Trends in
Agricultural
Sciences

OPEN ACCESS

Synergistic Effects of Black Seed and Fenugreek Seed on Growth Performance and Blood Profile of Broiler Chickens

[1]Okanlawon Eden Olusegun, [1]Olayeni Tunji Babatunde, [2]Haruna Moshood Abiola and
[1]Ayeni Emmanuel Oluwaseun
[1]Department of Animal Production and Health, Ladoke Akintola University of Technology, Ogbomoso, Nigeria
[2]Department of Animal Nutrition and Biotechnology, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

ABSTRACT

Background and Objective: The overuse of synthetic feed additives in poultry production raises concerns due to their residual effects on broilers and potential risks to consumers. Phytobiotics such as black seed (*Nigella sativa*) and fenugreek seed (*Trigonella foenum-graecum*) offer natural alternatives. This study aimed to evaluate the effects of black and fenugreek seed blends on growth performance, carcass yield, hematology, serum biochemistry, and nutrient digestibility in broiler chickens. **Materials and Methods:** A total of 160 unsexed day-old broiler chicks (Abor-acre) were randomly allotted into four dietary treatments in a completely randomized design, with 40 birds per treatment and four replicates of 10 birds each. The treatments included T1 (control, 0 g), T2 (20 g/kg, 1:1 FS:BPS), T3 (30 g/kg, 1:2 FS:BPS), and T4 (30 g/kg, 2:1 FS:BPS). Data on performance, carcass traits, organ weights, hematology, and serum biochemistry were collected and analyzed using ANOVA ($p = 0.5$). **Results:** Dietary treatments significantly ($p<0.05$) influenced growth, carcass yield, and blood profile. Birds on T3 (1:2) had the highest final weight gain (2390 g) and weight gain per day (75.75 g), while T2 (1:1) showed the lowest values (2208 g; 44.07 g/day). The T3-fed birds also recorded superior carcass traits with higher live (2370 g), bled (2332.5 g), defeathered (2239.5 g), and eviscerated (1994.5 g) weights, compared to the lowest values in T4 (2:1). Hematology revealed higher packed cell volume, hemoglobin, and RBC in T2, while T3 showed higher WBC counts. Serum biochemistry indicated higher total protein in T2 and the lowest in T4. **Conclusion:** A blend of 10 g of fenugreek seed and 20 g black seed (1:2 ratio) improved growth performance, carcass yield, feed conversion ratio, hematology, and serum biochemistry in broilers, supporting its use as a natural alternative to synthetic feed additives.

KEYWORDS

Fenugreek seeds, black seed, broiler chicken, performance, blood profile

INTRODUCTION

Medicinal plants are characterized as the main source for the preparation of herbal medicines or synthetic (chemical) medicines, directly or guidance for the manufacture of medicinal compounds similar to chemical compounds in plants in terms of therapeutic effect according to Al-Duraid *et al.*[1], antibiotics had

ISSN: 2957-9449 (Online)
ISSN: 2957-9430 (Print)
https://doi.org/10.17311/tas.2025.341.349

Received: 23 Aug. 2025
Accepted: 10 Nov. 2025
Published: 31 Dec. 2025

been used as growth promotors in the diet of growing and laying birds as feed additives during the whole period of raising for several years. The latest studies on this concern illustrated a resistance against different species of bacteria. Moreover, the accumulation of antibiotic residues in poultry products such as meat and eggs had a deleterious effect on the consumers of those products.

Poultry diets had been encouraged several researchers to lookout to antibiotics alternatives growth promotors, so the natural products had been used such as medicinal herbs that had been termed pathogens with its extracts due to its contents of volatile oils with phenol compounds, organic acids, vitamins and minerals with enzymes as reported by Alarcon-Rojo *et al*.[2]. Anise is one of the medicinal herbs that had used to alleviate some diseases due to its content of numerous active compounds such as camphor, carvone, ethanol, estragole, flavonoid glycosides, starch, phytoestrogens, proteins, choline. vitamin B, calcium, Iron, magnesium, and potassium.

Fenugreek seed (*Trigonella foenum-graecum*) is one of these herbs that have a role in improving the growth performance of poultry birds by their antibacterial activity and positive effect on gut morphology. Olayeni *et al*.[3] reported that fenugreek seeds contain crude protein (12.9-34.1%), crude fibre (4.7-14.8%), ether extract (4.5-12%), total ash (2.6-7.6) and nitrogen free extract (36.8-57.5%). Xue *et al*.[4] reported that fenugreek seed reduce the blood glucose, blood lipid levels and improve hemorheological effects in diabetic rats. Also, Murlidhar and Goswami observed its antinocarcinogenic, antioxidant, gastric stimulant, and anti-anorexia effects in addition to its uses as a food stabilizer, adhesive, and emulsifying agent.

