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Effect of Antibiotics Vis-A-Vis Fenugreek Seed Powder (*Trigonella foenum-graecum* L.) On Growth Performance and Feed Conversion Efficiency of Broilers

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Abstract: The feeding trial of six weeks in broiler chicks (n=160) was conducted which were subjected to 4 treatments and designated as treatment T_0, T_1, T_2 and T_3 respectively. All the broiler chicks were fed with starter ration up to 21 days and finisher ration from 22 to 42 days of age as per BIS (1992) specification. The chicks fed with basal diet in control group (T_0), while chicks in treatment T_1 was fed with Antibiotics viz. Zinc bacitracin and Salinomycin @ 20 and 60 mg/kg of feed respectively, T_2 and T_3 were fed basal diet with Fenugreek seed powder @ 1.0 and 1.5 %, respectively. All the birds were given isocaloric and isonitrogenous diets throughout the experimental period. The data were analyzed using General Linear Model procedure of statistical package for social sciences (SPSS) 20th version and means were compared using Duncan's multiple range test (1955) and significance was considered at ($P<0.05$) level. The weekly body weight changes of chicks indicated no significant difference among various treatment groups during the first two weeks of the experiment. There is significant ($P<0.05$) difference among the treatments were observed from third weeks onwards. At end the end of sixth week, significantly ($P<0.05$) higher body weight gain in the T3 group was recorded. The treatments T1, T2 and T1, T3 were at par to each other. The overall feed intake of the birds showed non-significant differences in all the treatment groups for the entire experimental period. All treatments were non-significant upto second week's period. Significant variation ($P<0.05$) was observed in FCR from third to six weeks. Statistically better FCR was recorded in T3 (FSP 1.5%) treatment as compared to other treatments. However, treatment T0, T1 and T2, T3 was at par to each other.

Keywords: Broilers, Growth performance, Fenugreek, Antibiotics.

INTRODUCTION

The Indian poultry industry is thought to be 5000 years old, with a greater expansion from backyard chicken husbandry to the poultry industry over the last four decades. Poultry farming played an important role in reducing starvation, poverty and unemployment. The poultry business in India is a fast-growing sector that accounts for around 8 per cent of the country's GDP.

India is the world's third-largest producer of eggs and fifth-largest producer of chicken meat. In 2019, the total number of chickens in the country was 851.81 million, up 16.8 per cent from the previous census. In 2019, the total number of backyard poultry in the country is 317.07 million, while the total number of commercial poultry is 534.74 million. A total of 95.2 billion eggs and 5.3 million metric tonnes of poultry manure are generated.

Fenugreek (*Trigonella foenum-graceum* L.) is a well-known medicinal plant that grows naturally and is primarily grown in India, Pakistan and China. Fenugreek seeds contain a wide range of medicinal qualities, including hypoglycemic, anti-diabetic, anti-fertility, anti-cancer, anti-parasitic, anthelmintic, antibacterial,

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anti-inflammatory, antipyretic and antimicrobial capabilities (Bash *et al.*, 2003). It contains neurin, biotin, and trim ethylamine, which promote appetite by acting on the neurological system. (Al Habori *et al.,* 1998)

Fenugreek is high in carbohydrates, minerals, and vitamins. Based on its notable qualities, a research study was designed to evaluate the benefits of Fenugreek as a growth booster of broiler chicks. Several studies found that integrating medicinal plants into broiler meals increased body weight gain and feed conversion efficiency while decreasing feed costs (Azoua, 2001; Abdel-Azem, 2006; Farman Ullah *et al.*, 2009). As a result, the goal of this study was to investigate the impact of Fenugreek seeds added to broiler chicken diets on production performance. when used as a natural feed supplement in broiler chicken diets, it improves feed efficiency while decreasing feed costs (Azoua 2001); Abdel Azem (2006) revealed the best results with fenugreek seeds at a 0.5 per cent level in the broiler chicken diet. In contrast, Weerasingha and Atapattu (2013) and Mamoun *et al.* (2014) observed a 1 per cent level. According to Magda (2012), 1.5 per cent fenugreek was effective for improving live body weight, body weight gain, feed conversion ratio, protein efficiency ratio, feed consumption, and energy usage efficiency.

