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Effect of dietary supplementation of fenugreek seed powder on growth, carcass traits and hematological parameters in broiler chickens

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Abstract

A 42 days experiment was carried out to examine the effect of dietary supplementation of Fenugreek seeds (*Trigonella foenum-graecum L.*) powder (FSP) on growth performance, carcass characteristic and hematological parameters in broiler chickens. One hundred and forty-four day-old broiler chicks were randomly divided into six dietary treatment groups viz. T₁, T₂, T₃, T₄, T₅ and T₆ with each treatment having three replications of 8 birds. Supplementation with FSP was done at the rate of 0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0% in T₁, T₂, T₃, T₄, T₅ and T₆, respectively. The study revealed that supplementation of fenugreek seed powder at 1.5% or above in the diet of broilers resulted in significant ($p < 0.05$) improvement in feed intake, weight gain and FCR. A significant ($p < 0.05$) increase in total leukocyte and platelet count in the blood of broilers fed diets supplemented with FSP was observed. The slaughter weight, un-eviscerated carcass, eviscerated carcass and thigh weight increased ($p < 0.05$) with increasing levels of fenugreek seed powder up to the level of 2.5%. The carcass weight was also highest at inclusion level 2.5% FSP. The fenugreek supplemented groups had the highest ($p < 0.05$) dressing percentage as compared to control group.

Keywords: fenugreek seed powder, broiler, FCR, hematology, carcass traits

Introduction

Broiler's ration accounts for about 70-75% of total rearing cost. Commercial industry uses antibiotics to improve growth traits, carcass yield, having detrimental effects on animal and human health. In response to consumer concerns about the wellbeing and ethics of broiler production, the European Union has banned the use of antibiotics in animal production since 2006 that led the researchers to look for other alternatives with similar benefits to antibiotics. One of the potential alternatives reported in poultry production are phyto-genic additives, a group of natural growth promoters or non-antibiotic growth promoters derived from herbs, spices, or other plants. Recently, medicinal herbs are used in a wide range as a feed supplement to enhance growth performance. Among the various phyto-genic one such medicinal herb known as Fenugreek (*Trigonella foenum graecum*), locally as Methi cultivated all over the world, and one of the herbs having multi-functional characteristics that have a role in improving the growth performance of poultry birds b their antibacterial activity and positive effect on gut morphology. Fenugreek seeds contain crude protein (28.4%), crude fiber (9.30%), ether extract (7.14%), total ash (3.28%) and moisture (6.87%) (On the basis of triplicate sample). Yassin (2020) ^[15] reported that feed intake of broilers increased with increasing the levels of fenugreek seed powder in their ration which can be due to the improvement of palatability of the feed containing FSP. Abdul-Rahman (2012) ^[2] investigated that inclusion of fenugreek seeds at 10 g/kg of diet in broiler breeder chicken significantly ($p < 0.05$) improved the packed cell volume percentage, red blood count and Hb concentration and attributed this improvement in erythropoiesis to the enhancement of antioxidant activity in RBCs which decreases the production of free radicals that destroy Hb and cause hemolysis of RBCs. Yesuf *et al.* (2017) ^[16] stated that there is a significant difference ($P \leq 0.05$) in commercial carcass yield and its percentage, edible carcass yield and its percentage, breast meat weight and its percentage, giblet percentage and back weight. Murlidhar and Goswami (2012) ^[10] observed its anticarcinogenic, antioxidant, antibacterial, gastric stimulant and anti-anorexia effects in addition to its uses as food stabilizer, adhesive and emulsifying agent. Improvement in broilers growth performance has been recorded due to inclusion of fenugreek seed to their diets.

The aim of the present study was to investigate the effect of fenugreek seed powder supplementation at different level on growth performance, carcass characteristics and hematological parameters.

Materials and Methods

The location of study

This study was conducted with a total of 144 day-old as broiler chickens under deep litter system at poultry shed of Department of Animal Nutrition, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar for a period of 42 days to examine the effect dietary supplementation of fenugreek seed powder on growth performance, carcass characteristics and hematological parameters.

