International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; SP-9(2): 25-28

Received: 14-01-2021
Accepted: 21-02-2021

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Effect of dietary incorporation of Sahjan (*Moringa oleifera*) and Tej Patta (*Cinnamomum tamala*) leaf powder as feed additive on haemato-biochemical parameters in commercial broiler chickens

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DOI: https://doi.org/10.22271/chemi.2021.v9.i2a.11900

Abstract
A feeding trial was conducted to discern the effect of dietary incorporation of *sahjan* (*Moringa oleifera*) leaf powder and *tejpatta* (*Cinnamomum tamala*) powder on haemato-biochemical parameters in commercial broiler chickens. 120, day-old broiler chicks were divided randomly into 4 treatment groups with 3 replicate each i.e. 10 broiler chicks per replicate. The feeding trail lasted for 42 days and blood samples were collected at the end of feeding trial. Chicks of treatment T_1 (control) were fed basal diet (starter and finisher diet), whereas in treatment groups T_2, T_3 and T_4, basal diet was incorporated with 0.5% *sahjan* leaf powder, 0.5% *tejpatta* powder and 0.25% *sahjan* leaf powder with 0.25% *tejpatta* powder, respectively. There was no significant difference was observed in haematological parameters among different treatment groups. The average haemoglobin content of different groups T_1, T_2, T_3 and T_4 was 9.06, 9.26, 9.30 and 9.28 gram per cent, respectively. Maximum serum cholesterol reduction was observed in the group T_4 (135.35 mg/dl) which was significantly different from other incorporated groups T_1, T_2, T_3 (147.98, 141.92 and 142.42 mg/dl). The serum triglycerides concentration in broiler chickens reduced significantly in T_4 (57.62 mg/dl), T_3 (59.15 mg/dl), T_2 (60.02 mg/dl) of broiler chicks fed diets included with *sahjan* and *tejpatta* alone and their combination as compared to T_1 (62.28 mg/dl). There was no significant difference in serum total protein, albumin, globulin and glucose concentrations as well as serum ALP, ALT and AST activities among the different treatment groups. Therefore, it could be concluded that incorporation of *sahjan* (*Moringa oleifera*) leaf powder and *tejpatta* (*Cinnamomum tamala*) powder in the diets of commercial broiler chickens had lower level of serum cholesterol and triglyceride.

Keywords: Sahjan and Tej Patta leaf powder, haematological parameters, broiler performance

Introduction
Poultry industry is one of the industries to meet out the daily protein requirement of human population through the meat and egg. The fast growing nature of broilers and there short generation interval has been associated with use of antibiotic as feed additive in animal feed. However, the use of antibiotic in the diet is restricted because of their residual effect on birds and in turn adverse effect on human health, environmental hazards and development of antimicrobial resistant strains of microorganisms (Lee *et al.*, 2004) [11]. Now a day's herbal products can act an alternative feed additive in poultry production sector as they have positive impact on improved feed conversion ratio and growth performance, under intense system of rearing and more widely accepted by consumers. Sahjan is one of the non-conventional feedstuff which can be used for poultry feeding because of its high nutritional value. *Sahjan* leaf extract has been reported to regulate cholesterol level in rats (Ghasi *et al*., 2000) [6]. *Sahjan* is an important nutritional source with various medicinal properties. It works as hypocholestrolemic agent in obese patients, antiproliferation and initiation of apoptosis on human cancer cells (Sreelatha *et al.*, 2011) [19]. Tejpatta (*Cinnamomum tamala)* has been used as traditional medicines as an astringent, hypocholestromic, stimulant, diuretic agent, and carminative and in cardiac disorders (Kar A. *et al.*, 2003) [10]. The essential oil from the leaves of tejpatta is also used as a flavouring agent of food. The leaf volatile oil has 81 components representing 94.1% of the total constituent present in the oil.

The eugenol is the main element (66.1%) followed by spathulenol (4.8%), viridiflorene (2.4%) methyleugenol (1.9%), aromadenendrene (1.5%) with other component in minor amounts (Kapoor IPS. *et al.*, 2009) [9]. The bark has been used as a substitute for true cinnamon, *Cinnamomum zelanicum* Breyn. Tejpat is commonly harvested in a dry and mild weather condition from the month of October to December and in some places, the collection is proceed till the month of March.

