
5 th week	2001.15 ^a	2035.55 ^b	2068.56 ^c	2074.50 ^c	2.95	9.10	
6 th week	2536.47 ^a	2573.53 ^b	2624.15 ^c	2636.12 ^c	19.65	19.65	

Note: (Significant (P<0.05) means under each class in the same column with different superscripts differ significantly)

Table.3 Hematological analysis under different feeding treatments of fenugreek

Parameters	Treatments					
	T ₁	T ₂	T ₃	T ₄	SE	CD
(WBC) White blood cells ($\times 10^3/\text{ul}$)	121.83 ^b	122.28 ^b	129.68 ^a	130.51 ^a	0.66	2.04
Lymphocytes (Volume) ($\times 10^3/\text{ul}$)	82.19 ^b	82.08 ^b	88.63 ^a	88.73 ^a	0.64	1.98
Monocytes (Volume) ($\times 10^3/\text{ul}$)	13.15 ^c	12.45 ^d	14.04 ^a	13.48 ^b	0.19	0.27
Granulocytes (Volume) ($\times 10^3/\text{ul}$)	26.49	27.75	27.01	28.3	0.84	N.S.
(RBC) Red blood cells ($\times 10^6/\text{ul}$)	2.44 ^a	2.14 ^b	2.10 ^b	2.05 ^b	0.06	0.20
(Hb) Hemoglobin (g/dl)	12.29 ^a	10.95 ^b	10.38 ^b	10.86 ^b	0.24	0.74
(HCT) Hematocrit (%)	32.53 ^a	28.40 ^b	27.78 ^b	27.73 ^b	0.57	1.76
(MCV) Mean corpuscle volume (fl)	137.96	134.58	133.55	133.11	1.42	N.S.
(MCH) Mean corpuscle Hemoglobin (pg)	32.06 ^b	39.73 ^a	39.85 ^a	32.14 ^b	2.22	6.48
(MCHC) Mean corpuscle Hemoglobin concentration (g/dl)	37.76 ^b	37.50 ^b	37.86 ^b	39.35 ^a	0.35	1.08
(PLT) Platelet ($\times 10^3/\text{ul}$)	187.50	318.00	225.63	245.25	37.88	N.S.

Note: (Significant ($P < 0.05$) differences are shown for the mean having variable superscript within a row)

Table.4 Effect of dietary treatment of fenugreek seed on serum constituents of broiler chicks

Treatments	T ₁	T ₂	T ₃	T ₄	SE	C.D
Parameter						
Glucose (mg/dl)	124.38 ^c	136.38 ^b	146.38 ^a	149.00 ^a	3.45	10.64
Cholesterol (mg/dl)	133.88	154.75	123.38	142.25	7.20	N.S.
Triglyceride (mg/dl)	219.50 ^a	206.25 ^a	118.38 ^{ab}	93.63 ^b	33.52	103.31
HDL (High density lipoprotein) (mg/dl)	62.38 ^b	90.50 ^a	77.38 ^a	79.88 ^a	4.29	13.23
LDL (Low density lipoprotein) (mg/dl)	26.00	34.13	31.13	37.88	2.69	N.S.
LDL / HDL Ratio	0.42	0.37	0.33	0.47	0.03	N.S.

Note: (Similar superscript do not differ significantly (P<0.05) from each other within a row)

Serum constituents

The result presented in Table 4. The blood biochemical data shows that the herbal feed additive used in this experiment have noteworthy effect on their lipid metabolism. The serum glucose for T₁ (124.38 mg/dl) control group fed without fenugreek seed powder was the lowest followed by group T₂ (136.38 mg/dl) fed 0.5 per cent fenugreek seed powder, T₃ (146 mg/dl) fed 1 per cent fenugreek seed powder group and highest in T₄ (149 mg/dl) fed 1.5 fenugreek seed powder group.

The serum cholesterol for T₃ (123.38 mg/dl) group fed 1 per cent fenugreek seed powder was the lowest followed by group T₁ control group (133.88 mg/dl) fed without fenugreek seed powder, T₄ (142.25 mg/dl) fed 1.5 per cent fenugreek seed powder group and highest in T₂ (154.75 mg/dl) fed 0.5 fenugreek seed powder group. The broilers in T₃ group recorded lower cholesterol than T₁, T₂ and T₄ groups. Serum triglyceride content was significantly (P<0.05) low in T₄ (93.63 mg/dl) than in T₃ group (118.38 mg/dl), T₂ (206.25 mg/dl) and T₁ (219.50 mg/dl). The HDL value was highest in T₂ group (90.50) and lowest in T₁ control group (62.38) and

values in T₃ and T₄ were 77.38 and 79.88 respectively. The LDL value was lowest in T₁ control group (26 mg/dl) than other groups in T₂, T₃, and T₄ group (34.13, 31.13 and 37.88) respectively. The LDL/HDL ratio values was highest in T₄ group. The 1 % fenugreek seed powder lowering the cholesterol level because of their properties.

Duru *et al.*, (2013) also reported the same findings and stated that if the level of Fenugreek seed increased above 20g/kg broiler diet causes decreased triglyceride and cholesterol levels but increased the LDL cholesterol and glucose. Al-Habori (1998) found that fenugreek and its extract reduced the levels of cholesterol, triglycerides, and low density lipoprotein (LDL-cholesterol) with no effect on high density lipoprotein (HDL-cholesterol). This selective reduction in LDL-cholesterol results in the improvement of the ratio of HDL- cholesterol to LDL-cholesterol. Weerasingh and Atapattu (2013) and Momoun *et al.*, (2014) reported that serum cholesterol levels were reduced when fenugreek was added in diet of broilers and increasing the triglyceride level in broilers. Whereas, Safaei *et al.*, (2013) reported that effect of fenugreek extract in drinking water on some blood parameter like triglyceride,

cholesterol, and glucose levels were significantly different among the treatments when compared to the control group.

It is concluded that the inclusion of 1.5 per cent of fenugreek seed powder in broiler diet as a herbal feed supplement is beneficial in improving the live weight of broilers. The inclusion of fenugreek seed powder in broiler ration increased white blood cells for strong immunity, lymphocytes and platelet count and improved the overall hematological parameter. The inclusion of fenugreek seed powder in broiler ration substantially decreased serum cholesterol, triglyceride and increased the glucose level and improved the LDL/HDL ratio. It is beneficial to use fenugreek as a growth promoter or feed supplement in commercial broiler production.

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