Experimental design and diets

A total of 144 day-old experimental broilers were weighed, identified by wing bands and randomly distributed to 6 treatment groups. Each treatment was divided into three replicates having 8 birds in each. So, each treatment group had 24 broilers. The ration was formulated as per the BIS (2007) Specification. The control group (T₁) was fed a basal diet having no fenugreek seed powder having antibiotics at recommended doses. While the rations of broilers under treatment group T₂, T₃, T₄, T₅ and T₆ was supplemented with fenugreek seed powder (FSP) at the rate of 1.0, 1.5, 2.0, 2.5 and 3.0%, respectively without any antibiotics.

Management of experimental broilers

For proper brooding of chicks, sufficient heat and light was provided by using electric bulbs in each treatment for first three weeks of age. Temperature of brooding was 95^oF for first week. A weekly reduction of 5^oF was done till brooder temperature reached to 85^oF by third week of age. Afterward sufficient artificial light was provided during night hours throughout the experimental period. Birds were vaccinated against F1 strain of Newcastle disease on 3rd day and Infectious Bursal Disease on 14th day through intranasal route. Fresh and clean drinking water was provided ad-libitum. All the precautionary measures against diseases were taken throughout the experimental period of six weeks. Feed intake and body weight gain was recorded weekly and at end of experimental study 5 birds from each treatment were slaughtered and weighed their carcass yield. Blood for hematological study was also collected from each bird via brachial wing vein puncture using sterilized syringes.

Statistical analysis

Data was analyzed statistically as described by Snedecor and Cochran (1994) [13]. Analysis of variance was used to study the differences among treatment means and they were compared by using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1956) [8].

Result

Cumulative Body Weight Gain

0-1st week

The body weight gain of broilers at 1st week in dietary treatment groups T₁, T₂, T₃, T₄, T₅ and T₆ were 51.79, 51.54, 61.69, 53.42, 53.26 and 46.34 g, respectively. The results so obtained depicted that body weight gain of experimental broilers up to 1st weeks of age was not affected by supplementing different levels of fenugreek seed powder in their ration.

0-3rd week

The results of this experiment a show that supplementation of fenugreek seed in antibiotic free diet of broiler at levels of 1.5, 2.0, 2.5 and 3.0 % increases the live weight gain significantly ($p < 0.05$) up to 3rd week of age as compare to broiler fed basal ration with antibiotics depicted in table 1.

0-6th week

The cumulative mean values of live weight gain in experimental broilers for 0-6week period showed that body weight gain of broilers during six weeks was found highest in treatment group T₄ (2% FSP) followed by T₅ (2.5%FSP) & T₃ (1.5%FSP), and significantly ($p < 0.05$) higher as compared to T₁ (control group). The finding of present investigation reveals that supplementation of fenugreek seed powder improves the live weight gain of broilers. Similarly, Alloui *et al.* (2012) [4] and Qureshi *et al.* (2015) [11] also reported that addition of either whole, crushed or powder form of FGS at various levels in broiler diets increased live weight of broilers. Gaikwad *et al.* (2019) [6] showed that 1.5% supplemented feed diet increases cumulative weight ($P < 0.05$) over control and other supplemental groups. Similarly, Ali *et al.* (2021) showed that 0.5%, 1% and 1.5% fenugreek seed supplementation of broiler diets resulted in increase in live weight than 0% fenugreek seed in broiler seeds.