Materials and Methods

A total of 120, day-old commercial broiler chicks (Ven Cobb 400 strain) were procured from D.N. poultry, Haldwani, Uttarakhand and randomly allocated into 4 treatment groups with 3 replication having 10 chicks in each in a completely randomized design. The broiler chicks in group T_1, were fed basal diet (control) whereas chicks of group T2, T3 and T4 were fed basal diet and incorporated with 0.5% *sahjan* leaf powder, 0.5% *tejpatta* powder and 0.25% *sahjan* leaf powder plus 0.25% *tejpatta* powder respectively. Standard broiler diets for starter starter (0-3 weeks) and finisher (3- 6 weeks) phases of growth were prepared by mixing the different ingredient as shown in Table 1 and provided to all the broiler chicks so as to meet the nutrient requirement as per BIS (2007) [3]. The feeds were analysed for proximate principles as per standard methods (AOAC, 2003) [2]. The broiler chicks were raised in a deep litter system under standard management conditions and provided *ad libitum* feed and clean drinking water throughout the trail period.

Blood samples were collected at the end of feeding trial (42nd day). Blood sample (about 3.0 ml) was collected aseptically from the wing vein with sterile needle into well labeled blood collecting test tubes.

Haemoglobin concentration (g/dl) was estimated by Sharma and Singh (2000) [18] using Sahli's haemoglobinometer with acid haematin method. Total erythrocyte counts (TEC) and total leucocytes count (TLC) was performed with Neubauer's counting chamber as described by Jain (1986) [7]. Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) was calculated.

Cholesterol concentration in serum was estimated spectrophotometrically using Erba diagnostic kit with Enzymatic CHOD-PAP (cholesterol oxidase - phenol + amino phenazone) method at 505 nm wavelength (Tietz, 1998) [20]. Serum triglycerides were estimated using Autospan diagnostic kit based on the method of Wako and the modifications by McGowan *et al*. (1983) [14] at 505 nm wavelengths. Estimation of serum glucose was conducted by enzymatic GOD-POD (glucose oxidase- peroxidase) method with using Autospan diagnostic kit at 505 nm wavelength against blank reagent (Sacks, 1998) [17]. Total protein concentration in serum was estimated by biuret method using Erba diagnostic kit at 540 nm wavelength (Johnson *et al*., 1999) [8]. Albumin concentration in the serum was estimated by bromocresol green end point assay method with the aid of AUTOSPAN diagnostic kit at 630 nm wavelength (Johnson *et al*., 1999) [8]. The serum albumin content was subtracted from serum total protein content to arrive at serum globulin content. For the estimation of serum glutamate pyruvate transaminase (SGPT), 4 - DNPH method (2, 4-Dinitrophenylhydrazin) of Reitman and Frankel (1957) [16] was followed using AUTOSPAN diagnostic kit. The activity of serum glutamate oxaloacetate transaminase (SGOT) or aspartate aminotransferase (AST) was measured following 2, 4 - DNPH method of Reitman and Frankel (1957) [16] using a AUTOSPAN diagnostic kit. The alkaline phosphatase activity in serum was assayed using Autospan diagnostic kit.

Result and Discussion

Data pertaining to the Haematological Parameters in broiler chicken are presented in Table-2. There were significant changes in haemoglobin, packed cell volume, total erythrocyte count, mean corpuscular volume and mean corpuscular haemoglobin on dietary supplementation of *sahjan* and *tejpatta* leaf powder in broiler chicken however there were no significant change in the total leukocyte counts and mean corpuscular haemoglobin concentration. The result of present study corroborated with the finding of Mahmood *et al.* (2010) [12] who did not found any significant effect on MCHC value in treatment group incorporated with herbal leaf meal as like *sahjan* leaf powder. Zanu *et al.*, (2012) also showed that effect of 15% *Moringa oleifera* leaf meal as feed additive in diet of rabbits did not affect the PCV, TEC, TLC, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), (MCHC), lymphocytes, neutrophils, monocytes, basophils and eosinophil. A marked improvement in the number of RBC and Hb, WBC, PCV, MCV, MCHC, MCH value may be attributed to the influence of *Moringa oleifera* protein content, which is rich in nutrients such as protein and minerals (Elbashier and Ahmed, 2016).

Data pertaining to the Serum Biochemical Parameters in broiler chicken are presented in Table-3. There were significant change in the serum cholesterol, triglycerides, glucose, serum glutamate pyruvate transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), total protein and globulin content on supplementation of *sahjan* and *tejpatta* leaf powder in the broiler chickens however there were no significant change in alkaline phosphatase and albumin content in serum of broiler chickens. The result of present study corroborated with the finding of Olugbemi *et al*., (2010) who reported that *sahjan* incorporation into the basal diets of broiler chickens significantly decrease total cholesterol and HDL-cholesterol and decreased LDL-cholesterol. Ghasi *et al.*, (2000) [6] also reported that hypocholestromic property of sahjan can be used in obese and heart diseases patient. Mahmoodi *et al.* (2011) [13] showed a decrease in the content in total cholesterol, LDL cholesterol and triglycerides, and an increase in HDL cholesterol in hypercholesterolemic rats, after the intake of tejpatta leaves. Elkloub *et al*., (2015) [5] were reported that 0.2%, 0.4% and 0.6% *Moringa* leaf meal in quail diets was significantly increased in total protein and globulin, albumin, albumin /globulin ratio and cholesterol, triglyceride. Akpet *et al.*, (2014) [1] were found that no significant changes in total protein and globulin, albumin, albumin /globulin ratio and cholesterol, triglyceride and in SGOT, SGPT, ALP activities at 20% inclusion rate of *Moringa oleifera* leaf, however, there was a significant increase in serum ALP activity at 10% *Moringa oleifera* leaf inclusion rate in broiler diets.

