

Effect of *Ajwain* (*Trachyspermum Ammi*) supplementation on haemato-biochemical parameters of broiler chicken

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ABSTRACT

The present study attempts to analyze the effect of supplementation of *Ajwain* on the Haemato-biochemical parameters of broiler chicken. Two hundred and twenty five day old straight run broiler chicks were distributed into 5 groups with 3 replicates, each consisting of 15 broilers in a completely randomized design. The treatments included the control group (basal diet) and four groups with basal diet + *Ajwain* powder @ 0.1% in feed, basal diet + *Ajwain* powder @ 0.2% in feed and basal diet + *Ajwain* seeds soaked in drinking water over nightly @ 0.1% and basal diet + *Ajwain* seeds soaked in drinking water over nightly @ 0.2% respectively. Temperature and humidity of the shed were recorded daily to calculate Temperature Humidity Index (THI). Standard feeding and all other managerial practices were followed during the experimental period. At 14, 28 and 42nd day of the experiment, one bird from each replicate was sacrificed for estimation of Haemato-biochemical parameters. Among Haemato-biochemical parameters Hb, PCV, TEC, TLC, cholesterol, calcium, phosphorus, magnesium and total protein showed significant differences among treatment groups as compared to control group.

Key words: *Ajwain*, Broiler, Haemato-biochemical parameters.

Ajwain (*Trachyspermum ammi*) is an aromatic, grassy and annual medicinal plant belonging to Apiaceae (Umbelliferae) family. It is mostly grown in areas like in Egypt, Iran, Iraq, Pakistan and eastern India. In India mostly it is grown in Rajasthan, Gujarat and Madhya Pradesh. The name *Ajwain* originated from Sanskrit word Yavanaka or Ajomoda. It is known by various vernacular names such as Bishop's weed (Sanskrit), Carom or Thyme seed (English name) and Ajowan or *Ajwain* or Omum (Indian name). *Ajwain* is highly esteemed as a remedial digestive agent for flatulence, flatulent colic, atonic dyspepsia, diarrhoea etc. and also as an antiseptic¹. The phytochemical studies on *Ajwain* have revealed the presence of alkaloids, steroids, fixed oils glycosides, tannins, saponin and

flavonoids, cumene, thymene, amino-acids and dietary fiber essential oils like thymol, carvacrol, c-terpinene, p-cymene, etc.

Thymol, the major phenolic compound present in *Ajwain*, has been reported to be germicide, antispasmodic and antifungal agent². Oil of *Ajwain* contains thymol and its specific gravity and odour resembles the volatile oil. The oil contains a liquid hydrocarbon, 1-methyl-4-isopropylbenzol, and another hydrocarbon which is isomeric with oil of turpentine¹.

Ajwain is reported to have platelet aggregation inhibitory action³, antifungal potency⁴ and blood pressure lowering action⁵. Recently, it was assessed that *Ajwain* powder at dose rate of 2 g/kg body weight and its equivalent methanol extract were effective lipid lowering agents⁶. It was also assessed that antihyperlipidaemic effect of *Ajwain* seed extracts in chloroform, methanol, petroleum ether and water is found in albino rabbits⁷. Aflatoxicosis

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can be treated using *Ajwain* in diet⁸. Respiratory problems in guinea pigs were cured when *Ajwain* was supplemented⁹. *Ajwain* has antioxidant activities which play an important role in biological systems by suppressing the formation of active oxygen species like hydrogen peroxide¹⁰. *Ajwain* seed extract has flavonoids which has antioxidant activity¹¹. *Ajwain* supplementation could improve blood cholesterol profile and gastrointestinal microbial population on broiler chicken¹². Anti-inflammatory and antioxidant activity of *Trachyspermum ammi* seeds was exhibited in collagen induced arthritis (CIA) in rats¹³. The intestinal epithelium acts as a natural barrier against pathogenic bacteria and toxic substances that are present in the intestinal lumen. The efficiency of utilization of dietary protein in poultry depends partly on the features of the gastrointestinal tract¹⁴. The small intestine, especially crypts and villi of the absorptive epithelium, plays a significant role in the final phase of nutrient digestion and assimilation¹⁵. Intestinal development can be accessed through measurements of the crypt, a region in which new intestinal cells are formed, as well as villus height and surface area, to determine the area available for digestion and absorption^{14, 16}. The morphological changes of the intestinal villi in broilers are dependent on the presence of digested nutrients in the small intestinal lumen¹⁷. Therefore, the present study was planned to observe the effect of *Ajwain* on the Haemato-biochemical parameters of broilers.