MATERIALS AND METHODS

Present study was carried out at Poultry Unit, Veterinary Polyclinic and A.I. Centre, Department of Animal Husbandry and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra State. Located at 19.392677 N and 74.648827 E at an altitude of 455 meter. Minimum and maximum ambient temperature range from 12^0 C to 15^0 C in winter and 33^0 C to 38^0C in summer with annual rainfall of 455 mm. The experiment was conducted in July - August during the year 2021-22. The experimental chicks were all raised in a deep litter system with rice husk as a litter material in a well-ventilated house under the same management and environmental conditions. For the first three weeks of life, proper brooding of chicks was accomplished by giving adequate heat and light using electric lamps in each group.

The fenugreek seed powder (FSP) was procured from Medicinal and Aromatic Plant Unit, Department of Agricultural Botany, Mahatma Phule Krishi Vidyapeeth, Rahuri as feed supplement and mixed in commercial broiler feed manufactured by Baramati Agro industries as per different treatment levels.

Selection of Experimental Chicks

For the present study 160 chicks of day old age, commercial broiler chicks of Vencob strain were procured from Vyankateshwara Hatcheries Pvt. Limited, Pune, Maharashtra. On arrival, chicks were weighed and distributed randomly in to 4 groups viz. T_0, T_1, T_2 and T_3 with 40 chicks in each treatment as replicates, on equal weight basis.

Treatment Details

The dietary treatments are as follows,

T0 Basal Diet (Control)

T1 Basal Diet + Antibiotic (Zinc Bacitracin 20 mg/kg and Salinomycin 60 mg/kg)

T2 Basal Diet + Fenugreek seed powder @1.0 % of feed.

T3 Basal Diet + Fenugreek seed powder @1.5 % of feed.

Proximate Composition of Experimental Broiler Ration

It was observed that experimental broiler rations contained adequate nutrients for growth as per BIS (1992). The proximate composition of experimental Pre-starter, starter ration and finisher ration is given in Table 1. The crude protein and metabolizable energy contain in pre-starter, starter and finisher ration as 23.63, 21.49, 20.24 and 2963.25, 3073.2, 3186.5 kcal/ kg, respectively.

Observations Recorded

a) Weekly live body weight: On the first day of the experiment all the day old chick were weighed and the birds were randomly divided into different groups. Subsequently all the birds were weighed week wise up to six weeks. The birds were weighed collectively in group for each replicate.

(b) Weekly Body weight gain: At the end of each week, total numbers of birds were collectively weighed replicate wise and data were recorded. However, in next week same birds were weighed to obtain the body weight gain. Likewise the data were recorded to calculate gain in weight in each replicate.

(c) Weekly Feed consumption: The experimental birds were offered a calculated feed during the experimental period and at the end of each week total feed remained over were recorded to obtain the feed intake of the group. The feed intake data was recorded replicate wise, and further calculated to obtain feed consumption per bird.

(d) Weekly Feed conversion ratio: The feed conversion ratio was calculated by considering the total feed intake and lives body weights of the birds. The recorded data of feed intake and live body weight were used to calculate feed conversion ratio.

STATISTICAL ANALYSIS

The data were analyzed using General Linear Model procedure of statistical package for social sciences (SPSS) 20th version and comparison of means tested using Duncan's multiple range test (1955) and significance was considered at ($P<0.05$).

RESULTS AND DISCUSSION

Growth Performance

Growth performance is related to the body weight changes of broiler chicks at different weekly intervals fed with fenugreek seed powder and antibiotics in feed are represented in Table 1. The Effect on production performance of fenugreek has long been utilised as a growth booster, particularly in broiler chicken diets. The addition of Fenugreek seeds to the diet boosts the body weight of broiler chickens substantially (Abaza 2001; Yatoo *et al.* 2012; Qureshi *et al.*, 2015). Furthermore, when used as a natural feed additive in broiler chicken diets, it enhances feed efficiency while lowering feed costs (Azoua 2001); Abdel Azem (2006) demonstrated the highest outcomes by fenugreek seeds when supplied at a 0.5 per cent level in the broiler chicken diet. Weerasingha and Atapattu (2013) and Mamoun *et al.* (2014), on the other hand, reported that 1 per cent and 1.5 per cent according to Magda (2012) incorporation levels were effective for enhancing live body weight, body weight gain, feed conversion ratio, protein efficiency ratio, feed consumption, and energy usage efficiency.