Black seed (*Nigella sativa*) is one of the medicinal black seeds that contains oils containing Thymoquinone and Nigellone; these compounds play an important role in alleviating the severity of some disease conditions because these compounds are antioxidants. Furthermore, these compounds have an important activity in improving the digestion as well as the feed conversion ratio of broilers. The bioactive compounds in these seeds may interact to produce complementary or additive effects, improving feed efficiency, growth, and physiological status. However, the mechanisms through which these seeds act synergistically, particularly in improving performance characteristics and blood profiles, have not been adequately explored. Addressing this gap is crucial for determining their combined efficacy as a natural alternative in broiler diets. This study aimed to evaluate the synergistic effects of black seed (*Nigella sativa*) and fenugreek seed (*Trigonella foenum-graecum*) on the growth performance and blood biochemical profile of broiler chickens.

MATERIALS AND METHODS

Study area: The experiment was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria, which lasted 6 weeks (February to March, 2025). The area is in the derived Savannah Zone of Nigeria. It lies on Longitude 4.5° East of the Greenish Meridian and Latitude 8.5° North-East towards Ibadan, the capital of Oyo State. The mean annual rainfall is 1247 mm, while the relative humidity is between 75 and 95%. It is situated at about 300-600 m above the sea level with a mean annual temperature of 27°C.

Collection of test ingredients: The test ingredients, fenugreek seed and black seed, were purchased from a local mini retail market at Ogbomosho, Oyo State. The fenugreek seed and black seed were used in the diets directly without any further processing.

Experimental animals and management: A total of 160 unsexed day-old Abor Acre chicks were purchased from a reputable hatchery and used for the experiment. The birds were randomly allotted into five dietary treatments of 40 birds per treatment and 4 replicates of 10 birds per replicate in a completely randomized design. Four experimental diets were formulated in a ratio 1:1 inclusion of black seeds and fenugreek seed blend in which the treatment groups include T1-0 g, T2-20 g/kg in ratio 1:1 of 10 g of fenugreek seed and 10 g of black seed, T3-30 g/kg in ratio 1:2 of 10 g fenugreek seed and 20 g of black

seed, T4-30 g/kg in a ratio of 2:1 of 20 g fenugreek seed and 10 g of black seed inclusion of the blend. The birds at 0-3 weeks were fed on a starter diet which had 23% crude protein and 2800 Kcal metabolisable energy/kg. All recommended vaccinations were administered as required. Feeding and drinking troughs were adequately provided. The finisher diets contained 20% crude protein and 3000 kcal/kg metabolisable energy. Feed and water were given *ad libitum* throughout the period of the trial. Growth performance data were collected on body weight, feed intake, feed conversion ratio, and blood profile.

Data collection

Growth performance[5]:

$$\text{Weight gain (g)} = \text{Final weight gain (g)-Initial weight (g)}$$

$$\text{Feed intake (g)} = \text{(Feed given-Leftover)}$$

$$\text{Feed conversion ratio (FCR)} = \frac{\text{Average feed intake (g)}}{\text{Average weight gain (g)}}$$

Carcass characteristics and relative organ weights[5]: At the end of the 6th week of the experimental period, four birds were randomly selected, were starved of feed for 12 hrs with the presence of abundant water, and slaughtered by severing the jugular veins. The birds were bled; defeathered, after which the visceral organs such as liver, intestine, pancreas, spleen, kidney, proventriculus, and hearts were removed. The bled, defathered, and eviscerated weights were evaluated accordingly. The head and shanks were removed to determine the carcass weight. The carcass was cut into various parts (thigh, breast, back, shank, drumstick, wings, and head), and their weights were expressed in percentage relative to the carcass weight. The weights of the organs were also expressed in relative values. The following calculations were evaluated:

$$\text{Relative cut parts weight} = \frac{\text{Weight of the cut}}{\text{Carcass weight}} \times 100$$

$$\text{Relative organ weight} = \frac{\text{Weight of organs}}{\text{Carcass weight}} \times 100$$

Blood analysis: Four birds were randomly selected from each treatment. About 2.5 mL of blood were collected in tubes containing EDTA anticoagulant to determine the values of haemoglobin concentration, packed cell volume, red blood cells count, total white blood cells count, differential white blood cell count, platelets count, and red cell indices as describe by Iranloye[6] and Venkatesan *et al*.[7]. The blood was slowly expressed into EDTA tubes to reduce the risk of haemolysis after removing the needles from syringes.

