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## Effect of fenugreek (*Trigonella foenum-graecum* L.) seed powder as feed additive on growth performance of commercial broiler chicken

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### Abstract

A study was undertaken to investigate the effect of dietary fenugreek (*Trigonella foenum-graecum* L.) seed powder on growth performance of commercial broiler chicken. Study was conducted for six weeks, a total of 150-day oldbroiler chicks with uniform body weight were randomly divided into five groups viz. T<sub>0</sub> (standard basal diet as control), T<sub>1</sub> (basal diet + 0.25% fenugreek seed powder), T<sub>2</sub> (basal diet + 0.50% fenugreek seed powder), T<sub>3</sub> (basal diet + 0.75% fenugreek seed powder) and T<sub>4</sub> (basal diet + 1% fenugreek seed powder) comprising 30 chicks in each group. The final body weight was significantly ( $P < 0.05$ ) higher in T<sub>4</sub> group (2252.10g) followed by T<sub>3</sub> group (2200.10g), T<sub>2</sub> group (2152.26g), T<sub>1</sub> group (2114.36g) and T<sub>0</sub> group (2030.66g). The total feed consumption per broiler was highest in T<sub>4</sub> group (3967.36g) and lowest in T<sub>0</sub> group (3851.83 g). The overall FCR for the entire period of the experimental groups was found best in T<sub>4</sub> group (1.74) followed by T<sub>3</sub> (1.76), T<sub>2</sub> (1.80), T<sub>1</sub> (1.83) and T<sub>0</sub> (1.89) groups. The study revealed that there was increased body weight, feed consumption, improved FCR and higher gross profit per broiler offered with 1 percent fenugreek seed powder.

**Keywords:** Broiler, body weight, feed consumption, FCR, gross profit, fenugreek seed powder

### Introduction

Poultry industry in India is one of the fastest growing and expanding segments of the agricultural and animal husbandry sectors due to its low investments and quick returns. Now-a-days broiler farming has become the most popular and profitable income generating enterprises for the educated unemployed youths. Most of the poultry farmers are interested in broiler production due to its shortest generation interval among various livestock and also produces the largest number of offspring per dam and also required much lesser space for rearing when compared to other livestock. In poultry production one of the possible alternatives reported for the normal growth, health and productive performance of birds are phytochemicals additives which include a group of natural feed additives; derived from herbs, spices and essential oils all serves as source for bioactive ingredients (Windisch *et al.*, 2008) [13]. Although for many years in the treatment for various diseases in animals and human being's, medicinal plants and herbs have been used for the treatment purposes and now-a-days, they are being used as growth promoters in animal feeds. They are incorporated in the diet of animal feedstuffs in order to improve the quality of feed and performance of the birds fed. Since long fenugreek (*Trigonella foenum-graecum*), locally known as Methi has been used as a feed additive particularly in the diet of broiler chicken and inclusion of fenugreek seeds in the diet significantly enhances growth and feed intake of broiler chicken by building better immunity (Yatoo *et al.*, 2012 and Quershi *et al.*, 2015) [14, 10]. Fenugreek seeds have many therapeutic effects like anti-parasitic, anti-helminthic, anti-diabetic, anti-fertility, anti-cancer, anti-bacterial, anti-inflammatory, anti-pyretic, and anti-microbial properties (Basch *et al.*, 2003; Mamoun *et al.*, 2014) [4, 8]. Fenugreek seed is an excellent source of minerals like iron, copper, selenium, zinc, calcium, potassium, magnesium and manganese and also an excellent source of many vital vitamins like thiamine, pyridoxine, riboflavin, vitamin A and C, (Michael and Kumawat, 2003) [9]. Fenugreek seeds also contain biotin, neurin and trimethylamine properties which by their action on the nervous system tends to stimulate the appetite of the bird (Al Habori and Raman, 2002) [1]. Considering the above facts in view the present study was undertaken to determine dietary supplementation of fenugreek seed powder on the performance of broiler chicken fed at different levels with feeds.

## Material and Method

The trial was conducted in the experimental poultry shed of the Instructional Poultry Farm, C.V.Sc., Khanapara, Guwahati with 150 number of day-old broiler chicks having uniform body weight from a single hatch. The chicks were randomly divided into five groups *viz.* T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> comprising of 30 chicks in each group. Each group was further subdivided into 3 replicates of 10 chicks in each. The chicks were wing banded and reared under deep litter system of management.