Table 1: Proximate chemical composition of experimental broiler ration (% DM basis)

Sr. No.	*Nutrients*	*Per cent in ration*		
		Pre-starter	*Starter*	*Finisher*
1	Crude Protein	23.63	21.49	20.24
2	Crude Fibre	3.49	3.44	3.78
3	Ether Extract	4.38	5.39	5.49
4	Total Ash	6.59	6.41	5.89
5	Acid Insoluble Ash	1.29	1.59	1.62
6	Nitrogen Free Extract	60.44	63.37	64.45
7	Metabolizable Energy (Kcal/Kg)	2963.25	3073.2	3186.5
8	E/P Ratio	126.26:1	142.34:1	153.54:1

Body weight changes

Present study was conducted to investigate the comparative effects of fenugreek seed powder and antibiotic on broilers growth performance. Table 2 represents the data growth performance due to different dietary treatments of fenugreek seed powder and antibiotic supplementation during experimental period.

The growth performance of experimental broiler birds at weekly interval from day old to 6th week is presented in Table 2. The data on the cumulative body weight of experimental broiler birds under different experimental treatments recorded during the six weeks period were assigned to CRD and the results are presented in Table 2 .

Table 2 depicts the average weekly cumulative body weight in g of the broiler birds. Under the treatments T_0, T_1, T_2 and T_3 as 178.58, 179.83, 179.78 and 178.93 g per bird in first week. The subsequent values of average weekly cumulative body weight of the broiler birds

in second week are 345.60, 344.48, 344.80 and 342.03 g per bird in treatments T_0, T_1, T_2 and T_3 respectively. In third week the average weekly cumulative body weight of the broiler birds as 667.65, 678.55, 672.50 and 698.33 g per bird in treatments T_0, T_1, T_2 and T_3 respectively. In fourth week the average weekly cumulative body weight of the broiler birds as 1043.78, 1071.40, 1061.73 and 1115.90 g per bird in treatments T_0, T_1, T_2 and T_3 respectively.

In fifth week the average weekly cumulative body weight of the broiler birds are 1448.00, 1506.80, 1494.30 and 1586.43 In g per bird in treatments T_0, T_1, T_2 and T_3 respectively and during sixth week the average weekly cumulative body weight of the broiler birds are 1921.83, 2037.93, 2010.70 and 2138.48 g per bird in treatments T_0, T_1, T_2 and T_3 respectively. Khadr and Abdel-Fattah (2007) Results recorded that supplying fenugreek seeds during the growing period had slightly raised the body weight gain for birds fed diets containing 1% fenugreek seeds followed by those fed 2% than that of control diet.

The present results accomplished are contrary to the results of Duru Metin.*et al.* (2013) who recorded that addition of germinated fenugreek seed powder in diet shows that significantly ($p<0.05$) decreases the body weight and breast weight of treatment groups compared to control. Fenugreek seed powder feed additive has an excellent nutritional profile high protein with includes all the essential amino acids and abundant in minerals and vitamins. Fenugreek improves the growth and reproduction and immune status.