Cumulative Feed Intake (g/Bird) of Broilers

The perusal of data indicated that feed intake of broiler under treatment group T₃, T₄ and T₅ were significantly ($p < 0.05$) higher than the control group T₁. During the period of 0 to 3rd week of the experiment, a significant effect ($p < 0.05$) on feed intake of the birds was observed on supplementation of Fenugreek seed powder as a feed additive, as the feed intake of the birds fed on Fenugreek seed powder supplemented ration (T₂, T₃, T₄ & T₅) was significantly ($p < 0.05$) higher than the control group (T₁) of birds fed on basal ration with antibiotics, however, supplementation of 3% FSP had no profound effect of feed intake over the control group. During the period of 0-6 week the cumulative mean values of feed intake were 3772.54, 4173.91, 4456.08, 4645.57, 4627.47 and 3767.86 g in treatment groups T₁, T₂, T₃, T₄, T₅ and T₆, respectively. The statistical analysis of the data revealed that cumulative feed intake values were significantly ($p < 0.05$) higher in broiler chicks fed ration supplemented at the levels of 1.0, 1.5, 2.0 and 2.5 % as compared to 3.0 % supplemental and control group. Yassin (2020) [15] also reported that feed intake of broilers increased with increasing the levels of fenugreek seed powder in their ration which can be due to the improvement of palatability of the feed containing FSP. Similarly, Abdel-Azeem (2016) [1] concluded that maximum values in average feed consumption were recorded for the groups fed diets with 1.5% Fenugreek seed while, the lower values were recorded in groups fed diets with 0.50% FGS and 1.0% FGS in contrast to the control group during the whole experimental period. In harmony of this result Weerasingha and Atapattu (2013) [14] and Mamoun *et al.* (2014) [9] reported that supplementation of fenugreek at 1% level and 1.5% levels are useful for enhancing feed consumption, live body weight, body weight gain, feed conversion ratio, protein efficiency ratio and efficiency of energy utilization.

Cumulative Feed Conversion Ratio (FCR)

The cumulative FCR is showed in table 1. FCR values did not differ significantly among different dietary treatment groups

as well control group during 0-1 week of growth period. During the growth period up to three weeks of age the cumulative feed conversion ratio in broiler were 1.69, 1.64, 1.52, 1.51, 1.40 and 1.31 in treatment groups T₁, T₂, T₃, T₄, T₅ and T₆, respectively. The results of present research unveiled that as the level of fenugreek seed powder was increased in the antibiotic free diets of broilers the feed conversion efficiency in terms of feed intake per unit weight gain improved. The cumulative mean values of feed conversion ratio in broilers for whole experimental period i.e., up to 6th week of growth period under dietary treatments T₁, T₂, T₃, T₄,

T₅ and T₆ were 1.82, 1.78, 1.64, 1.68, 1.66 and 1.77, respectively. Rahimian *et al.* (2018) [12] showed that the body weight and feed conversion ratio were significantly highest ($p < 0.05$) in treatment group that fed on fenugreek supplemented feed compared to control group. Yasin *et al.* (2020) concluded that fenugreek seed powder addition at various levels in broiler diets improved the feed conversion efficiency which is in agreement with the findings of Hamden *et al.* (2010) [7] who reported that inclusion of FSP improved feed conversion efficiency of broiler chicks.

Table 1: Cumulative average feed intake (g), Cumulative body weight gain (g), Cumulative feed conversion ratio (FCR) of broiler under different dietary treatment

Treatment	0-1 week			0-3week			0-6 week		
	Feed intake	BWG	FCR	Feed intake	BWG	FCR	Feed intake	BWG	FCR
T ₁	60.58 ^b ±0.66	51.79 ±2.79	1.27 ±0.06	773.34 ^a ±9.72	456.94 ^a ±9.90	1.69 ^b ±0.02	3772.54 ^a ±4.59	2085.74 ^a ±17.65	1.82 ^c ±0.049
T ₂	60.80 ^b ±0.55	51.54 ±0.14	1.28 ±0.11	866.20 ^b ±18.54	533.02 ^{ab} ±53.66	1.64 ^b ±0.12	4173.91 ^b ±3.35	2396.40 ^b ±44.62	1.78 ^{bc} ±0.035
T ₃	72.11 ^c ±0.53	61.69 ±1.77	1.27 ±0.18	951.83 ^c ±2.62	624.79 ^c ±13.69	1.52 ^{ab} ±0.03	4456.08 ^c ±1.30	2412.48 ^b ±80.01	1.64 ^a ±0.03
T ₄	72.11 ^c ±0.53	53.42 ±1.64	1.27 ±0.03	1016.41 ^c ±8.40	668.94 ^{cd} ±8.48	1.51 ^{ab} ±0.02	4645.57 ^c ±1.04	2507.48 ^c ±114.11	1.68 ^{ab} ±0.049
T ₅	70.83 ^d ±1.17	53.26 ±2.07	1.33 ±0.03	1006.35 ^c ±10.96	718.05 ^d ±8.84	1.40 ^a ±0.02	4627.47 ^c ±0.92	2433.54 ^{bc} ±31.10	1.66 ^{ab} ±0.02
T ₆	56.99 ^a ±2.67	46.34 ±1.94	1.23 ±0.059	764.62 ^a ±3.93	591.9 ^b ±39.09	1.31 ^a ±0.16	3767.86 ^a ±0.06	2335.81 ^b ±68.75	1.77 ^{bc} ±0.030