MATERIALS AND METHODS

Two hundred and twenty five day-old straight run broiler chicks were obtained from a local commercial hatchery and were weighed; wing banded and randomly allotted to five treatment groups viz. T₁, T₂, T₃, T₄ & T₅, with three replications having fifteen chicks in each. The control group T₁ was fed a basal diet¹⁸ while the birds in group T₂: control + *Ajwain* powder in feed @ 0.1 %; T₃: control + *Ajwain* powder in feed @ 0.2 %; T₄: control + soaked seeds of *Ajwain* in drinking water over nightly @ 0.1 % and T₅: control + soaked seeds of *Ajwain* in drinking water over nightly @ 0.2 % were supplemented. Before formulation of experimental rations (pre-starter, starter and finisher), the feed ingredients

were analyzed for proximate composition¹⁹ and experimental diet offered is presented in Table 1. *Ajwain* seeds were grinded in a grinder-mixer to make fine powder. *Ajwain* seeds were soaked in drinking water over nightly and aqueous solution was prepared after sieving through muslin cloth twice.

The chicks were routinely vaccinated and reared under strict hygienic conditions on deep litter system maintaining all standard managemental practices including brooding, lighting, raking of litter, cleaning of feeders, drinkers etc.

Haemato-biochemical analysis was carried out by using the blood collected at the time of slaughtering the experimental chickens at the 14, 28 and 42 days of the experiment. The birds were slaughtered and blood was collected from the jugular vein of the selected birds per treatment group with the aid of needle and syringe. Approximately twelve milliliter (ml) of blood was collected from each chicken and transferred immediately into a set of sterile plastic tubes with and without anti-coagulant for haematological and serum biochemical tests respectively. The test tubes were held in slanting position for serum separation. The sera were centrifuged to remove the erythrocytes present, if any. The clear, non-haemolysed sera were then collected in clean, dry and labelled vials. These sera were preserved under deep-freezing in capped vials for further analysis.

Haematological parameters such as Haemoglobin (Hb), Total Erythrocytes Count (TEC), Total Leucocytes Count (TLC), Differential leucocyte count (DLC) etc. were analyzed with the automated haematology analyser MS45 blood cell counter.

Fully automated Random Access Clinical Chemistry Analyzer (EM 200™ Erba Mannheim – Germany) was employed for estimation of biochemical parameters using kits procured from Transasia Biomedical Limited.

The data pertaining to various parameters were analyzed statistically²⁰. All the data were subjected to ANOVA using the General Linear Models procedure of SAS software (SAS Institute, 2003).

The significant mean differences were tested as per Duncan's multiple range test²¹ and significance was declared at $P < 0.05$.

RESULTS AND DISCUSSION

Haematology

The results of haematological parameters of broiler at 14 day are presented in Table 2. There was significant ($P < 0.05$) difference in the haemoglobin, PCV, TEC and TLC values among treatment groups. While differential leucocytes count showed no significant differences amongst treatment groups.

The results of haematological parameters of broiler at 28 day are presented in Table 3. There was significant ($P < 0.05$) difference in the haemoglobin, PCV, TEC and TLC values among treatment groups. Haemoglobin values ranged from T_1 (10.18 g/dl) to T_5 (10.36 g/dl). PCV values ranged from T_1 (39.67 %) to T_5 (40.60 %). Total erythrocytes count and total leucocytes count among treatment groups ranged from 2.21 (T_1) to 2.32 (T_5) millions/ mm^3 and 23.24 (T_1) to 23.80 (T_5) thousands/ mm^3 , respectively. While differential leucocytes count showed no significant differences amongst treatment groups.

The results of haematological parameters of broiler at 42 day are presented in Table 4. There was significant ($P < 0.05$) difference in the haemoglobin, PCV, TEC values among treatment groups. While total leucocytes count and differential leucocytes count showed no significant differences amongst treatment groups.