Serum parameters include total protein was obtained by the biuret method in the assay as described by Kohn and Allen[8]. The globulin concentration was obtained by subtracting albumin from the total protein. Albumin was determined using the bromocresol green (BCG) method. Aspartate Transferase (AST) activities were determined using spectrophotometric methods. Alanine Aminotransferase (ALT) activities were determined using spectrophotometric methods. Serum urea was determined using a kit (Quimica clinical spam) having a linear measurement of about 566.6 mL/L of urea concentration. The serum urea will be determined calorimetrically. The serum cholesterol was determined using the enzymatic endpoint method.

Data analysis: Data collected were analysed using ANOVA ($p = 0.5$) as contained in SAS. Significant means were separated using the Duncan's Multiple Range Test.

RESULTS

Table 1 shows the effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed on the growth performance of broiler chickens. Significant ($p<0.05$) differences were recorded on final weight, weight gain, and feed conversion ratio. The broiler chick fed diets T3 (1:2) of fenugreek and black seed had the highest ($p<0.05$) final weight gain and weight gain 2390.00 and 75.75 g, while the broiler fed a diet T2 (1:1) had the lowest 22081.00 and 44.07 g, respectively. The highest ($p<0.05$) feed conversion ratio (2.57) was recorded with broiler birds fed diet T2 (1:1) while broiler birds fed diet T3 (1:2) had the least (1.45).

Table 2 shows the effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed (*Nigella sativa*) on carcass and relative cut-up parts of broiler chicken at the starter and finisher phase. Significant ($p<0.05$) differences were observed on live weight, bled weight, defeathered weight, eviscerated weight, back, thigh, drumstick, and shank. The broiler chick fed diets T3 (1:2) of fenugreek and black seed had the highest ($p<0.05$) live, bled, defeathered and eviscerated weight 2370.00, 2332.5, 2239.50 and 1994.50 g, while the broiler fed a diet T4 (2:1) had the lowest 2232.00, 2062.00, 1965.50 and 1694.50 g, respectively. The highest ($p<0.05$) back weight (16.52%) was recorded with broiler birds fed the control diet T1, while broiler birds fed diet T4 (2:1) had the least (13.56%). Highest ($p<0.05$) drumstick and shank weight 13.80 and 5.06% were recorded with broiler bird fed diet T4 (2:1), while broiler fed diet T2 (1:1) had the least 12.20 and 4.45%, respectively. The highest ($p<0.05$) thigh weight (15.20%) was recorded with broiler bird fed diet T3 (1:2), while broiler fed diet T4 (2:1) had the least (14.16%).

Table 3 shows organ characteristics of broiler chickens fed varying levels of fenugreek seed and black seed diet. A significant ($p<0.05$) difference was recorded in the pancreas. The highest ($p<0.05$) pancreas (0.42%) was recorded with broiler birds fed a control diet, while broiler birds fed diet T2 (1:1) had the least (0.31%). Proventriculus, gizzard, lungs, bursa of fab, and heart were not significantly affected.

Table 1: Effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed blend on growth performance of broiler chicken

Parameter	T1 (control)	T2 (1:1)	T3 (1:2)	T4 (2:1)	SEM
Initial weight (g)	1231.50	1464.00	1329.50	1287.50	16.35
Final weight gain (g)	2326.50^{ab}	2081.00^{b}	2390.00^{a}	2249.50^{ab}	46.13
Weight gain (g)	75.36^{a}	44.07^{b}	75.75^{a}	68.71^{a}	4.04
Feed intake (g)	104.81	113.95	108.20	104.51	5.56
Feed conversion ratio	1.63^{ab}	2.57^{a}	1.45^{b}	1.55^{ab}	0.68

^{ab}Means on the same row bearing different superscripts differed significantly ($p<0.05$)

Table 2: Effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed (*Nigella sativa*) on carcass and relative cut-up parts of broiler chicken

Parameter	T1 (control)	T2 (1:1)	T3 (1:2)	T4 (2:1)	SEM
Live weight (g)	2326.50^{ab}	2081.00^{c}	2370.00^{a}	2232.00^{b}	46.75
Bled weight (g)	2261.00^{ab}	2062.50^{b}	2332.50^{a}	2185.00^{b}	4314
Defeathered weight (g)	2179.00^{ab}	1965.50^{c}	2239.50^{a}	2099.00^{bc}	43.31
Eviscerated weight (g)	1919.00^{ab}	1694.50^{c}	1994.50^{a}	1848.00^{b}	42.18
Carcass weight (g)	1782.50	1578.50	1853.00	1708.50	39.45
Dressing (%)	76.59	75.80	77.52	76.60	0.32
Head (%)	2.69	2.97	2.86	2.96	0.06
Neck (%)	5.04	5.62	6.04	5.99	0.21
Back (%)	16.52^{a}	16.25^{b}	16.14^{c}	13.56^{d}	0.33
Breast (%)	37.57	39.47	38.39	40.16	1.53
Thigh (%)	15.20^{a}	14.54^{b}	15.20^{a}	14.49^{b}	0.23
Drumstick (%)	13.23^{a}	12.20^{b}	13.17^{a}	13.80^{a}	0.17
Wing (%)	9.79	9.88	9.80	10.21	0.15
Shanks (%)	4.77^{b}	4.45^{c}	4.88^{ab}	5.06^{a}	0.09