The control group (T<sub>0</sub>) was fed with basal diet without any supplementation and the treatment groups T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were supplemented with fenugreek seed powder at the rate of 0.25, 0.50, 0.75 and 1.0 per cent respectively. The chicks were fed with broiler pre starter (0-10 days), starter (11-28 days) and finisher (29-42 days) diets as per BIS (2007). The composition and nutrient levels of basal diet are shown in Table 1.

**Table 1:** Ingredients and nutrient composition of basal diet (broiler pre-starter, starter and finisher)

Ingredients (Kg)	Pre-starter (0-10 days)	Starter (11-28 days)	Finisher (29-42 days)
Maize	45.0	43.7	49.0
Rice polish	7.0	10.0	10.0
Ground nut cake	17.0	10.0	10.0
Soyabean meal	25.5	28.0	22.7
Vegetable oil	3.0	6.0	6.0
Mineral mixture	2.0	2.0	2.0
Salt	0.5	0.3	0.3
Nutrient composition			
Dry matter (%)	86.90	88.40	86.60
Crude protein (%)	23.63	21.92	20.06
Ether extract (%)	3.15	3.47	3.64
Crude fibre (%)	4.60	4.19	4.92
Nitrogen free extract (%)	35.48	33.51	32.31
Total ash (%)	4.10	3.93	3.69
Metabolizable energy (Kcal/Kg)*	2907.75	3086.10	3141.75

\*Calculated values

(N.B. Vitamin premix Alvite-M was added @20g per quintal of ration in pre-starter, starter and finisher diet).

All the birds were offered ad libitum drinking water and feed throughout the experimental period of six weeks. The chicks were kept in deep litter system using fresh paddy husk as a litter bedding material throughout the experimental period following standard hygienic and uniform managemental procedures. Chicks were medicated and vaccinated as per standard schedule. The performance of broiler in respect of weekly feed intake, weekly body weight and body weight gain, Feed Conversion Ratio (FCR) and economics of production were calculated as per standard methods. One

Way Analysis of Variance was performed by software SPSS and excel 2019.

## Results and Discussion

### Weekly feed intake and total feed consumption

The mean weekly feed intake of the present study (Table 2), observed that during the first week of age, the feed intake was highest in T<sub>4</sub> group as compared to other groups. Similar trend of highest feed intake in T<sub>4</sub> group was seen in second, fourth, fifth and sixth week of age. During, the third week of age, feed intake was highest in T<sub>3</sub> group and lowest in T<sub>4</sub> group.

**Table 2:** Mean weekly feed intake (g/bird) and total feed consumption (g/bird)

Group week	T <sub>0</sub> (Control)	T <sub>1</sub> (0.25%)	T <sub>2</sub> (0.50%)	T <sub>3</sub> (0.75%)	T <sub>4</sub> (1.00%)
1 <sup>st</sup>	184.60	185.80	183.80	184.03	186.50
2 <sup>nd</sup>	331.13	332.00	309.30	300.56	334.93
3 <sup>rd</sup>	586.86	584.76	575.56	570.56	570.33
4 <sup>th</sup>	809.96	836.86	837.30	839.40	846.76
5 <sup>th</sup>	872.76	887.76	905.03	907.16	943.63
6 <sup>th</sup>	1066.50	1053.76	1072.73	1082.96	1085.20
Total	3851.83	3880.67	3883.73	3884.70	3967.36

The total feed consumption was highest in T<sub>4</sub> group (3967.36g) and lowest in T<sub>0</sub> group (3851.83g). The findings were in line to the findings of Mamoun *et al.* (2014) [8] who reported that fenugreek seed supplementation in broiler diets significantly ( $P < 0.05$ ) improved feed intake, which may be due to their active compounds such as anti-bacterial, anti-fungal, anti-inflammatory, carminative and anti-oxidant activities which may have increased the feed intake in birds or may be due to fenugreek as natural feed additives improved diet palatability and helps in stimulating the digestive process by increasing the appetite of the birds (Hernandez *et al.*, 2004) [6]. The increased in feed intake in the FSP fed group

could be explained by the fact that fenugreek seed contain trimethylamine, neurin and biotin which by their action on the nervous system tends to increase the appetite of the bird (Al Habori and Raman, 2002) [1] or this can be attributed to the existence of steroid saponins (appetite-stimulating) in fenugreek seeds, which increased feed intake and motivated to eat (Khadr and Abdel Fattah 2007) [7].