The present findings of haematological parameters showed significant ($P < 0.05$) differences in the values of Hb, PCV, TEC and TLC at 42 days of age.

A significant increase in TLC along with haemoglobin was observed by supplementation of polyherbal formulation Stresroak @ 1g per kg of feed to birds under overcrowding stress²². There was no significant ($P > 0.05$) alteration in haemoglobin

concentration, total erythrocyte counts, total leucocyte counts and packed cell volume between the dietary treatments upon different levels of probiotic supplementation in broiler chicken diets²³.

Haemoglobin concentration, total erythrocyte count, total leucocyte count, differential leucocyte count (heterophil, basophil, eosinophil, monocyte and lymphocyte) and packed cell volume were non-significant between the dietary treatments of enzyme supplemented and control groups in broilers²⁴.

Similarly, there was no significant difference in haemoglobin content, RBC and WBC count and total albumen content of broilers fed on diets with 0, 5, 10 and 15% of TLMC (Tree leaves meal cocktail)²⁵.

The comparative effect of *Ajwain* extract (50mg/kg) and warfarin (0.54mg/kg) on coagulation parameters after 14 days of continuous administration of drugs to rats and the antithrombotic effect was assessed by determining aPTT (Activated partial thromboplastin time) and PT (Prothrombin time)²⁶. *Ajwain* extract did not show any significant effect on aPTT as compared to control. However, there was highly significant increase in PT as compared to control.

Biochemical parameters

The findings of various serum biochemical parameters of broiler at 14 day performed by biochemistry auto analyzer are presented in Table 5.

The mean values of serum cholesterol, phosphorus, calcium, total protein and magnesium showed significant results ranging from 212.53 (T_1) to 219.07 (T_5) mg/dl, mg/dl, 105.09 (T_5) to 115.00 (T_1) mg/dl, 3.60 (T_1) to 3.78 (T_5) mg/dl, 7.82 (T_1) to 8.16 (T_5) mg/dl, 2.95 (T_1) to 3.09 (T_5) g/dl and 2.94 (T_1) to 3.11 (T_5) mg/dl. The mean values of serum SGOT, SGPT, direct bilirubin, total bilirubin, urea, ceatinine and glucose showed non-significant results, respectively.

The findings of various serum biochemical parameters of broiler at 28 day performed by biochemistry auto analyzer are presented in Table 6. The mean values of serum cholesterol, phosphorus, calcium, total protein and magnesium showed significant results ranging from 109.67 (T₅) to 127.67 (T₁) mg/dl, 3.96 (T₁) to 4.09 (T₅) mg/dl, 8.01 (T₁) to 8.46 (T₅) mg/dl, 3.00 (T₁) to 3.18 (T₅) g/dl and 3.01 (T₁) to 3.16 (T₅) mg/dl. The mean values of serum SGOT, SGPT, direct bilirubin, total bilirubin, urea, creatinine and glucose showed non-significant results respectively.

The findings of various serum biochemical parameters of broiler at 42 day performed by biochemistry auto analyser are presented in Table 7. The mean values of serum cholesterol, phosphorus, calcium, total protein and magnesium showed significant results ranging from 119.01 (T₅) to 131.93 (T₁) mg/dl, 4.53 (T₁) to 4.86 (T₅) mg/dl, 11.57 (T₁) to 11.83 (T₅) mg/dl, 4.36 (T₁) to 4.83 (T₅) g/dl and 3.13 (T₁) to 3.28 (T₅) mg/dl. The mean values of serum SGOT, SGPT, direct bilirubin, total bilirubin, urea, creatinine and glucose showed non-significant results respectively.

The values of serum biochemical parameters under present investigation showed significant (P<0.05) differences among cholesterol, total protein, calcium, phosphorus and magnesium. The values of SGOT, SGPT, direct bilirubin, total bilirubin, urea, creatinine and glucose showed no significant differences under different treatments.

Natural herbal drug supplementation with diet had no effect on SGOT, SGPT, serum glucose, serum protein and serum urea²⁷. There was no significant (P>0.05) variation in total serum protein, serum albumin, serum globulin and A:G ratio, serum glucose, serum SGPT and serum SGOT between the dietary treatments upon different levels of probiotic supplementation in broiler chicken diets²³. Serum cholesterol was, however, significantly (P<0.05) lower for the birds supplemented with probiotics

than those of control groups. Supplementation of *Ajwain* reduced the blood cholesterol and improved the HDL level¹².