^{ab}Means on the same row bearing different superscripts differed significantly ($p<0.05$)

Table 3: Effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed (*Nigella sativa*) on organ characteristics of broiler chicken

Parameter (%)	T1 (control)	T2 (1:1)	T3 (2:1)	T4 (2:1)	SEM
Proventricular	0.47	0.52	0.52	0.54	0.03
Gizzard	3.37	2.60	3.13	3.31	0.19
Liver	2.17	2.28	2.50	2.53	0.13
Lung	0.91	0.74	0.80	0.72	0.05
Pancreas	0.42^{a}	0.31^{b}	0.35^{b}	0.36^{b}	0.02
Heart	0.56	0.60	0.58	0.57	0.03
Bursal of fab	0.22	0.17	0.17	0.18	0.02

^{ab}Means on the same row bearing different superscript differed significantly ($p<0.05$)

Table 4: Effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed (*Nigella sativa*) on haematological parameters of broiler chicken

Parameter	T1 (control)	T2 (1:1)	T3 (1:2)	T4 (2:1)	SEM
PCV (%)	32.25^{b}	34.00^{a}	31.25^{b}	26.75^{c}	0.61
HB (g/dL)	10.38^{b}	11.00^{a}	10.03^{b}	8.53^{c}	0.21
RBC ($\times 10^{6}$ µL)	3.38^{a}	3.40^{a}	3.15^{a}	2.77^{b}	0.61
WBC ($\times 10^{3}$ µL)	16675.00^{ab}	14137.50^{b}	17825.00^{a}	17162.50^{a}	434.00
Lymphocytes (%)	65.50^{a}	66.00^{a}	63.75^{ab}	59.00^{c}	0.78
Monocytes (%)	2.50^{b}	4.00^{a}	4.00^{a}	4.00^{a}	0.20
Eosinophils (%)	3.50^{a}	3.00^{b}	2.00^{c}	3.00^{b}	0.30
Platelet ($\times 10^{9}$ µL)	150750.00^{ab}	135250.00^{b}	173000.00^{ab}	186125.00^{a}	6682.06

^{abc}Means on the same row bearing different superscripts differed significantly ($p<0.05$), PLT: Platelet, HB: Haemoglobin, PCV: Pack cell volume, RBC: Red blood cell and WBC: White blood cell

Table 5: Effect of fenugreek seed (*Trigonella foenum-graecum*) and black seed (*Nigella sativa*) on serum biochemistry of broiler chicken

Parameter	T1 (control)	T2 (1:1)	T3 (1:2)	T4 (2:1)	SEM
TP (g/dL)	2.69^{b}	3.51^{a}	2.60^{b}	2.52^{b}	1.23
Globulin (g/dL)	1.79^{ab}	2.08^{a}	1.25^{b}	1.69^{ab}	0.11
Albumin (g/dL)	1.03^{ab}	0.73^{c}	1.05^{ab}	1.28^{a}	0.05
ALP (1 µ/L)	48.60^{b}	50.14^{a}	36.05^{c}	41.27^{bc}	2.07
AST (1 µ/L)	119.89^{d}	178.27^{b}	215.59^{a}	145.41^{c}	7.66
ALT (1 µ/L)	22.57^{a}	19.86^{c}	21.50^{b}	19.92^{c}	1.28
Glucose (g/dL)	300.38^{b}	333.03^{a}	345.03^{a}	253.94^{c}	11.14
Urea (mg/dL)	4.92^{c}	5.44^{b}	6.03^{a}	6.23^{a}	0.16
CRT (mg/dL)	0.95	1.14	1.03	1.02	0.33
CHO (mg/dL)	141.56^{a}	118.38^{c}	132.08^{b}	137.99^{b}	3.63
HDL (mg/dL)	79.03^{ab}	62.98^{b}	73.96^{b}	87.55^{a}	2.22
Triglyceride (mg/dL)	63.60^{a}	39.27^{c}	46.91^{b}	44.70^{bc}	2.90

