



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2026): 4.61

VET 2025; SP-11(7): 36-40

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www.veterinarypaper.com

Received: 14-05-2026

Accepted: 18-06-2026

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Influence of dietary fenugreek (*Trigonella foenum-graecum* L.) seed powder supplementation on haemato-biochemical and lipid profile of Mewari chicks

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DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i7Sa.3622>

Abstract

The present study was conducted to evaluate the effect of dietary supplementation of fenugreek (*Trigonella foenum-graecum* L.) seed powder on the haemato-biochemical attributes of Mewari chicks. A total of 208 one-day-old Mewari chicks were randomly allocated to four dietary treatments comprising a control (T₁) and diets supplemented with 1% (T₂), 2% (T₃) and 3% (T₄) fenugreek seed powder. Each treatment had four replicates of 13 birds and the feeding trial lasted for 56 days. At the end of the experiment, blood samples were collected for biochemical and lipid profile analysis. Dietary supplementation of fenugreek significantly ($p < 0.05$ or $p < 0.01$) affected all the studied parameters. Birds fed 1% fenugreek seed powder recorded the lowest blood glucose (219.00 ± 1.08 mg/dl), total cholesterol (94.00 ± 1.29 mg/dl), triglycerides (41.00 ± 1.22 mg/dl), LDL cholesterol (34.75 ± 1.43 mg/dl) and VLDL cholesterol (8.20 ± 0.16 mg/dl), while exhibiting the highest serum total protein (4.70 ± 0.11 g/dl), albumin (3.80 ± 0.10 g/dl), globulin (1.50 ± 0.08 g/dl) and HDL cholesterol (50.00 ± 1.63 mg/dl). Although supplementation at 2% and 3% also improved the biochemical profile compared with the control, the response was inferior to that of the 1% level. It is concluded that dietary supplementation of fenugreek seed powder at 1% is the optimum inclusion level for improving the haemato-biochemical and lipid profile of Mewari chicks under intensive rearing conditions.

Keywords: Fenugreek seed powder, Mewari chicks, haemato-biochemical parameters, lipid profile

1. Introduction

The poultry sector is one of the fastest-growing livestock industries in India, contributing significantly to food security, rural livelihoods and the national economy. Although commercial poultry production dominates the industry, indigenous chicken breeds continue to play an important role in backyard farming due to their adaptability, disease resistance and suitability to local agro-climatic conditions (BAHS, 2025). Among these, the Mewari chicken, an indigenous germplasm of Southern Rajasthan, is valued for its hardiness and adaptation to local environmental conditions. However, limited information is available on its haemato-biochemical responses to dietary interventions under intensive rearing systems. The ban on and restricted use of antibiotic growth promoters, driven by concerns over antimicrobial resistance and drug residues, have intensified the search for natural feed additives. Phytogenic feed additives, particularly medicinal herbs, have gained considerable attention owing to their antimicrobial, antioxidant, anti-inflammatory and immunomodulatory properties (Wang *et al.*, 2024) [10].

Fenugreek (*Trigonella foenum-graecum* L.), a medicinal herb belonging to the family Fabaceae, is rich in proteins, dietary fibre, vitamins, minerals and bioactive compounds such as saponins, flavonoids, alkaloids and diosgenin. These constituents improve digestion, nutrient utilization, lipid metabolism, antioxidant status, immune function and gut health, thereby enhancing poultry performance (Giridhar *et al.*, 2023; Niknam *et al.*, 2021) [3, 6]. Previous studies have demonstrated beneficial effects of fenugreek supplementation on growth performance, feed efficiency and immunity in broiler chickens (Patel *et al.*, 2017; Yassin *et al.*, 2020) [8, 11].

However, information regarding its influence on the haemato-biochemical profile of indigenous Mewari chicks is scarce. Therefore, the present study was undertaken to evaluate the effect of dietary supplementation with fenugreek (*Trigonella foenum-graecum* L.) seed powder on haemato-biochemical attributes of Mewari chicks.