Table 2: Effect of supplementation of Fenugreek Seed Powder and Antibiotics on cumulative body weight changes of broilers

Treatments	*Age in weeks*					
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*
T1	178.58 ± 0.41	345.6 ± 0.39	667.65 ± 10.12^{a}	1043.78 ± 12.7^{a}	1448 ± 18.14^{a}	1921.83 ± 23^{a}
T2	179.83 ± 0.57	344.48 ± 0.62	678.55 ± 1.56^{a}	1071.4 ± 2.17^{b}	1506.8 ± 14.38^{b}	2037.93 ± 17.47^{b}
T_3	179.78 ± 0.49	344.8 ± 0.54	672.5 ± 0.66^{a}	1061.73 ± 0.87^{ab}	1494.3 ± 11.71^{b}	2010.7 ± 17.29^{b}
T4	178.93 ± 0.65	342.03 ± 2.19	698.33 ± 2.73^{b}	1115.9 ± 7.28^{c}	1586.43 ± 12.56^{c}	2138.48 ± 8.69^{c}
SE ±	0.54	1.19	5.31	7.42	14.41	17.39
CD at 5%	NS	NS	14.83	20.71	40.26	48.57

Body weight gain

The data of the gain in body weight of experimental broiler birds under different experimental treatments observed during the six weeks period were assigned to CRD. Table 4.3 depicts the average weekly body weight gain in g of the broiler birds. The age of birds and treatments also encouraged the weekly weight gain. As concern to influence of age the weekly trend in weight gain was almost similar as recorded in cumulative body weights. The lightest recorded average weekly weight gain was 136.4 g in first week and highest was 552.05 g during sixth week. In the given treatments T_0, T_1, T_2 and T_3 as 137.70, 136.40, 137.85 and 137.40 g body weight gain per bird in first week. The subsequent values of average weekly gain in body weight in g of the broiler birds in second week as 167.03, 164.65, 165.03 and 163.10 g per bird in treatments T_0, T_1, T_2 and T_3, respectively. In third week of the trial average weekly body weight gain in g of the broiler birds as 322.05, 334.08, 327.70 and 356.30 g per bird in treatments T_0, T_1, T_2 and T_3, respectively. In fourth week the average weekly gain in body weight in g of the broiler birds as 376.13, 392.85, 389.23 and 417.58 g per bird in treatments T_0, T_1, T_2 and T_3, respectively. In fifth week the average weekly gain in body weight in g of the broiler birds as 404.23, 435.40, 432.58 and 470.53 g per bird in treatments T_0, T_1, T_2 and T_3, respectively. Since average weekly gain during sixth week, the body weight in g of the broiler birds are as 473.83, 531.13, 516.40 and 552.05 g per bird in treatments T_0, T_1, T_2 and T_3, respectively and the net total body weight gain at the end of six week is 1921.83, 2037.93, 2010.70 and 2138.48 g per bird in treatments T_0, T_1, T_2 and T_3, respectively.

The results are also same as the results obtained by Weerasingha *et al.* (2013) who found that supplementation of 1% fenugreek in the diet of broiler significantly ($p<0.05$) increases the body weight gain compare to addition of 4 and 5% fenugreek which results decline in the body weight gain in broiler. Similar results were obtained by Elbushra (2012) who studied on the effect of dietary fenugreek seeds *(Trigonella foenum-graceum L.)* as natural feed supplementation on broiler birds performance. Khadr and Abdel-Fattah (2007) results 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 per cent as compared to control diet.

Table 3: Effect of supplementation of Fenugreek Seed Powder and Antibiotics on weekly body weight changes of broilers

Treatments	*Age in weeks*					
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*
T0	137.7 ± 0.67	167.03 ± 0.5	322.05 ± 10.18[a]	376.13 ± 13.71[a]	404.23 ± 8.91[a]	473.83 ± 19.2[a]
T1	136.4 ± 0.77	164.65 ± 0.86	334.08 ± 1.67[a]	392.85 ± 2.69[a]	435.4 ± 14.78[ab]	531.13 ± 12.36[b]
T_2	137.85 ± 0.64	165.03 ± 0.73	327.7 ± 0.84[a]	389.23 ± 1.09[a]	432.58 ± 11.78[a]	516.4 ± 13.65[b]
T3	137.4 ± 0.84	163.1 ± 2.29	356.3 ± 3.35[b]	417.58 ± 6.88[b]	470.53 ± 14.43[b]	552.05 ± 13.33[b]
SE ±	0.74	1.31	5.45	7.81	12.70	14.88
CD at 5%	NS	NS	15.20	21.81	35.47	41.57

