

EFFECT OF DIETARY SUPPLEMENTATION OF FENUGREEK (*TRIGONELLA FOENUM GRAECUM* L.) SEED POWDER IN PLACE OF ANTIBIOTICS ON THE PERFORMANCE OF BROILERS

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Received: 02.08.2021; Accepted: 27.10.2022

ABSTRACT

A study was conducted for a growth period of 6 weeks to determine effect of dietary inclusion of fenugreek seed powder (FSP) on the performances of broiler chickens. One hundred and fortyfour day old broiler chicks were randomly allocated to six groups with three replicates (degree of freedom) of 8 birds each following CRD design. Group T₁ served as control group and was offered basal diet as per BIS (2007) with antibiotic, while the basal diets in group T₂, T₃, T₄, T₅ and T₆ was supplemented with 1, 1.5, 2.0, 2.5 and 3.0 % FSP, respectively. Broilers fed on the diet containing FSP at every level of inclusion exhibited significantly (P<0.05) better growth performances compared to control group. Further, dietary inclusion of FGS at 2% level (T₄) resulted in significantly (P<0.05) higher feed intake and body weight gain compared to other level of the FGS inclusion. Similarly, feed conversion ratio (FCR) was also found to be significantly improved (P<0.05) in birds of group T₄ fed FGS at 2% level. With regard to economic performance, broilers fed on diet containing 1% FGS (T₂) fetched highest profit among the different dietary treatment groups. Therefore, it can be concluded that replacement of antibiotics with supplementation of FGS at 1% inclusion level in the diets of broiler chickens may be useful for efficient and economical broiler lean meat production.

Keywords: Broiler, Economics, FCR, Fenugreek Seed Powder, Growth Performance

How to cite: Kumar, P., Sihag, S., Kumar, S. and Sihag, Z.S. (2022). Effect of dietary supplementation of fenugreek (*Trigonella foenum graecum* L.) seed powder in place of antibiotics on the performance of broilers. *Haryana Vet.* 61(SI-2): 12-15.

The growth promoting properties of antibiotics has led to their extensive use at sub-therapeutic doses as feed additives in poultry industry. Although this practice has been beneficial for poultry birds' health and productivity, it has been proved as a double-edged sword for human health concerns. Prior to slaughtering, if antibiotics are not confined from the poultry feed, it will lead to harmful effect on the consumer of poultry meat or eggs (Halhidi, 2003). Also, it causes selection and dissemination of antibiotic-resistant strains of poultry pathogens (Gayatri *et al.*, 2017). Therefore, feed additives having growth promoting effects need to be explored and used in poultry production in place of antibiotics.

Phytogenic additives are a group of natural non-antibiotic growth promoters derived from herbs, spices, or other plants. Phytogenic feed additives have gained increasing interest, especially for their application in poultry diets. They beneficially control the potential pathogens, stabilize health promoting intestinal microbial ecosystem and improve the digestive capacity. Fenugreek (*Trigonella foenum graecum*) locally known as Methi is one of the herbs having multi-functional characteristics. It is used in functional food, traditional food, and nutraceuticals as well as in physiological utilization such as antibacterial, anticancer, antiulcer, anthelmintic, hypocholesterolemic, hypoglycaemic, antioxidant and antidiabetic agent (Murlidhar and Goswami, 2012). It is rich in protein, fat, total carbohydrates and minerals such as calcium, phosphorus, iron, zinc, magnesium (Gupta *et*

al., 1996); fatty acids predominantly linoleic, linolenic, oleic and palmitic (Schryver, 2002) and neurin, biotin, trimethylamine which tends to stimulate the appetite by their action on the nervous system (Michael and Kumawat, 2003). In the light of above-mentioned benefits of fenugreek, the current study was planned to investigate the response of broiler chickens to diet containing fenugreek seed powder in place of antibiotics.

MATERIALS AND METHODS

Experimental design

The experiment was carried out for a period of 42 days in three phases (pre-starter, starter and finisher phase) at poultry shed of Department of Animal Nutrition, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar. The ingredient and chemical composition of control diets for different phases has been presented in Table 1. The nutrient requirement of the control group T₁ was met with maize, groundnut cake and soybean meal-based basal diet as per BIS (2007) recommendations. Oxytetracycline was used as antibacterial medicine in the feed of control group. In place of oxytetracycline, the ration of the 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. The crude protein of the different pre-starter rations, starter rations and finisher rations ranged from 23.03 to 23.20%, 22.03 to 22.30% and 20.00 to 20.43%, respectively. ME content of different pre-starter, starter and finisher rations ranged from 3005.76 to 3041.95 kcal/kg, 3102.18 to 3120.65 kcal/kg and 3200.50 to