The methanolic and petroleum ether extract of *Trachyspermum ammi* at the rate of 2 g/kg body weight were equally effective to Simvastatin in treating hyperlipidaemia in albino rabbits⁷. The possible mechanism of lipid alteration might be a cholestatic effect of *Ajwain* in the liver through enhanced removal or catabolism of lipoproteins or inhibition of HMG COA reductase by the liver. Thus the clinical benefits of *Ajwain* can be correlated with a decrease in LDL cholesterol and an increase in HDL cholesterol⁶.

No significant differences were observed for total protein, albumin, total cholesterol, triglyceride, AST and ALT levels by supplementation of thyme powder @ 1g/kg in basal diet of broilers²⁸. Treatment means for serum glucose, total serum protein, serum albumin, serum globulin and A:G ratio, AST, ALT and ALP in the serum of the birds did not differ (P>0.05) between control and enzyme treated groups²⁴. Herbal feed supplementation in broilers significantly reduced the serum cholesterol, serum triglycerides and increased the humoral response against NCD vaccine²⁹.

The main reason of cholesterol decrease in blood of chicks is substances like carvacrol and thymol which are present in *Ajwain*.

CONCLUSION

Haematological as well as biochemical values indicate that *Ajwain*, as an additive to broiler chicken feed, has great potentials for improving haemogram, serum cholesterol, total protein and serum minerals like calcium, phosphorus and magnesium which strengthen immune system response. Thus, it can be inferred that *Ajwain* can be promoted as a NAGP in broiler industry.

Table 1. Quantity of ingredients and chemical composition (% DM basis) of experimental diet (kg/100 kg feed)

Name of Ingredients	Quantity		
	Pre-starter (0-1 week)	Starter (2-3 weeks)	Finisher (4-6 weeks)
Maize	51	53	57
Soyabean meal	23	19	16
Ground nut cake	10	12	11
Rice polish	3	3	4
Fish meal	8	7	5
*Mineral mixture	2	2	2
Vegetable oil	3	4	5
**Feed additives (g/100kg of ration)	0-1 week	2-3 weeks	4-6 weeks
Spectromix (g)	10	10	10
Spectro BE (g)	20	20	20
Cocciwin (g)	50	50	50
Choline chloride (g)	50	50	50
Lysine (g)	50	50	50
DL - methionine (g)	80	80	80
Antibiotic (chlortetracycline)	150	150	150
Chemical composition	Pre-starter	Starter	Finisher
Moisture %	10.34	10.84	10.88
Crude protein %	23.28	21.96	19.76
Crude fibre %	3.64	3.61	3.32
Ether extract %	6.98	8.38	8.98
Total ash %	6.30	6.18	5.86
Nitrogen free extract %	49.53	48.97	50.88
Methionine %	0.45	0.40	0.35
Lysine %	1.26	1.15	0.94
Metabolizable energy (Kcal/Kg)	2960	3050	3162

*Mineral mixture (salt free): Ca (32%), P (6%), Mn (0.27%), Zn (0.26%), Iodine (0.01%), Fe (1000 ppm), Cu (100 ppm), and Co (50 ppm).

**Spectromix Powder: Each gm contained Vitamin A-82,500 IU, Vit. B2-50 mg, Vit. D3-12,000 IU, and Vit. K-10mg, Spectro BE Powder: Each gm contained Vit.B1-8 mg, Vit.B6-16 mg, Vit.B12-80 mg, Niacin- 120mg, Vit. E-160 mg, Lysine hydrochloride-10 mg, DL-methionine- 10 mg, Calcium pantothenate -80mg, and Calcium – 260mg., Cocciwin: Dinitro- O –Toluamide, Lysine: Contained 98 per cent lysine, DL- methionine: Contained 98 per cent methionine, Choline chloride: Contain 60 percent choline, Antibiotic chlortetracycline: Control group only

Table 2. Effect of Ajwain on mean hematological parameters of broiler chicken at 14 day