Feed Intake and Feed Efficiency

Cumulative Feed Intake

The average feed intake of experimental broiler chicks was recorded at weekly interval throughout the experimental period of 6 weeks. the results are represented in Table 4.. Table 4 reveals the average weekly feed consumption in g of the broiler birds. In the given treatments T_0, T_1, T_2 and T_3 as 174.38, 174.53, 175.08 and 174.95 g per bird in the first week. The corresponding values of average weekly feed consumption in g of the broiler birds in second week as 547.45, 541.70, 548.28 and 544.10 g per bird in treatments T_0, T_1, T_2 and T_3 respectively. In third week the average weekly feed consumption in g of the broiler birds as 1180.58, 1160.53, 1163.80 and 1157.45 g per bird in treatments T_0, T_1, T_2 and T_3 respectively. In fourth week the average weekly feed consumption in g of the broiler birds as 1985.45, 1956.83, 1964.33 and 1949.03 g per bird in treatments T_0, T_1, T_2 and T_3 respectively. In fifth week the average weekly feed consumption in g of the broiler birds as 2807.40, 2735.83, 2751.03, 2723.23 g per bird in treatments T_0, T_1, T_2 and T_3 respectively where treatments T_1, T_2 and T_3 were statistically at par. During sixth week the average weekly feed consumption in g of the broiler birds as 1496.30, 1493.37, 1422.08 and 1513.66 g per bird in treatments T_0, T_1, T_2 and T_3 respectively and the total feed consumption at the end of sixth week was 3717.43, 3627.03, 3643.45 and 3608.33 g per bird in treatments T_0, T_1, T_2 and T_3 respectively where treatments T_1, T_2 and T_3 were statistically at par. Alloui *et al.* (2012) reported that feeding fenugreek seeds of feed in broiler chicken is favourable due to the presence of galactomannas and neurin which enhances the appetite and improvement in FCR due to the beneficial effect on gut microflora. Purshothaman *et al.* (2015) Observed that feed intake of all the chicks supplementing FSP was comparatively lower than that of control and there were a linear decline in intake as level of FSP addition.

Weekly Feed Intake

The feed intake of experimental broiler birds was recorded at weekly interval throughout the entire experimental period of 6 weeks. The average weekly feed intake of broiler chicks represented in Table 5.

The average feed intake of the birds for treatment T_0, T_1, T_2 and T_3 during experiment at first week of age were 174.38, 174.53, 175.08 and 174.95 g, respectively. The average feed intake of the birds during experiment for treatment T_0, T_1,

Table 4: Effect of supplementation of Fenugreek Seed Powder and Antibiotics on cumulative feed intake of broilers

Treatments	*Age in weeks*					
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*
T0	174.38 ± 0.24	547.45 ± 4.14	1180.58 ± 5.98	1985.45 ± 8.8	2807.4 ± 21.4[b]	3717.43 ± 20.29[b]
T1	174.53 ± 1.82	541.7 ± 4.09	1160.53 ± 5.44	1956.83 ± 10.22	2735.83 ± 12.78[a]	3627.03 ± 22.6[a]
T_2	175.08 ± 1.8	548.28 ± 4.38	1163.8 ± 5.38	1964.33 ± 7.71	2751.03 ± 11.61[a]	3643.45 ± 0[a]
T3	174.95 ± 2.54	544.1 ± 5.21	1157.45 ± 11.28	1949.03 ± 12.51	2723.23 ± 0[a]	3608.33 ± 0[a]
SE ±	1.81	4.48	7.44	9.97	13.75	15.18
CD at 5%	NS	NS	NS	NS	38.41	42.41

T_2 and T_3 at six weeks of age were 910.03, 881.20, 892.43 and 875.10 g, respectively. However, the difference was non-significant variation of the feed intake in all the treatment groups for the given experimental period.

Purshothaman *et al.* (2015) Reported that feed intake of all the broiler birds receiving fenugreek seed powder was lower than that of control and there were a linear decline in intake as level of fenugreek seed powder addition.