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Table 1. Ingredient and chemical composition of basal diet fed during pre-starter, starter and finisher phase of broiler production

Ingredient (kg /100 of feed)	Pre starter	Starter	Finisher
Ingredient composition* (%)			
Maize	55	56	57.20
Soybean meal	20	14	14.4
Ground nut cake	12	16	14.4
Fish meal	7	7	6
Vegetable oil	4	5	6
Mineral mixture	2	2	2
Chemical composition (%) **			
Moisture	9.83	10.05	9.97
Crude protein	23.12	22.03	20.42
Ether extract	6.32	6.64	8.28
Crude fibre	2.50	2.59	2.56
Total ash	6.08	6.18	6.65
ME (kcal/kg)	3013.15	3102.18	3210.15

* Feed additive mixture was added @ 410 g/100kg of control ration and 310 g/100 kg feed in the rest of treatment rations during different growth phases of broilers. Feed additive mixture was composed of Vitamin Mixture-I-10 g, Vitamin mixture-II-20 g, Coccidiostat-50 g, Choline chloride-100 g, Antibiotic, oxytetracycline (only in T₁) 100g, Lysine-50 g and DL-methionine-80 g. **Each value is mean of three observations.

3218.76 kcal/kg, respectively. Almost similar content of protein and energy in different diets reflected that all the rations were iso-proteinic and iso-caloric. Moisture, crude protein, ether extract, crude fibre and ash content of the FSP was 6.87, 28.4, 7.14, 9.30 and 3.28%, respectively and cost of Fenugreek was Rs. 8400/- per quintal.

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° F for first week. A weekly reduction of 5 °F was done till brooder temperature reached to 85°F by third week of age. After word sufficient artificial light was provided during night hours throughout the experimental period. Birds were vaccinated against F1 strain of New castle 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. Body weight and feed intake was recorded for pre-starter, starter and finisher phase separately. Subsequently, average body weight gain and FCR was calculated during different growth phases.

Statistical analysis

Data was analyzed statistically as described by Snedecor and Cochran (1994). Analysis of variance was

used to study the differences among treatment means and were compared by using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1956). All the data were subjected to ANOVA using the General Linear Models procedure of SPSS-20 (IBM).

RESULTS AND DISCUSSION

Pre-Starter Phase (0-7 day)

It was revealed that feed intake of broiler under treatment T₃, T₄ and T₅ were significantly (P<0.05) higher than the control group T₁ (60.58) and treatment group T₂(60.80). Treatment T₆ had significantly (P<0.05) lower feed intake as compared to all other groups. Body weight gain of chicks during pre-starter phase for different treatment groups did not differ significantly(P>0.05). Similarly, the mean values of FCR in group T₁, T₂, T₃, T₄, T₅ and T₆ were statistically similar.

Starter Phase (8-21 days)

During starter phase of growth, feed intake of broilers (g) in FSP supplemented treatment groups were significantly (P<0.05) higher as compared to control T₁ and T₆. Body weight gain was significantly (P<0.05) higher in broilers fed FSP supplemented diet at levels of 1.5%, 2.0% and 2.5% as compared to control and 1.0% or 3.0% FSP supplemented groups. As the level of FSP was increased in antibiotic free starter diets of broilers, the FCR was improved and control group had poorest FCR among all the experimental birds.

Finisher Phase (22-42 days)

During finisher phase, feed intake (g) in group T₁ was significantly (P<0.05) lower as compared to experimental groups T₂, T₃, T₄ and T₅, but statistically similar to T₆. All the graded levels of FSP supplemented antibiotics free diets significantly (P<0.05) increased the body weight gains (g) as compared to control group. The FCRs of dietary treatment T₄ and T₅ having 2.0% and 2.5% levels of FSP, respectively, were significantly (P<0.05) better as compared to other treatment and control group during finisher phase of broiler. Also, FCRs of treatment groups T₂, T₃ and T₆, were improved (P<0.05) in comparison to control.