^{abc}Means with different superscripts are significantly ($p<0.5$) different, SEM: Standard error of mean, HDL: High density lipoprotein, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, TP: Total protein, CRT: Creatinine and CHO: Cholesterol

Table 4 shows the results of hematological characteristics of broiler starter chicken fed with varying levels of fenugreek and black seed. There were significant differences ($p>0.05$) recorded on packed cell volume, haemoglobin, red blood cell, white blood cell, lymphocyte, monocyte, eosinophils and platelet. Broiler chicken fed diet T2 (1:1) recorded the highest value on packed cell volume, haemoglobin, red blood cell, 34.00, 11.00, and 3.38% while those fed diet with T4 (2:1) had the least 26.75, 8.53, and 2.77%. Higher ($p<0.05$) white blood cell (17825.50×10^{3} µL) was recorded with broiler birds fed diet T3 (1:2), while broiler chickens fed diet T2 (1:1) had the least (14137.50×10^{3} µL). A higher ($p<0.05$) value of lymphocyte (66.00%) was recorded with broiler birds fed diet T2 (1:1), while broiler chickens fed diet T4 (2:1) had the least (59.00%). A higher ($p<0.05$) value of monocyte (4.00%) was recorded with broiler birds fed diet T4 (1:1), while broiler chickens fed the control diet had the least (2.50%). A higher ($p<0.05$) value of eosinophils (3.50%) was recorded with broiler birds fed a control diet, while broiler chickens fed diet T3 (1:2) had the least (2.00%). A higher ($p<0.05$) value of platelet (186125.00×10^{9} µL) was recorded with broiler birds fed diet T4 (2:1), while broiler chickens fed diet T2 (1:1) had the least (135250.00×10^{9} µL).

Table 5 shows the results of the serum biochemistry of broiler starter chicken fed diets supplemented with fenugreek and black seed. Significant differences ($p>0.05$) were recorded on total protein, albumin, globulin, alkaline phosphatase, aspartate aminotransferase, alanine aminotransferase, high-density lipoprotein, cholesterol, triglycerides, and creatinine. Higher ($p<0.05$) total protein (3.51 g/dL) was recorded with broiler birds fed diet T2 (1:1), while broiler chickens fed diet T4 (2:1) had the least (2.52 g/dL). Higher ($p<0.05$) albumin (1.28 g/dL) was recorded with broiler birds fed diet T4 (2:1), while broiler chickens fed diet T2 (1:1) had the least (0.73 g/dL). Higher ($p<0.05$) globulin (2.08 g/dL) was recorded with broiler birds fed diet T2 (1:1), while broiler chickens fed diet T3 (2:1) had the least (2.15 g/dL). Higher ($p<0.05$) total protein (3.51 g/dL) was recorded with broiler birds fed diet T2 (1:1), while broiler chicken fed diet T4 (2:1) had the least (2.52 g/dL). Higher ($p<0.05$) glucose value (345.03 g/dL) was recorded with broiler chicken fed diet T3 (1:2), while broiler chicken fed diet T4 (2:1) had the least (253.94 g/dL). Higher ($p<0.05$) alkaline phosphatase (50.14 LU/L) was recorded with broiler birds fed diet T2 (1:1) while broiler chickens fed diet T3 (1:2) had the least (36.051 µ/L). Higher ($p<0.05$) aspartate aminotransferase (215.591 LU/L) was recorded with broiler bird fed diet T3 (1:2) while broiler chickens fed control diet had the least (119.891 µ/L). Higher ($p<0.05$) alanine aminotransferase (22.57 LU/L) was recorded with broiler bird fed control diet while broiler chicken fed diet T2 (1:1) had the least (19.861 µ/L). Higher ($p<0.05$) high density lipoprotein (87.55 mg/dL) was recorded with broiler birds fed diet T4 (2:1) while broiler chicken fed diet T2 (1:1) had the least (62.98 mg/dL). Higher ($p<0.05$) cholesterol (141.56 mg/dL) was recorded with broiler chicken fed control diet, while broiler chicken fed diet T2 (1:1) had the least (118.38 mg/dL). Higher ($p<0.05$) urea (6.23 mg/dL) was recorded with broiler chicken fed diet T4 (1:2), while broiler chicken fed control diet had the least (4.92 mg/dL). Higher ($p<0.05$) triglyceride (63.60 mg/dL) was recorded with broiler chicken fed control diet, while broiler chicken fed diet T2 (1:1) had the least (39.27 mg/dL).