Materials and Methods

Experimental Birds, Housing and Dietary Treatments

The experiment entitled “Influence of Dietary Fenugreek (*Trigonella foenum-graecum* L.) Seed Powder Supplementation on Haemato-Biochemical and Lipid Profile of Mewari Chicks” was conducted for 8 weeks at the Poultry Farm, Department of Animal Production, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur. A total of 208 one-day-old Mewari chicks maintained under the All India Coordinated Research Project (AICRP) on Poultry Breeding were randomly allotted to four dietary treatments, each comprising four replicates of 13 birds. The birds were reared under a deep litter system in pens measuring 5 × 3 × 2.5 ft and managed under uniform husbandry conditions. Feed and drinking water were provided *ad libitum* throughout the 56-day experimental period. The basal diet, formulated with maize, soybean de-oiled cake, de-oiled rice bran, rice bran oil, dicalcium phosphate and a vitamin-mineral premix, was isonitrogenous (20% crude protein) and isocaloric (2,800 kcal ME/kg). Treatment details showed as below in table 1.

Table 1: Details of experimental dietary treatments for Mewari Chicks

Treatment notation	Treatment
T ₁	Control (Maize soya-based diet)
T ₂	Control containing 1% Fenugreek Seed Powder (FSP)
T ₃	Control containing 2% Fenugreek Seed Powder (FSP)
T ₄	Control containing 3% Fenugreek Seed Powder (FSP)

Observations Recorded

Haemato-biochemical Parameters

At the end of the experiment, one bird from each replicate (four birds per treatment) was randomly selected for blood collection. Approximately 5 mL of blood was collected aseptically from the wing vein using sterile disposable syringes. Serum was separated after clotting at room temperature and stored at -20 °C until analysis.

1. Triglyceride (mg/dl)

The total serum cholesterol was estimated using spectrophotometer (Systronics model No. 106) with LiquiCHEK Triglycerides Kit (GPO-TOPS methodology) supplied by AGAPPE Diagnostics Ltd.

$$\text{Triglycerides (mg/dl)} = \frac{\text{Absorbance of test sample}}{\text{Absorbance of standard}} \times 200$$

2. Total cholesterol (mg/dl)

The total serum cholesterol was estimated using spectrophotometer (Systronics model No. 106) with LyphoCHEK Cholesterol Kit (Cholesterol Oxidase Peroxidase methodology) supplied by AGAPPE Diagnostics Ltd. Serum total cholesterol was calculated by using following formula.

$$\text{Total cholesterol (mg/dl)} = \frac{\text{Absorbance of test sample}}{\text{Absorbance of standard}} \times 200$$

3. LDL (mg/dl)

The total serum LDL was estimated using the following (Friedwald's *et al.*, 1972) as follows:

$$\text{LDL cholesterol (mg/dl)} = \text{Total cholesterol} - (\text{HDL cholesterol} + \text{VLDL cholesterol})$$

4. HDL (mg/dl)

The total serum HDL was estimated using spectrophotometer (Systronics model No. 106) with CliniQuant-FSR HDL-Direct Reagent Kit (Accelerator Selective Detergent Methodology) supplied by Meril Diagnostics Pvt Ltd.

$$\text{HDL (mg/dl)} = \frac{\text{Absorbance of test sample} \times \text{Concentration of calibrator}}{\text{Absorbance of calibrator}}$$

5. Blood Sugar (Random)

The total serum glucose was estimated using spectrophotometer (Systronics model No. 106) using the LyphoCHEK Glucose Kit (GOD-PAP methodology) supplied by AGAPPE Diagnostics Ltd.

$$\text{Serum glucose (mg/dl)} = \frac{\text{Absorbance of test sample}}{\text{Absorbance of standard}} \times 100$$

6. Total protein (g/dl)

Serum total protein was estimated by Biuret method (Zheng *et al.*, 2017) [12].

Statistical Analysis

The experimental data were analyzed using one-way Analysis of Variance (ANOVA) under a Completely Randomized Design (CRD) following the procedures described by Snedecor and Cochran (1994) [9]. Differences among treatment means were considered statistically significant at $P < 0.05$.