### Weekly body weight and body weight gain

The differences associated with the treatment for mean ( $\pm$ SE) weekly body weight (Table 3) in first and second week of age were found to be non-significant ( $P > 0.05$ ). During third,

fourth, fifth and sixth week of age, the body weight differed significantly ( $P \leq 0.05$ ) among different treatment groups. At the end of sixth week, T<sub>4</sub> group gained significantly higher body weight as compared to other groups. Similar findings were obtained by Weerasingha and Atapattu (2013) [12], Mamoun *et al.* (2014) [8], Qureshi *et al.* (2015) [10] and Ali *et al.* (2021) [2] who reported that supplementation of fenugreek seed powder in the basal diet of broiler chicken improved

final body weight of the broiler chicken as compared to control group. The improvement in body weight of the broiler chicken supplemented with FSP in the diets might be due to increase feed intake and improvement in the gut microflora (Hernandez *et al.*, 2004) [6]. The higher body weight observed in fenugreek supplemented groups may be attributed due to the presence of the essential fatty acids and high-quality protein in the fenugreek seeds (Schryver, 2002) [11].

**Table 3:** (Mean  $\pm$  S.E.) weekly body weight (g/bird) of broilers under different treatment groups

Groups weeks	T0 (Control)	T1 (0.25%)	T2 (0.50%)	T3 (0.75%)	T4 (1.00%)
1 <sup>st</sup>	128.20 <sup>a</sup> $\pm$ 8.56	136.76 <sup>a</sup> $\pm$ 2.45	132.36 <sup>a</sup> $\pm$ 2.31	141.80 <sup>a</sup> $\pm$ 8.27	148.56 <sup>a</sup> $\pm$ 6.15
2 <sup>nd</sup>	349.63 <sup>a</sup> $\pm$ 7.33	365.26 <sup>a</sup> $\pm$ 6.95	344.96 <sup>a</sup> $\pm$ 6.59	402.80 <sup>a</sup> $\pm$ 7.90	447.53 <sup>a</sup> $\pm$ 8.47
3 <sup>rd</sup>	613.30 <sup>a</sup> $\pm$ 14.70	656.60 <sup>ab</sup> $\pm$ 12.72	660.66 <sup>ac</sup> $\pm$ 14.91	700.86 <sup>acd</sup> $\pm$ 13.97	768.03 <sup>abcd</sup> $\pm$ 18.51
4 <sup>th</sup>	1022.16 <sup>a</sup> $\pm$ 23.57	1069.43 <sup>ab</sup> $\pm$ 19.71	1074.53 <sup>ac</sup> $\pm$ 25.26	1118.26 <sup>acd</sup> $\pm$ 24.91	1180.96 <sup>ab</sup> $\pm$ 27.28
5 <sup>th</sup>	1513.13 <sup>a</sup> $\pm$ 26.52	1575.53 <sup>b</sup> $\pm$ 27.88	1588.93 <sup>bc</sup> $\pm$ 33.33	1630.83 <sup>bcd</sup> $\pm$ 30.59	1698.50 <sup>bc</sup> $\pm$ 23.15
6 <sup>th</sup>	2030.66 <sup>a</sup> $\pm$ 26.19	2114.36 <sup>b</sup> $\pm$ 24.49	2152.26 <sup>bc</sup> $\pm$ 29.03	2200.10 <sup>cd</sup> $\pm$ 17.35	2269.30 <sup>c</sup> $\pm$ 23.17

Means bearing different superscripts in a row differ significantly ( $P \leq 0.05$ )

The mean ( $\pm$ SE) weekly body weight gain (Table 4) of different experimental groups showed no significant ( $P > 0.05$ ) difference in the first of week of age. On the second, third, fourth, fifth and sixth week of age, the mean ( $\pm$ SE) weekly body weight gain differed significantly ( $P \leq 0.05$ ) among the different treatment groups. The mean ( $\pm$ SE) total gain was lowest in T<sub>0</sub> group and highest in T<sub>4</sub> group. Contrary to the

present finding, Khadr and Abdel-Fateh (2007) [7], Medina *et al.* (2020) and Alloui *et al.* (2012) [3] reported increased body weight gain in FSP supplemented groups. The improvement in body weight gain due to supplementation of FSP in the diets might be due to increase feed intake and improvement in the gut microflora (Hernandez *et al.*, 2004) [6].