DISCUSSION

The inclusion of fenugreek seed (*Trigonella foenum-graecum*) and black seed at 10/20 g (1:2) shows an improvement in growth performance. This improvement could be associated with the synergistic effects of the essential oils in the herbal supplements. Additionally, there have been reports of the beneficial effects of feeding mixtures of essential oils on the growth performance of broiler chickens reported by Kohn and Allen[8]. It was recommended by Khattak *et al.*[9] supplementing broiler feed be supplemented with fenugreek and black seed for optimal body weight gain.

The observable improvement in the growth parameters in this present study may be linked to the beneficial effect of fenugreek and black seed as spices. Spices are known to stimulate appetite and enhance the secretion of digestive enzymes that boost the digestion of protein, carbohydrates, and absorption of these digestive products, thus resulting in better growth performance according to Saeid *et al.*[10]. The increased surface area of intestinal mucosa of the birds supplemented with black cumin may be the reason for better utilization of nutrients and therefore lower feed gain ratio. Additionally, Similar outcomes were released by Ingweye *et al.*[11] and Durrani *et al.*[12] regarding increased feed intake with black cumin seed supplementation, as well as by Shokrollahi and Sharifi[13] regarding garlic powder supplementation. Borgohain *et al.*[14] reported that supplementing different percentages of black cumin had significantly ($p<0.05$) improved the feed conversion ratio because of the phytochemicals they contained that have been reported to help increase the feed conversion ratio.

In contrast to the current finding of Durrani *et al.*[12] reported that the addition of 4% black cumin to broiler basal ration resulted in an improvement in dressing percentage. Durrani *et al.*[12] observed, incorporating 4% black cumin into broiler diets increased the weight percentage of thigh and breast. It was noted by Eltazi[15], that a diet containing 1.75% mixed powder (1.5% garlic+0.25% ginger) resulted in the highest dressing percentage along with increased percentages of commercial cuts such as breast, drumstick, and

thigh. However, it was observed by Issa and Abo Omar[16], that, including garlic powder in broiler diets had no significant impact on carcass cuts. This study of carcass yield is in agreement with the findings of Olayeni *et al*.[3], who reported that fenugreek seed and black seed had a significant influence on carcass characteristics of broiler chickens and the variation in the result by the combination and the inclusion level of the test ingredient in the diet used in this study. The overall result might be due to the appropriate utilization of proteins that are made available in the feeds of the chickens. Also, the phytochemicals (phenols, quinones, flavones, tannins, terpenoids, and alkaloids) found in both fenugreek seed and black seed used in this study act as natural growth promoters and boosters, which enhance both growth and carcass yield. Durrani *et al*.[12] also observed that incorporating 4% black cumin into broiler diets increased the weight percentage of thigh and breast.

The findings of the present study on organ are in agreement with the findings of Yesuf *et al*.[17], who reported that dressing percentages of chicks fed on 1 and 2% FSP showed significantly ($p<0.05$) heavier weights compared to the non-supplemented group. An increasing percentage of broilers may be attributed to the feed additives, which contain some phytochemicals that will help in organ function.

The observations tabulated are close to the outcomes reported by Toghyani *et al*.[18], who observed a significant ($p<0.05$) increase in RBC count following supplementation of black cumin seed powder in the broiler diet. Similarly, Borgohain *et al*.[14] noted a significant effect ($p<0.05$) on the differential count of RBC in broilers supplemented with subsequently differing levels of garlic powder in their feed. Fenugreek and black seed function as an active oxygen scavenger, competing with Hemoglobin (Hb) in Red Blood Cells (RBCs) for oxygen, which induces hypoxia. This hypoxic condition stimulates the synthesis of hemoglobin and production of RBCs, consequently increasing the concentration of RBCs in the blood.

Notably, all observed PCV values fell within the normal range for chickens (26.00 to 45.20%). This finding aligns with the observations made and published by Shokrollahi and Sharifi[13], indicating that ration supplementing with black cumin seeds significantly elevated PCV (%) levels in broilers. Similarly, Borgohain *et al*.[14] observed significant ($p<0.05$) improvements in PCV values in various treated groups of broilers fed with garlic powder at varying levels compared to the control group. Singh and Kumar[19] also noted the highest packed cell volume in broiler chickens fed a diet containing 1% of a mixture of black cumin seed, garlic, and turmeric rhizome powder in equal proportions compared to other groups. The observed increase in PCV content in the current study may be observed due to the active principles occurring in the form of phytochemicals like allicin and flavonoids found in black cumin seed and garlic. The haemoglobin values were within normal haemoglobin ranges from 7.00 to 13.00 (g/dL) for healthy chickens. Since haemoglobin is responsible for cellular respiration, which is an important determinant in metabolic reaction, to decrease in haemoglobin is an important determinant of anaemia, which may probably lead to a reduction in oxygen carrying capacity. In this study increase in platelet number was observed in birds fed with higher level of fenugreek seed and black seed which confirm the health benefits of fenugreek seed and black seed.