Results

Dietary supplementation of fenugreek seed powder significantly influenced the haemato-biochemical and lipid profile of Mewari chicks (Table 2; Fig. 1a and 1b). The mean random blood sugar levels recorded in the control group (T₁), 1 per cent fenugreek seed powder supplemented group (T₂), 2 per cent fenugreek seed powder supplemented group (T₃) and 3 per cent fenugreek seed powder supplemented group (T₄) were 275.00 ± 1.47, 219.00 ± 1.08, 231.00 ± 2.08 and 236.00 ± 1.58 mg/dl, respectively. Birds supplemented with 1 per cent fenugreek seed powder (T₂) exhibited significantly lower ($p < 0.01$) blood sugar levels compared to the other treatment groups. The highest blood sugar level was observed in the control group (T₁). Significant differences were observed among all treatment groups. The mean serum total protein concentrations were 3.80 ± 0.19, 4.70 ± 0.11, 4.60 ± 0.09 and 4.20 ± 0.16 g/dl in T₁, T₂, T₃ and T₄, respectively. Birds receiving 1 per cent fenugreek seed powder supplementation (T₂) recorded significantly higher ($p < 0.01$) serum total protein concentration than the control group (T₁) and T₄, while T₃ remained statistically at par with T₂. The lowest value was observed in the control group.

The mean serum albumin concentrations were 2.70 ± 0.26, 3.80 ± 0.10, 3.50 ± 0.18 and 3.10 ± 0.22 g/dl in T₁, T₂, T₃ and T₄, respectively. Birds supplemented with 1 per cent fenugreek seed powder (T₂) recorded significantly higher ($p < 0.05$) serum

albumin levels compared to the control group (T₁). The values observed in T₃ and T₄ remained statistically comparable with both T₁ and T₂. The mean serum globulin concentrations recorded were 0.70 ± 0.12 , 1.50 ± 0.08 , 1.10 ± 0.12 and 0.90 ± 0.07 g/dl in T₁, T₂, T₃ and T₄, respectively. Birds receiving 1 per cent fenugreek seed powder supplementation (T₂) exhibited significantly higher ($p < 0.01$) serum globulin concentration than the other treatment groups. The lowest globulin concentration was observed in the control group (T₁). The mean serum cholesterol levels were 119.00 ± 2.73 , 94.00 ± 1.29 , 95.50 ± 1.84 and 100.00 ± 2.61 mg/dl in T₁, T₂, T₃ and T₄, respectively. Birds supplemented with fenugreek seed powder recorded significantly lower ($p < 0.01$) serum cholesterol levels than the control group. The lowest serum cholesterol concentration was observed in birds receiving 1 per cent fenugreek seed powder supplementation (T₂).

The mean serum triglyceride concentrations recorded were 94.00 ± 0.81 , 41.00 ± 1.22 , 56.00 ± 0.81 and 85.00 ± 1.63 mg/dl in T₁, T₂, T₃ and T₄, respectively. Birds fed the diet supplemented with 1 per cent fenugreek seed powder (T₂) exhibited significantly lower ($p < 0.01$) serum triglyceride levels than birds in all other treatment groups. The highest triglyceride concentration was recorded in the control group

(T₁). Significant differences were observed among all treatment groups. The mean HDL cholesterol levels were 40.00 ± 2.04 , 50.00 ± 1.63 , 45.00 ± 1.22 and 44.00 ± 1.22 mg/dl in T₁, T₂, T₃ and T₄, respectively. Birds receiving 1 per cent fenugreek seed powder supplementation (T₂) recorded significantly higher ($p < 0.01$) HDL cholesterol concentration than the other treatment groups, whereas T₁, T₃ and T₄ remained statistically similar. The mean LDL cholesterol concentrations were 60.10 ± 2.04 , 34.75 ± 1.43 , 36.90 ± 0.81 and 40.40 ± 2.21 mg/dl in T₁, T₂, T₃ and T₄, respectively. Birds supplemented with 1 per cent fenugreek seed powder (T₂) exhibited significantly lower ($p < 0.01$) LDL cholesterol concentration compared to the control group. The values observed in T₃ and T₄ remained statistically comparable with T₂ and were significantly lower than T₁.