Parameter	Unit	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
Hb	g/dl	9.93 ^c ± 0.01	10.15 ^b ± 0.03	10.25 ^a ± 0.02	10.21 ^{ab} ± 0.01	10.28 ^a ± 0.02
PCV	%	39.23 ^b ± 0.14	40.07 ^a ± 0.06	40.20 ^a ± 0.06	40.10 ^a ± 0.10	40.32 ^a ± 0.09
TEC	millions/mm ³	2.19 ^c ± 0.01	2.25 ^b ± 0.02	2.31 ^{a±} 0.01	2.27 ^b ± 0.02	2.30 ^a ± 0.01
TLC	thousand/mm ³	20.54 ^c ± 0.26	21.79 ^b ± 0.15	22.86 ^a ± 0.18	22.93 ^a ± 0.09	22.97 ^a ± 0.25
Lymphocyte	%	69.50 ± 0.29	69.00 ± 0.57	69.00 ± 0.29	68.50 ± 0.57	68.50 ± 0.57
Heterophil	%	29.00 ± 0.33	29.50 ± 0.28	29.00 ± 0.33	29.50 ± 0.28	29.50 ± 0.28
Monocyte	%	0.83 ± 0.29	0.83 ± 0.16	1.00 ± 0.29	1.00 ± 0.29	1.00 ± 0.29
Eosinophil	%	0.50 ± 0.00	0.50 ± 0.33	0.50 ± 0.05	0.50 ± 0.01	0.50 ± 0.01
Basophil	%	0.17 ± 0.16	0.17 ± 0.16	0.50 ± 0.33	0.50 ± 0.33	0.50 ± 0.33

Each value is a mean of three replicates.

Means bearing different superscripts, differ significantly (P<0.05) row wise.

Table 3. Effect of Ajwain on mean hematological parameters of broiler chicken at 28 day

Parameter	Unit	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
Hb	g/dl	10.18 ^{b±} 0.04	10.33 ^a ± 0.04	10.35 ^{a±} 0.03	10.27 ^{ab} ± 0.04	10.36 ^a ± 0.04
PCV	%	39.67 ^b ± 0.33	40.13 ^{ab±} 0.32	40.50 ^{a±} 0.06	40.23 ^{ab} ± 0.08	40.60 ^a ± 0.06
TEC	millions/mm ³	2.21 ^b ± 0.01	2.27 ^{ab} ± 0.02	2.31 ^a ± 0.01	2.23 ^{ab} ± 0.01	2.32 ^a ± 0.01
TLC	thousand/mm ³	23.24 ^b ± 0.17	23.43 ^{ab} ± 0.34	23.69 ^{a±} 0.23	23.40 ^{ab} ± 0.20	23.80 ^a ± 0.14
Lymphocyte	%	69.50 ± 0.29	69.00 ± 0.57	69.00±0.29	68.50 ± 0.57	68.50 ± 0.57
Heterophil	%	29.00 ± 0.33	29.50 ± 0.28	29.00±0.33	29.50 ± 0.28	29.50 ± 0.28
Monocyte	%	0.83 ± 0.29	0.83 ± 0.16	1.00 ± 0.29	1.00 ± 0.29	1.00 ± 0.29
Eosinophil	%	0.50 ± 0.00	0.50 ± 0.33	0.50 ± 0.05	0.50 ± 0.01	0.50 ± 0.01
Basophil	%	0.17 ± 0.16	0.17 ± 0.16	0.50 ± 0.33	0.50 ± 0.33	0.50 ± 0.33

Each value is a mean of three replicates.

Means bearing different superscripts, differ significantly (P<0.05) row wise.

Table 4. Effect of Ajwain on mean hematological parameters of broiler chicken at 42 day