The enzymatic activity data for Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST) in broilers, which were fed a diet supplemented with fenugreek and black seed are displayed in the findings indicate that the inclusion of the fenugreek and black seed combine in the broiler diet did not lead to any significant ($p<0.05$) alterations in the functions of serum Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT). Elevated levels of these enzymes typically indicate liver cell damage and dysfunction. The normal content of these enzymes (AST: 70 to 220 IU/L, ALT: 9 to 43 IU/L) suggests no adverse effects on the liver parenchyma of the birds. This may have happened due to the antioxidant properties of fenugreek and black seed, which could help stabilize cell membranes and shield the liver from harmful agents and free radical-induced toxicity, thereby reducing liver enzyme levels. The findings

revealed a significant reduction in cholesterol levels (mg/dL) in the groups treated with fenugreek and black seed compared to those treated with the control group. This aligns with similar observations reported by Singh and Kumar[19], who all noted a significantly ($p<0.05$) reduced serum cholesterol content in black cumin-treated groups at varying rates compared to control groups. Additionally, Borgohain *et al.*[14] observed a significantly ($p<0.01$) reduced cholesterol concentration in broilers treated with garlic compared to the control group. This reduction in cholesterol concentration might be achieved due to the hypocholesterolemic and hypolipidemic activities of the active principles present in these feed additives, which suppress hepatic activities of lipogenic and cholesterogenic enzymes. The results revealed a significant reduction in serum triglyceride levels in the fenugreek and black seed treated group compared to the. Additionally, Shokrollahi and Sharifi[13] observed that supplementation of black cumin resulted in a decline in serum triglyceride concentration at varying rates. Borgohain *et al.*[14] found a significant reduction in triglyceride concentration with different rates of garlic supplementation compared to the control group. The findings demonstrate a significant improvement in High-Density Lipoprotein (HDL) levels (mg/dL) in the groups treated with fenugreek and black seed compared with those administered with the antibiotic and the control group. Singh and Kumar[19] and Shokrollahi and Sharifi[13] reported significant improvements in HDL levels due to supplementation with black cumin seed at varying rates compared to the control group in broiler ration. Borgohain *et al.*[14], and it was observed a significantly ($p<0.01$) enhanced HDL concentration was observed in broiler chickens treated with garlic compared to the control group. The serum uric acid levels in broilers typically fall within the range of 5-7 mg/dL. In our study, both uric acid and creatinine values remained within these normal ranges across all dietary treatments. Importantly, there were no notable variations ($p<0.05$) associated with the changes in nutrition, suggesting that the combination of fenugreek and black seed powder had no adverse impact on normal kidney functions of broilers.

CONCLUSION

The use of fenugreek seed and black seed had a positive impact on growth performance, feed conversion ratio, carcass yield, haematological parameters, and serum biochemistry of broiler chicken. It is therefore recommended that the inclusion of 10 g/kg of fenugreek seed and 20 g/kg of black seed blend at a ratio of 1:2 in the diet will help to improve the overall performance and health status of boiler chicken.

SIGNIFICANCE STATEMENT

This study discovered the synergistic potential of black seed (*Nigella sativa*) and fenugreek seed (*Trigonella foenum-graecum*) blends in enhancing broiler performance, carcass yield, hematology, and serum biochemistry, offering a natural and safe alternative to synthetic feed additives. The findings highlight how a 1:2 ratio (10 g fenugreek seed and 20 g black seed) can optimize nutrient utilization and improve physiological health in poultry production. This approach reduces dependency on chemical growth promoters, promoting healthier meat quality and sustainable poultry farming. This study will help researchers to uncover the critical areas of phytobiotic interactions and nutritional synergism that many were not able to explore. Thus, a new theory on plant-based feed synergy may be arrived at.

REFERENCES

1. Al-Duraid, M.H., K.A. Al-Taey and A.H.J. Al-Kikhani, 2019. Effect of phenylalanine and naphthalene acetic acid on growth, yield and antioxidant activity of fenugreek *Trigonella foenum-graecum*. IOP Conf. Ser.: Earth Environ. Sci., Vol. 388. 10.1088/1755-1315/388/1/012073.
2. Alarcon-Rojo, A.D., H. Janacua-Vidales and A. Renteria-Monterrubio, 2017. Oregano Essential Oil in Animal Production. In: Active Ingredients from Aromatic and Medicinal Plants, El-Shemy, H. (Ed.), IntechOpen, London, United Kingdom, ISBN: 978-953-51-5475-4, pp: 225-235.
3. Olayeni, T.B., E.O. Okanlawon and T.P. Akilapa, 2024. Effect of dietary fenugreek powder on growth performance, carcass characteristics and serum biochemistry of broiler chicken at starter and finisher phase. Cognizance J. Multidiscip. Stud., 4: 255-266.