*Mean bearing different superscripts in a column differ significantly ($p < 0.05$).

Table 2: Dressed, Eviscerated, Drawn, Giblet, Breast, Drum, Thigh (%) of the experimental birds under different dietary treatments

Treatment	Dressed (%)	Eviscerated (%)	Drawn (%)	Giblet (%)	Breast (%)	Drum stick (%)	Thigh (%)
T ₁	70.12 ^a ±0.96	69.5 ^{bc} ±0.5	53.53 ^a ±1.07	4.77 ^{ab} ±0.11	8.80 ^c ±0.17	4.80 ^a ±0.05	4.60 ^a ±0.06
T ₂	71.90 ^a ±0.39	68.2 ^{ab} ±0.7	53.84 ^a ±0.09	4.70 ^{ab} ±0.23	7.65 ^{bc} ±0.09	5.04 ^b ±0.06	4.80 ^a ±0.14
T ₃	72.57 ^a ±0.60	69.68 ^c ±0.22	55.42 ^a ±0.50	4.85 ^{ab} ±0.10	7.29 ^a ±0.19	4.55 ^a ±0.2	4.95 ^{ab} ±0.21
T ₄	76.04 ^b ±0.58	70.73 ^{cd} ±0.38	58.20 ^b ±0.86	4.40 ^a ±0.32	7.30 ^a ±0.20	5.32 ^b ±0.02	5.05 ^b ±0.11
T ₅	82.27 ^c ±1.41	71.7 ^d ±0.20	63.60 ^c ±0.81	4.50 ^a ±0.13	7.28 ^a ±0.19	5.50 ^b ±0.2	5.26 ^b ±0.20
T ₆	78.40 ^b ±0.68	68.05 ^a ±0.30	58.81 ^b ±0.60	5.40 ^b ±0.34	8.12 ^{bc} ±0.25	4.60 ^a ±0.28	5.30 ^b ±0.57

*Mean bearing different superscripts in a column differ significantly ($p < 0.05$).

Dressing percentages of different dietary treatments ranged from 70.12% (T₁) to 82.27 % (T₅) and differ significantly between the supplemented and the control group. The percentage dressed weight was significantly ($p < 0.05$) high in experimental broilers fed 2%, 2.5% and 3% FSP as compared to control group as well low levels of supplemented groups. Similarly, eviscerated percentage also differ significantly between the control group and other treatment groups and ranged between 68.05% (T₆) to 71.7 (T₅). Highest eviscerated percentage was obtained with supplementation of basal diet with 2.0 and 2.5 % Fenugreek seed powder supplemented group (T₄ & T₅). Drawn percentage of different dietary treatments ranged from 53.53 % (T₁) to 63.6% (T₅). Drawn percentage was highest in T₅ (basal diet supplemented with 2.5% FSP). This differs significantly ($p < 0.05$) with the antibiotic supplemented group. Under different dietary treatments giblet percentage was ranged between 4.4% (T₄) to 5.4% (T₆). Highest giblet percentage was obtained in dietary treatment T₆. This was significantly ($p < 0.05$) higher than the control group. Breast muscle weight percentage under different dietary treatments ranges from 7.28% (T₁) to 8.8% (T₅). This differs significantly with the control group. Thigh muscle weight percentage under different dietary treatments ranges from 4.6 % (T₁) to 5.3% (T₆). Drumstick weight percentage under different dietary treatments ranges from 4.6% (T₆) to 5.5 % (T₅). It has been appeared from the present study that the weights of dressed carcass, thigh, drumstick, eviscerated, drawn and livers of broilers were increased in fenugreek supplemented group. The findings of present study are in agreement with finding of Mamoun *et al.* (2014) [9] who reported that dressing percentages of chicks fed on 1% and