**Table 4:** (Mean  $\pm$  S.E.) weekly body weight gain (g/bird) of broilers under different treatment groups

Group week	T0 (Control)	T1 (0.25%)	T2 (0.50%)	T3 (0.75%)	T4 (1.00%)
1 <sup>st</sup>	75.46 <sup>a</sup> $\pm$ 8.40	82.86 <sup>a</sup> $\pm$ 2.31	80.86 <sup>a</sup> $\pm$ 2.35	89.87 <sup>a</sup> $\pm$ 8.44	98.5 <sup>a</sup> $\pm$ 6.28
2 <sup>nd</sup>	221.43 <sup>a</sup> $\pm$ 8.92	228.50 <sup>b</sup> $\pm$ 5.33	212.60 <sup>abc</sup> $\pm$ 5.36	261.00 <sup>acd</sup> $\pm$ 7.73	298.96 <sup>abcd</sup> $\pm$ 10.12
3 <sup>rd</sup>	263.66 <sup>a</sup> $\pm$ 8.60	291.33 <sup>ab</sup> $\pm$ 7.28	315.70 <sup>c</sup> $\pm$ 10.98	298.06 <sup>acd</sup> $\pm$ 10.90	320.50 <sup>ac</sup> $\pm$ 10.88
4 <sup>th</sup>	408.86 <sup>a</sup> $\pm$ 17.68	412.83 <sup>ab</sup> $\pm$ 16.22	413.86 <sup>abc</sup> $\pm$ 14.60	417.40 <sup>abcd</sup> $\pm$ 17.76	412.93 <sup>bd</sup> $\pm$ 14.22
5 <sup>th</sup>	490.96 <sup>a</sup> $\pm$ 22.17	506.10 <sup>ab</sup> $\pm$ 24.27	514.54 <sup>c</sup> $\pm$ 28.73	512.56 <sup>cd</sup> $\pm$ 24.26	517.54 <sup>cd</sup> $\pm$ 23.35
6 <sup>th</sup>	517.53 <sup>a</sup> $\pm$ 20.24	538.83 <sup>ab</sup> $\pm$ 25.25	563.33 <sup>ac</sup> $\pm$ 34.62 <sup>a</sup>	569.26 <sup>acd</sup> $\pm$ 26.04	570.80 <sup>ac</sup> $\pm$ 23.60
Total gain	1974.6 <sup>a</sup> $\pm$ 29.33	2060.45 <sup>b</sup> $\pm$ 24.26	2100.77 <sup>bc</sup> $\pm$ 28.99	2148.17 <sup>cd</sup> $\pm$ 17.36	2219.23 <sup>c</sup> $\pm$ 22.99

Means bearing different superscripts in a row differ significantly ( $P \leq 0.05$ )

### Feed Conversion Ratio

The mean weekly FCR (Table 5) values during the first week of age was found to be lowest in T<sub>4</sub> group (1.89) and highest in T<sub>0</sub> group (2.44). In the second week, T<sub>1</sub> (1.45) and T<sub>2</sub> (1.45) groups showed better FCR as compared to other groups. In third week, T<sub>4</sub> (1.77) group showed the best result as

compared to other groups. In the fourth week, T<sub>0</sub> (1.98) group showed the lowest FCR values and T<sub>4</sub> (2.05) group showed the highest FCR values. In the fifth week, T<sub>2</sub> (1.74) group showed the lowest FCR values as compared to other groups. At the end of the sixth week, T<sub>4</sub> (1.90) group showed lowest FCR values compared to other groups.

**Table 5:** Mean weekly feed conversion ratio of broilers under different treatment groups

Group week	T0 (control)	T1 (0.25%)	T2 (0.50%)	T3 (0.75%)	T4 (1.00%)
1 <sup>st</sup>	2.44	2.24	2.27	2.04	1.89
2 <sup>nd</sup>	1.49	1.45	1.45	1.52	1.57
3 <sup>rd</sup>	2.22	2.00	1.82	1.91	1.77
4 <sup>th</sup>	1.98	2.04	2.02	2.01	2.05
5 <sup>th</sup>	1.77	1.75	1.74	1.76	1.82
6 <sup>th</sup>	2.06	1.95	1.94	1.92	1.90
Overall	1.89	1.83	1.80	1.76	1.74