Overall Growth Performance

Overall feed intake (0-42 days) among the birds fed antibiotic free diet supplemented with FSP @ 1.00, 1.5, 2.0 and 2.5% was significantly (P<0.05) higher as compared to control group (Table 2). However, supplementation of FSP @ 3.00 % had no significant effect on feed intake over control. Lower feed intake at 3% inclusion level of FSP might be due to its bitter taste and pungent odor. In a similar study, Yatoo *et al.* (2012) also reported that

Table 2. Overall average feed intake (g), body weight gain (g), feed conversion ratio (FCR) and economics of broiler production under different dietary treatments

Treatment	Initial BW	Final BW	BWG (g)	Feed intake (g/bird)	FCR
T ₁	44.37±1.57	2130.11 ^a ±1.09	2085.74 ^b ±17.65	3772.54 ^a ±4.59	1.81 ^b ±0.08
T ₂	44.83±0.75	2441.25 ^b ±4.19	2396.40 ^c ±44.62	4173.91 ^b ±3.35	1.74 ^a ±0.05
T ₃	44.64±0.58	2457.04 ^{ab} ±8.53	2412.48 ^{cd} ±80.01	4456.08 ^b ±1.30	1.84 ^c ±0.11
T ₄	44.73±1.12	2552.21 ^b ±13.47	2507.48 ^d ±114.11	4645.57 ^c ±1.04	1.85 ^c ±0.55
T ₅	44.89±1.77	2478.43 ^{ab} ±1.54	2433.54 ^{cd} ±31.10	4627.47 ^c ±0.92	1.90 ^d ±0.10
T ₆	44.17±0.78	1891.16 ^{ab} ±8.14	1846.99 ^a ±68.75	3767.86 ^a ±0.06	2.04 ^e ±0.52

*Values bearing different superscripts in a column differ significantly (P<0.05).

inclusion of fenugreek seeds @ 1% level in the diet of broiler chicken significantly (P<0.05) increases the feed intake. According to Alloui *et al.* (2012) stimulation of appetite with improved FCR in broilers fed fenugreek seeds supplemented diets were due to the presence of galactomannans and neurin in fenugreek which bears beneficial effect on gut microflora.

Overall body weight gain (Table 2) of birds under T₂, T₃, T₄ and T₅ groups was reported to be significantly (P<0.05) higher as compared to birds of control group (T₁), indicating encouraging effects of supplementation of FSP in dietary regimen of broilers over antibiotics up to a level of 2.5% of diet. But, supplementation of FSP @ 3.00 % reduced the gain in weight significantly (P<0.05) as compared to control group. In the same way, Mamoun *et al.* (2014) also reported significant improvement in weight gain of chicks fed fenugreek which is attributable to increased feed intake and presence of antibacterial, antifungal, anti-inflammatory and antioxidant compounds. Improvement in body weight has also been attributed to the presence of essential fatty acids and high-quality proteins in fenugreek seeds (Murray *et al.*, 1991) and digestion stimulating agents (Hernandez *et al.*, 2004; Hind *et al.*, 2013). Analogous reports have also been confirmed by Alloui *et al.* (2012) and Qureshi *et al.* (2015).

FCR (Table 2) in broilers of treatment group T₂ (1.0% FSP) was significantly (P<0.05) better as compared to T₁ and other groups. Poorest FCR was reported in T₆ followed by T₅. Thus, supplementation of FSP in antibiotic free diet at 1.0 of concentrate mixture improved the FCR significantly (P<0.05) in broilers as compared to basal diet with antibiotics. These finding are in line with those reported by Mamoun *et al.* (2014), Alloui *et al.* (2012) and Rahimian *et al.* (2018) upon supplementation of fenugreek in broiler's diet.

Economics of broiler production

The economics of broiler production (Table 3) was calculated by taking into consideration the cost of day-old broiler chicks and feed consumed. The cost of the day-old

Table 3. Economics of broiler production under different dietary treatments

Treatment	Total cost of feed (Rs.)	Gross return (Rs.)	Production cost/bird (Rs.)	Profit/bird (Rs.)
T ₁	121.85	272.41	157.85	97.76
T ₂	138.32	301.95	174.32	118.62
T ₃	149.54	292.08	185.54	109.29
T ₄	157.85	301.92	193.85	112.40
T ₅	159.18	284.93	195.18	102.22
T ₆	131.19	286.67	167.19	118.40

chick was Rs. 36/- per bird. They were sold at the age of 6 weeks @ Rs. 120 per bird as fixed by the university. The cost of feeding per chick (Rs.) was highest in the treatment T₅ (159.18) and lowest in T₁ (121.85). The total production cost was maximum in treatment T₅ (Rs. 195.18) and minimum in T₁ treatment (Rs. 157.85). The highest profit per bird (Rs.) was obtained in case of group supplemented with FSP @ 1% (T₂) followed by 3.0% (T₆) and 2.0% (T₄).

CONCLUSIONS

Although inclusion of FSP higher than 1.0% of the diet also increased the weight gain in broilers but in terms of body weight gain, feed consumption and FCR and profit per bird altogether, inclusion of 1.0% FSP in broilers' diet was inferred to be the best level in improving their performance.

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