Table 5: Effect of supplementation of Fenugreek Seed Powder and Antibiotics on weekly feed intake of broilers

Treatments	*Age in weeks*					
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*
T0	174.38 ± 0.24	373.25 ± 4.52	631.23 ± 6.20	804.88 ± 7.49	821.95 ± 20.54	910.03 ± 27.76
T1	174.53 ± 1.82	367.18 ± 3.53	618.83 ± 7.49	800.53 ± 7.03	779.00 ± 13.44	881.2 ± 23.27
T_2	175.08 ± 1.80	373.20 ± 3.10	615.53 ± 6.13	796.3 ± 10.08	786.7 ± 13.07	892.43 ± 9.91
T3	174.95 ± 2.54	369.15 ± 3.38	613.35 ± 10.41	791.58 ± 8.97	774.2 ± 16.83	875.1 ± 22.75
SE ±	1.81	3.68	7.76	8.49	16.26	21.96
CD at 5%	NS	NS	NS	NS	NS	NS

Feed Conversion Ratio

Table 6 the results seen that feed conversion ratio during 0-14 days of the experiment does not differ significantly in fenugreek seed powder and antibiotics supplemented group as compared to control. The feed conversion ratio at six week for treatment T_0, T_1, T_2 and T_3 were 2.14 ± 0.17, 1.7 ± 0.07, 1.78 ± 0.06 and 1.65 ± 0.08, respectively. Statistically better FCR was recorded in T_2 treatment as compared to other treatments. However, treatment T_0, T_1 and T_2, T_3 was at par to each other. Significant better FCR was recorded

in 1.5% fenugreek seed powder supplemented group as compared to control group during 21-42 day of the growth period.

Overall FCR ranged from 1.76 to 2.05. The difference was statistically significant (P>0.05) and improved FCR was found as the level of inclusion of fenugreek seed powder was increased upto 1.5% as compared to control group.

Table 6: Effect of supplementation of Fenugreek Seed Powder and Antibiotics on feed conversion ratio of broilers

Treatments	*Age in weeks*						*Overall*
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*	
T0	1.27 ± 0.01	2.23 ± 0.02	2.2 ± 0.2^{b}	2.34 ± 0.17^{b}	2.09 ± 0.08^{b}	2.14 ± 0.17^{b}	2.05 ± 0.05^{c}
T1	1.28 ± 0.02	2.23 ± 0.03	1.86 ± 0.02^{a}	2.03 ± 0.03^{a}	1.9 ± 0.1^{ab}	1.7 ± 0.07^{a}	1.84 ± 0.02^{b}
T_2	1.27 ± 0.02	2.26 ± 0.02	1.87 ± 0.01^{a}	2.06 ± 0.02^{a}	1.89 ± 0.08^{ab}	1.78 ± 0.06^{a}	1.86 ± 0.02^{b}
T3	1.28 ± 0.02	2.28 ± 0.04	1.73 ± 0.03^{a}	1.92 ± 0.05^{a}	1.69 ± 0.05^{a}	1.65 ± 0.08^{a}	1.76 ± 0.01^{a}
SE ±	0.02	0.03	0.10	0.09	0.08	0.10	0.03
CD at 5%	NS	NS	0.28	0.25	0.22	0.29	0.08

The outcomes of present study supports the findings of Alloui Nadir (2012), Elbushra (2012), and Mamoun *et al.* (2014) where they reported significant (P<0.05) improvement of FCR in all treatments groups fed with different feed additives compare to control group fed without any feed additives.

These outcomes are partially in agreement with Khadr and Abdel-Fattah (2007) who reported that the feed conversion ratio of chicks groups showed no significant change but comparatively, the 1% level was best.

CONCLUSION

According to the trial carried out earlier, it is valuable to use fenugreek as a growth promoter or feed supplement and alternative to antibiotics in commercial broiler production. The conclusions can be drawn from this project that the addition of fenugreek seed powder in broiler ration when compared to antibiotics, adding 1.5 percent fenugreek to the broiler diet as a herbal feed additive improves live weight and weight gain. When compared to antibiotics, adding 1.5 percent fenugreek to the broiler diet as a herbal feed supplement improves feed consumption and feed conversion efficiency.

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