Parameter	Unit	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
Hb	g/dl	10.36 ^b ± 0.03	10.38 ^a ± 0.04	10.39 ^a ± 0.03	10.37 ^a ± 0.04	10.39 ^a ± 0.04
PCV	%	39.93 ^b ± 0.18	40.16 ^{ab} ± 0.02	40.55 ^a ± 0.06	40.20 ^{ab} ± 0.08	40.66 ^a ± 0.06
TEC	millions/mm ³	2.63 ^b ± 0.02	2.69 ^a ± 0.02	2.70 ^a ± 0.01	2.67 ^{ab} ± 0.01	2.71 ^a ± 0.01
TLC	thousand/mm ³	26.07 ^b ± 0.32	27.69 ^a ± 0.34	27.98 ^a ± 0.23	27.70 ^a ± 0.20	27.99 ^a ± 0.14
Lymphocyte	%	69.50 ± 0.29	69.00±0.57	69.00±0.29	68.50 ± 0.57	68.50 ± 0.57
Heterophil	%	29.00 ± 0.33	29.50±0.28	29.00±0.33	29.50 ± 0.28	29.50 ± 0.28
Monocyte	%	0.83 ± 0.29	0.83 ± 0.16	1.00 ± 0.29	1.00 ± 0.29	1.00 ± 0.29
Eosinophil	%	0.50 ± 0.00	0.50 ± 0.33	0.50 ± 0.05	0.50 ± 0.01	0.50 ± 0.01
Basophil	%	0.17 ± 0.16	0.17 ± 0.16	0.50 ± 0.33	0.50 ± 0.33	0.50 ± 0.33

Each value is a mean of three replicates.

Means bearing different superscripts, differ significantly (P<0.05) row wise.

Table 5. Effect of Ajwain on mean serum biochemical parameters of broiler chicken at 14 day

Parameter	Unit	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
SGPT	IU/L	8.85 ± 0.07	9.04 ± 0.03	9.10 ± 0.03	9.01 ± 0.05	9.21 ± 0.03
SGOT	IU/L	248.99 ± 1.19	250.98 ± 1.40	251.22 ± 0.97	249.85 ± 1.50	251.15 ± 1.01
Direct bilirubin	mg/dl	0.05 ± 0.003	0.05 ± 0.003	0.04 ± 0.003	0.04 ± 0.004	0.04 ± 0.004
Total bilirubin	mg/dl	0.05 ± 0.003	0.05 ± 0.06	0.05 ± 0.003	0.04 ± 0.003	0.04 ± 0.003
Urea	mg/dl	2.35 ± 0.15	2.34 ± 0.04	2.33 ± 0.07	2.33 ± 0.06	2.32 ± 0.06
Creatinine	mg/dl	0.22 ± 0.01	0.21 ± 0.009	0.20 ± 0.01	0.20 ± 0.007	0.20 ± 0.007
Glucose	mg/dl	214.53 ± 1.36	214.80 ± 2.70	216.21 ± 2.80	215.07 ± 1.09	216.07 ± 0.38
Cholesterol	mg/dl	115.00 ^a ± 1.52	113.25 ^{ab} ± 1.85	109.07 ^b ± 2.30	107.81 ^{bc} ± 0.88	105.09 ^c ± 1.76
Phosphorus	mg/dl	3.60 ^b ± 0.02	3.71 ^{ab} ± 0.05	3.77 ^a ± 0.03	3.67 ^{ab} ± 0.03	3.78 ^a ± 0.04
Calcium	mg/dl	7.82 ^b ± 0.06	7.96 ^{ab} ± 0.12	8.15 ^a ± 0.07	7.98 ^{ab} ± 0.05	8.16 ^a ± 0.05
Total protein	g/dl	2.95 ^b ± 0.02	3.04 ^a ± 0.06	3.08 ^a ± 0.05	3.04 ^a ± 0.07	3.09 ^a ± 0.04
Magnesium	mg/dl	2.94 ^b ± 0.02	3.03 ^{ab} ± 0.02	3.10 ^a ± 0.03	3.08 ^{ab} ± 0.04	3.11 ^a ± 0.04

Each value is a mean of three replicates.

Means bearing different superscripts, differ significantly (P<0.05) row wise.

Table 6. Effect of Ajwain on mean serum biochemical parameters of broiler chicken at 28 day