The mean VLDL cholesterol concentrations recorded were 18.80 ± 0.12 , 8.20 ± 0.16 , 11.20 ± 0.20 and 17.00 ± 0.24 mg/dl in T₁, T₂, T₃ and T₄, respectively. Birds receiving 1 per cent fenugreek seed powder supplementation (T₂) recorded significantly lower ($p < 0.01$) VLDL cholesterol concentration than birds in the remaining treatment groups. Significant differences were observed among all treatment groups.

Table 2: Effect of supplementation of fenugreek (*Trigonella foenum-graecum* L.) seed powder on blood biochemical and lipid parameters of Mewari chicks

Parameter	T ₁	T ₂	T ₃	T ₄	S.Em ±	CD
Blood Sugar (Random)	275.00 ± 1.47^a	219.00 ± 1.08^d	231.00 ± 2.08^c	236.00 ± 1.58^b	1.59	4.91**
Serum Total Proteins	3.80 ± 0.19^c	4.70 ± 0.11^a	4.60 ± 0.09^{ab}	4.20 ± 0.16^{bc}	0.15	0.45**
Serum Albumin	2.70 ± 0.26^c	3.80 ± 0.10^a	3.50 ± 0.18^{ab}	3.10 ± 0.22^{bc}	0.21	0.64*
Serum Globulin	0.70 ± 0.12^c	1.50 ± 0.08^a	1.10 ± 0.12^b	0.90 ± 0.07^{bc}	0.10	0.32**
Serum Cholesterol	119.00 ± 2.73^a	94.00 ± 1.29^b	95.50 ± 1.84^b	100.00 ± 2.61^b	2.20	6.79**
Serum Triglycerides	94.00 ± 0.81^a	41.00 ± 1.22^d	56.00 ± 0.81^c	85.00 ± 1.63^b	1.17	3.61**
HDL Cholesterol	40.00 ± 2.04^b	50.00 ± 1.63^a	45.00 ± 1.22^b	44.00 ± 1.22^b	1.57	4.83**
LDL Cholesterol	60.10 ± 2.04^a	34.75 ± 1.43^b	36.90 ± 0.81^b	40.40 ± 2.21^b	1.72	5.30**
VLDL Cholesterol	18.80 ± 0.12^a	8.20 ± 0.16^d	11.20 ± 0.20^c	17.00 ± 0.24^b	0.19	0.58**

* $p < 0.05$, ** $p < 0.01$, Values are mean ± Standard error.

Means with different letter within a column shows significant differences (at $p \leq 0.05$) as per Duncan's multiple-range test

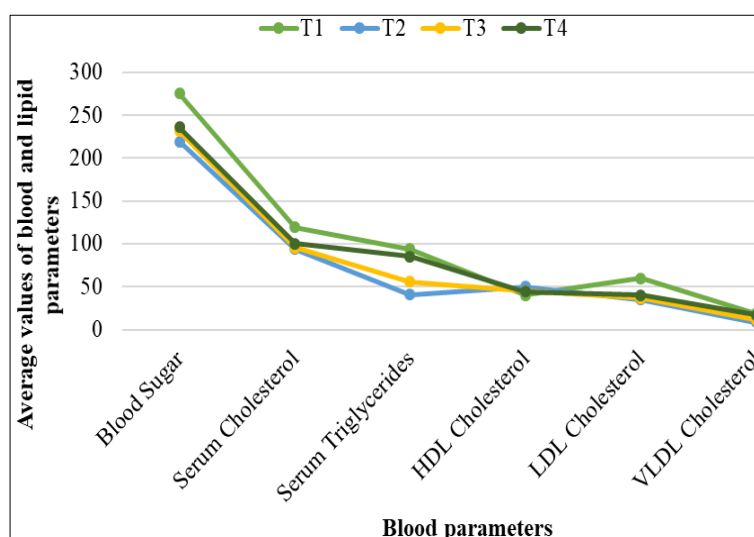


Fig 1a: Effect of supplementation of fenugreek (*Trigonella foenum-graecum* L.) seed powder on blood biochemical and lipid parameters of Mewari chicks