4. Xue, W.L., X.S. Li, J. Zhang, Y.H. Liu, Z.L. Wang and R.J. Zhang, 2007. Effect of *Trigonella foenum-graecum* (fenugreek) extract on blood glucose, blood lipid and hemorheological properties in streptozotocin-induced diabetic rats. Asia Pac. J. Clin. Nutr., 16: 422-426.
5. Olusegun, O.E., R.T. Adewale, O.T. Babatunde, O.O. Hammed, S. Olakiitan and A.S. Adeyemi, 2025. Growth response of broiler chickens to diets containing graded levels of *Datura stramonium* and *Curcuma longa* blend. Trends Biol. Sci., 1: 144-154.
6. Iranloye, B.O., 2002. Effect of chronic garlic feeding on some haematological parameters. Afr. J. Biomed. Res., 5: 81-82.
7. Venkatesan, R., P. Nagarajan, R.S. Rajaretnam and S.S. Majumdar, 2006. Hematologic and serum biochemical values in aged female bonnet macaques (*Macaca radiate*) anesthetized with ketamine hydrochloride. J. Am. Assoc. Lab. Anim. Sci., 45: 45-48.
8. Kohn, R.A. and M.S. Allen, 1995. Enrichment of proteolytic activity relative to nitrogen in preparations from the rumen for *in vitro* studies. Anim. Feed Sci. Technol., 52: 1-14.
9. Khattak, F., A. Ronchi, P. Castelli and N. Sparks, 2014. Effects of natural blend of essential oil on growth performance, blood biochemistry, cecal morphology, and carcass quality of broiler chickens. Poult. Sci., 93: 132-137.
10. Saeid, J.M., A.B. Mohamed and M.A. Al-Baddy, 2013. Effect of adding garlic powder (*Allium sativum*) and black seed (*Nigella sativa*) in feed on broiler growth performance and intestinal wall structure. J. Nat. Sci. Res., 3: 35-41.
11. Ingweye, J.N., O. Anaele and F.I. Ologbose, 2020. Response of rabbit bucks to diets containing Aidan (*Tetrapleura tetraptera*) as feed additive. Anim. Res. Int., 17: 3691-3705.
12. Durrani, F.R., N. Chand, K. Zaka, A. Sultan, F.M. Khattak and Z. Durrani, 2007. Effect of different levels of feed added black seed (*Nigella sativa* L.) on the performance of broiler chicks. Pak. J. Biol. Sci., 10: 4164-4167.
13. Shokrollahi, B. and B. Sharifi, 2018. Effect of *Nigella sativa* seeds on growth performance, blood parameters, carcass quality and antibody production in Japanese quails. J. Livest. Sci., 9: 56-64.
14. Borgohain, B., J.D. Mahanta, D. Sapcota, B. Handique and Rafiqul Islam, 2019. Effect of feeding garlic (*Allium sativum*) on haematological, serum biochemical profile and carcass characteristics in broiler chicken. Int. J. Curr. Microbiol. Appl. Sci., 8: 492-500.
15. Eltazi, S.M.A., 2014. Response of broiler chicks to diets containing different mixture levels of garlic and ginger powder as natural feed additives. Int. J. Pharm. Res. Allied Sci., 3: 27-35.
16. Issa, K.J. and J.M. Abo Omar, 2012. Effect of garlic powder on performance and lipid profile of broilers. Open J. Anim. Sci., 2: 62-68.
17. Yesuf, K.Y., B.T. Mersso and T.E. Bekele, 2017. Effects of different levels of turmeric, fenugreek and black cumin on carcass characteristics of broiler chicken. J. Livest. Sci., 8: 11-17.
18. Toghyani, M., M. Toghyani, A. Gheisari, G. Ghalamkari and M. Mohammadrezaei, 2010. Growth performance, serum biochemistry and blood hematology of broiler chicks fed different levels of black seed (*Nigella sativa*) and peppermint (*Mentha piperita*). Livest. Sci., 129: 173-178.
19. Singh, P.K. and A. Kumar, 2018. Effect of dietary black cumin (*Nigella sativa*) on the growth performance, nutrient utilization, blood biochemical profile and carcass traits in broiler chickens. Anim. Nutr. Feed Technol., 18: 409-419.