Table 1: Ingredient and chemical composition (%) of basal diet of broiler starter and broiler finisher) diets

Ingredients (percentage)	Broiler starter (0 -3 weeks)	Broiler finisher (3 – 6 weeks)
Maize	53.0	56.0
Rice polish	04.0	06.0

Deoiled soyabean meal	30.0	25.0
Groundnut cake	10.0	08.0
Vegetable oil	0.725	2.325
Lysine	0.20	0.20
DL-methionine	0.30	0.30
Dicalcium phosphate	1.00	1.40
Trace mineral mixture	0.25	0.25
Common salt	0.30	0.30
Vitamin premix	0.025	0.025
Coccidiostat	0.05	0.05
Hepatocare	0.10	0.10
Choline chloride	0.05	0.05
Chemical Composition		
Dry matter	94.12	93.21
Crude Protein	22.29	19.88
Ether Extract	4.26	4.67
Crude Fibre	4.39	4.39
Ash	6.45	8.25
Nitrogen Free Extract	62.61	62.81

Table 2: Haematological values of broilers fed diets supplemented with *sahjan* and *tejpatta* leaf powder (42nd days)

Parameters	Treatments/ Groups			
	T_1	T_2	T_3	T_4
Haemoglobin (%)	9.06±0.26	9.26±0.19	9.30±0.24	9.28±0.39
Packed cell volume (%)	28.55±1.13	29.01±0.98	29.95±0.78	29.48±0.71
Total erythrocyte counts (10^6 /µl)	2.41±0.05	2.48±0.08	2.51±0.05	2.48±0.05
Total leukocyte counts (10^3 /µl)	23.33±0.68	24.38±0.68	23.41±0.38	23.18±0.58
Mean corpuscular volume (fl)	118.78±6.41	117.08±2.13	119.05±1.33	118.89±4.01
Mean corpuscular haemoglobin (pg)	37.70±1.57	37.49±1.02	37.01±0.91	37.45±1.72
Mean corpuscular haemoglobin concentration (g/dl)	31.98±1.49	32.10±1.19	31.08±0.59	31.60±1.64

Table 3: Average values of serum biochemical constituents of broilers fed diets incorporated with *sahjan* and *tejpatta* leaf powder (42nd days)

Parameters	Treatments/ Groups			
	T_1	T_2	T_3	T_4
Cholesterol *(mg/dl)	147.98^{a}±3.78	141.92^{b}±3.49	142.42^{b}±1.52	135.35^{bc}±1.82
Triglyceride*(mg/dl)	62.28^{a}±0.73	60.02^{bc}±0.96	59.15^{ab}±1.90	57.62^{c}±0.61
Glucose (mg/dl)	155.48±8.27	153.03±8.43	153.18±25.47	152.15±11.30
Total protein (g/dl)	3.25±0.11	3.23±0.04	3.24±0.05	3.24±0.02
Albumin (g/dl)	1.45±0.03	1.46±0.02	1.45±0.03	1.46±0.01
Globulin (g/dl)	1.80±0.12	1.77±0.06	1.79±0.07	1.78±0.02
Serum glutamate pyruvate transaminase (U/L)	26.38±2.65	25.22±2.90	27.10±2.86	25.37±3.52
Serum glutamate oxaloacetate transaminase (U/L)	163.36±5.53	167.07±2.92	165.95±6.53	165.77±4.25
Serum Alkaline Phosphatase (U/L)	85.44±6.26	86.55±3.99	84.11±7.48	83.02±10.76

$^{a, b, c}$ values bearing different superscripts in a row differ significantly from each other,* $P< 0.05$

Conclusion

In the view of the aforesaid findings, It can be concluded that dietary incorporation of *sahjan* and *tejpatta* leaf powder at a level of 0.5% alone or with combination had significant reduced on serum cholesterol, triglycerides, glucose and liver enzymes such as SGOT and SGPT whereas it increases serum total protein, globulin content of commercial broiler chickens.

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