2% FSP showed significantly ($p < 0.05$) heavy weights compared to non-supplemented group.

Haematological Parameter

Mean values of Hb ranged from 8.33% (T₂) to 10.53% (T₅) and higher values of Hb% were obtained in T₅ group, however, non-significant difference was noted in the Hb concentration among all groups treated with different doses of FSP and control group. Total Leukocyte Counts ranged from 20.64 m/mm³ (T₂) to 29.33m/mm³ (T₆). The results exhibited that TLC increased significantly ($p < 0.05$) in broilers fed FSP at levels of 2, 2.5 & 3.0% as compared to other levels and control group. Similarly, TEC mean value ranged from 2.5M/mm³ (T₃) to 2.92M/mm³ (T₅) revealing that Total Erythrocytes Counts were more in FSP supplemented group but did not differ statistically with control. Platelets count mean value ranged from 15.67 m/mm³ (T₁) to 30.33m/mm³ (T₅). The result of present investigation revealed that platelets count in broilers increased significantly ($p < 0.05$) on inclusion of FSP in their antibiotics free diet. The present finding is in harmony with earlier study of Abdul-Rahman (2012) [2] who investigated that feeding of Fenugreek seeds at 10 g/kg of diet in broiler breeder chicken significantly ($p < 0.05$) improved the packed cell volume percentage, red blood count and Hb concentration and attributed this improvement in erythropoiesis to the enhancement of antioxidant activity in RBCs which decreases the production of free radicals that destroy Hb and cause hemolysis of RBCs. Bhaisare and Thyagarajan (2014) also reported that hemoglobin content was significantly ($p < 0.05$) high when fenugreek seeds were used in turkey poults, indicating that certain bioactive

principles in fenugreek seeds have positive effect on haemopoietic process in the body.

Table 3: Mean values of Haematology parameters of broilers under different treatments

Treatments	Hb (g/dl)	TLC (m/mm ³)	TEC (m/mm ³)	Platelets (m/mm ³)
T ₁	8.96 ±0.70	22.68 ^{ab} ±1.20	2.71±0.12	15.67 ^a ±3.18
T ₂	8.33 ±0.38	20.64 ^a ±0.71	2.59±0.18	17.67 ^{ab} ±3.71
T ₃	8.83 ±0.63	25.44 ^{bc} ±1.31	2.50±0.19	19.67 ^b ±0.33
T ₄	9.23 ±0.38	27.38 ^{cd} ±0.17	2.81±0.14	25.02 ^c ±2.04
T ₅	10.53±1.03	28.10 ^{cd} ±1.74	2.92±0.22	25.11 ^c ±2.30
T ₆	10.50±1.12	29.33 ^d ±0.33	2.91±0.34	30.33 ^d ±1.61

Conclusion

In the view of the aforesaid findings, inclusion of up to 3% FSP in the diet of broilers did not affect the palatability of the diet. Addition of FSP improved feed intake with better average daily gain and carcass characteristic compared to the control group. The dressing percentage, total leukocyte count and platelets count increased as the level of FSP in the diet increased. It was concluded that better performance was observed when fenugreek seed powder was added up to 3 % in commercial broiler diets under conditions of the current experiment without any antibiotic in ration.

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