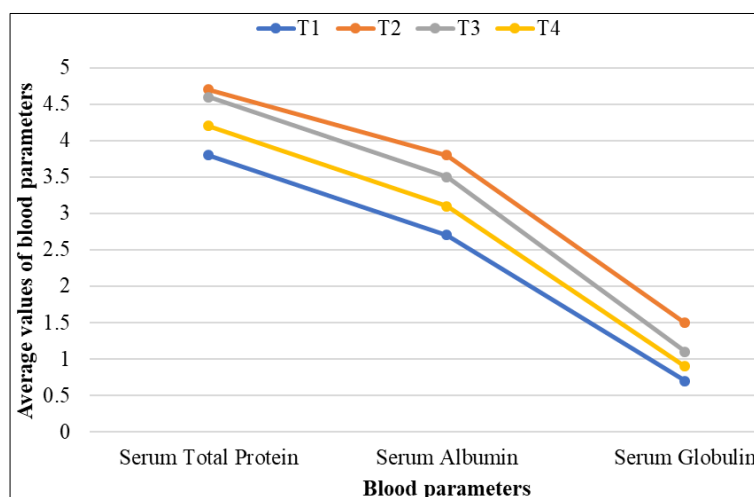


Fig 1b: Effect of supplementation of fenugreek (*Trigonella foenum-graecum* L.) seed powder on blood biochemical parameters of Mewari chicks

Discussion

Birds supplemented with 1% fenugreek seed powder (T₂) exhibited lower blood glucose, total cholesterol, triglycerides, LDL and VLDL cholesterol concentrations, along with higher serum total protein, albumin, globulin and HDL cholesterol levels than the control group. The hypoglycaemic effect of fenugreek may be associated with bioactive constituents such as trigonelline, galactomannan and 4-hydroxyisoleucine, which are known to enhance insulin secretion and improve glucose utilization (Majumdar *et al.*, 2025) [5]. The improvement in serum protein fractions may be attributed to enhanced protein digestion and nutrient utilization, supported by the rich nutritional composition and bioactive compounds present in fenugreek seeds. Likewise, the reduction in serum cholesterol, triglycerides, LDL and VLDL cholesterol could be due to the action of saponins, dietary fibre and galactomannan, which decrease intestinal cholesterol absorption and promote bile acid excretion. The increase in HDL cholesterol further indicates improved lipid metabolism and physiological well-being of the birds (Giridhar *et al.*, 2023) [3]. Among the supplementation levels evaluated, 1% fenugreek seed powder produced the most favourable haemato-biochemical response, whereas higher inclusion levels did not confer additional benefits. These findings are consistent with previous studies reporting the hypoglycaemic and hypolipidaemic effects of fenugreek supplementation in poultry. Similar observations have been reported by Olayeni *et al.* (2024) [7] and Hassan *et al.* (2025) [4], who also observed beneficial effects of fenugreek seed supplementation on blood biochemical parameters in poultry.

Conclusion

Dietary supplementation of fenugreek seed powder significantly improved the haemato-biochemical and lipid profile of Mewari chicks. Birds receiving 1% fenugreek seed powder (T₂) recorded the lowest blood glucose (219.00 ± 1.08 mg/dl), total cholesterol (94.00 ± 1.29 mg/dl), triglycerides (41.00 ± 1.22 mg/dl), LDL cholesterol (34.75 ± 1.43 mg/dl) and VLDL cholesterol (8.20 ± 0.16 mg/dl), while exhibiting the highest serum total protein (4.70 ± 0.11 g/dl), albumin (3.80 ± 0.10 g/dl), globulin (1.50 ± 0.08 g/dl) and HDL cholesterol (50.00 ± 1.63 mg/dl). These findings indicate improved glucose and lipid metabolism, enhanced protein utilization and better physiological status in fenugreek-supplemented birds. Therefore, supplementation of fenugreek (*Trigonella foenum-graecum* L.) seed powder at 1% of the diet can be

recommended as the optimum inclusion level for improving the haemato-biochemical profile of Mewari chicks under intensive rearing conditions.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article

Kumar D, Mishra S, Choudhary JL, Singh H, Sharma L, Bamniya S. Influence of dietary fenugreek (*Trigonella foenum-graecum* L.) seed powder supplementation on haemato-biochemical and lipid profile of Mewari chicks. *International Journal of Veterinary Sciences and Animal Husbandry*. 2026;SP-11(7):36-40.

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