The overall FCR during the entire period of the experimental was best in T<sub>4</sub> group (1.74), followed by T<sub>3</sub> group (1.76), T<sub>2</sub> group (1.80), T<sub>1</sub> group (1.83) and T<sub>0</sub> group (1.89). Similar results were found by Yattoo *et al.* (2014), Weerasingha and Atapattu (2013) [12], and Mamoun *et al.* (2014) [8]. The improvement in the FCR of broiler chicks supplemented with fenugreek seed powder might be due to the improvement in gut microflora due to addition of fenugreek seeds which can

be induced by differences in gut load of microbial content including their metabolites in the gastrointestinal tissues (Alloui *et al.*, 2012) [3].

### Economics of Production

The cost of production per broiler including the additional cost of fenugreek seed powder were found to be (₹)242.94, 246.13, 248.09, 249.74 and 255.18 for T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>

groups, respectively. The gross profit per broiler was found to be the highest in T<sub>4</sub> (₹27.32) group followed by T<sub>3</sub> (₹25.26), T<sub>2</sub> (₹20.66), T<sub>1</sub> (₹17.62), T<sub>0</sub> (₹10.81) groups, respectively. The better gross profit per broiler in T<sub>4</sub> group could be due to improved overall performance and improved FCR of broilers due to the addition of fenugreek seed powder in the ration.

These findings were similar with the results of Khadr and Abdel-Fattah (2007) [7], Mamoun *et al.* (2014) [8], who found that although all chicks fed on different levels of FSP recorded high ratio of profits, the broiler fed with 1 per cent FSP was the highest as compared to control group.

**Table 6:** Cost of production and gross profit per (₹) broiler under different treatment groups

Particular	Treatments				
	T <sub>0</sub> (Control)	T <sub>1</sub> (0.25%)	T <sub>2</sub> (0.50%)	T <sub>3</sub> (0.75%)	T <sub>4</sub> (1.00%)
<b>I. Expenditure</b>					
Chick cost (A)=1.05 x cost of one day-old-chick (₹)	57.75	57.75	57.75	57.75	57.75
Feed cost (B) = Live weight in kg x FCR x cost per kg of feed* (₹)	153.51	154.77	154.96	154.88	157.94
Miscellaneous expenditure (C) = Add 15% of (A+B) (₹)	31.68	31.87	31.90	31.89	32.53
Additional cost of fenugreek seed powder (D)	---	1.74	3.48	5.22	7.14
Production cost per broiler (A+B+C+D)	242.94	246.13	248.09	249.74	255.18
<b>II. Return</b>					
Sale of live broiler @ ₹ 125 per kg	253.75	263.75	268.75	275.00	282.50
III. Gross profit per broiler (₹)	10.81	17.62	20.66	25.26	27.32

### Conclusion

A batch of 150-day-old broiler chicks having similar body weight were randomly divided into five experimental groups viz. T<sub>0</sub> (standard basal diet as control), T<sub>1</sub> (basal diet + 0.25% fenugreek seed powder), T<sub>2</sub> (basal diet + 0.50% fenugreek seed powder), T<sub>3</sub> (basal diet + 0.75% fenugreek seed powder) and T<sub>4</sub> (basal diet + 1% fenugreek seed powder) comprising 30 chicks in each group with 3 replications of 10 chicks in each. The final body weight per broiler was significantly ( $P < 0.05$ ) higher in T<sub>4</sub> group (2252.10g) followed by T<sub>3</sub> group (2200.10g), T<sub>2</sub> group (2152.26g), T<sub>1</sub> group (2114.36g) and T<sub>0</sub> group (2030.66g). The total feed consumption per broiler was highest in T<sub>4</sub> group (3967.36g) and lowest in T<sub>0</sub> group (3851.83 g). The overall FCR for the entire period of the experimental groups was found best in T<sub>4</sub> group (1.74) followed by T<sub>3</sub> (1.76), T<sub>2</sub> (1.80), T<sub>1</sub> (1.83) and T<sub>0</sub> (1.89) groups. The study revealed that there was increased body weight, feed consumption, improved FCR and higher gross profit per broiler offered with 1 percent fenugreek seed powder. Thus, it can be concluded that fenugreek seed powder can be used economically as a natural feed additive in broiler chicken diet at the level of 1.00 per cent to improve the overall performance of commercial broiler chicken.

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