Parameter	Unit	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
SGPT	IU/L	12.49 ± 0.03	12.50 ± 0.06	12.53 ± 0.07	12.52 ± 0.04	12.51 ± 0.05
SGOT	IU/L	267.08 ± 1.36	267.99 ± 1.69	267.82 ± 1.70	269.15 ± 1.41	268.35 ± 1.61
Direct bilirubin	mg/dl	0.05 ± 0.003	0.05 ± 0.003	0.04 ± 0.003	0.04 ± 0.004	0.04 ± 0.004
Total bilirubin	mg/dl	0.05 ± 0.003	0.05 ± 0.006	0.05 ± 0.003	0.04 ± 0.003	0.04 ± 0.003
Urea	mg/dl	8.28 ± 0.11	8.24 ± 0.11	8.21 ± 0.06	8.23 ± 0.08	8.20 ± 0.07
Creatinine	mg/dl	0.22 ± 0.01	0.21 ± 0.009	0.20 ± 0.01	0.21 ± 0.007	0.20 ± 0.007
Glucose	mg/dl	227.83 ± 1.96	230.20 ± 1.85	228.21 ± 1.55	232.07 ± 1.93	230.33 ± 1.81
Cholesterol	mg/dl	127.67 ^a ± 0.88	122.67 ^{ab} ± 1.06	111.33 ^c ± 1.03	118.01 ^b ± 1.16	109.67 ^c ± 1.04
Phosphorus	mg/dl	3.96 ^b ± 0.02	4.02 ^a ± 0.16	4.04 ^a ± 0.19	4.00 ^a ± 0.15	4.09 ^a ± 0.16
Calcium	mg/dl	8.01 ^b ± 0.09	8.29 ^a ± 0.07	8.36 ^a ± 0.09	8.23 ^a ± 0.10	8.46 ^a ± 0.11
Total protein	g/dl	3.00 ^c ± 0.02	3.07 ^b ± 0.03	3.15 ^a ± 0.02	3.08 ^b ± 0.02	3.18 ^a ± 0.03
Magnesium	mg/dl	3.01 ^b ± 0.07	3.07 ^{ab} ± 0.06	3.14 ^a ± 0.08	3.10 ^a ± 0.04	3.16 ^a ± 0.04

Each value is a mean of three replicates.

Means bearing different superscripts, differ significantly (P<0.05) row wise.

Table 7. Effect of *Ajwain* on mean serum biochemical parameters of broiler chicken at 42 day

Parameter	Unit	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
SGPT	IU/L	18.03 ± 0.53	18.10 ± 0.48	18.12 ± 0.20	18.09 ± 0.39	18.13 ± 0.38
SGOT	IU/L	295.98 ± 22.94	294.98 ± 10.69	295.62 ± 9.19	295.15 ± 12.11	295.85 ± 12.21
Direct bilirubin	mg/dl	0.06 ± 0.003	0.07 ± 0.003	0.07 ± 0.003	0.07 ± 0.004	0.07 ± 0.004
Total bilirubin	mg/dl	0.13 ± 0.003	0.13 ± 0.006	0.12 ± 0.003	0.13 ± 0.003	0.12 ± 0.003
Urea	mg/dl	22.29 ± 0.15	21.94 ± 0.19	21.86 ± 0.13	21.90 ± 0.16	21.83 ± 0.16
Creatinine	mg/dl	0.206 ± 0.01	0.20 ± 0.009	0.20 ± 0.01	0.201±0.007	0.205 ± 0.007
Glucose	mg/dl	229.53 ± 3.26	231.20 ± 4.75	232.21 ± 2.85	231.07 ± 4.33	233.07 ± 4.33
Cholesterol	mg/dl	131.93 ^a ± 1.82	125.25 ^b ± 1.52	120.97 ^{bc} ± 1.40	124.81 ^b ± 1.30	119.01 ^c ± 1.38
Phosphorus	mg/dl	4.53 ^c ± 0.28	4.67 ^b ± 0.26	4.83 ^a ± 0.13	4.68 ^b ± 0.16	4.86 ^a ± 0.16
Calcium	mg/dl	11.57 ^b ± 0.15	11.65 ^b ± 0.29	11.82 ^a ± 0.29	11.70 ^{ab} ± 0.17	11.83 ^a ± 0.18
Total protein	g/dl	4.36 ^c ± 0.07	4.68 ^b ± 0.06	4.81 ^a ± 0.05	4.70 ^b ± 0.07	4.83 ^a ± 0.07
Magnesium	mg/dl	3.13 ^c ± 0.08	3.17 ^{bc} ± 0.06	3.27 ^a ± 0.08	3.20 ^b ± 0.04	3.28 ^a ± 0.04

Each value is a mean of three replicates.

Means bearing different superscripts, differ significantly (P<0.05) row wise.

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