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Giloe (*Tinospora cordifolia*) and Cinnamon (*Cinnamomum zeylanicum*) Powder Supplementation Effect on Growth Performance in Vencobb Broilers

Garima Tiwari and Anshu Rahal

Dept. of Animal Nutrition, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand (263 145), India

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Corresponding rahalanshu@gmail.com

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ABSTRACT

This experiment was conducted during month of December, 2016 to January, 2017 for 42 days at the Instructional Poultry Farm, Nagla, to evaluate the effect of Giloe and Cinnamon powder supplementation on growth performance, feed consumption (FC) and feed conversion ratio of Vencobb broiler chicken. Total one hundred twenty day old broilers chicks were procured and randomly divided into six treatment groups. While T_1 was taken as control consisting of basal diet, T_2, T_3, T_4, T_5 and T_6 basal diet were supplemented with 1% Giloe, 2% Giloe, 1% Cinnamon, 2% Cinnamon and a combination of 1% Giloe and 1% Cinnamon, respectively. During starter phase (0–21 days), the body weight gain was significantly ($p \leq 0.05$) higher in treatment group incorporated with 2% Giloe. The feed conversion ratio was significantly ($p \leq 0.05$) improved in broiler chicks fed diet incorporated with 1% Giloe. The performance index was significantly better in groups supplemented with 1% or 2% giloe. During finisher phase (22–42 days), the feed conversion ratio was significantly better in group supplemented with 1% Giloe with/without 1% Cinnamon . Performance index was significantly higher in group supplemented with 1% Giloe. During the whole experimental period (0–42 days), incorporation of 1% Giloe improved broiler performance in terms of body weight, weight gain, feed conversion ratio and performance index. Overall values indicated that 1% Giloe dietary incorporation can affect body weight and feed conversion ratio. Giloe @ 1% with/without Cinnamon can be fed in the broiler diet.

KEYWORDS: L and W, GSI, HSI, elasmobranch, bycatch, life history, saurashtra coast

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1. INTRODUCTION

Cinnamon (*Cinnamomum zeylanicum*) is a tropical tree with medicinal importance and belongs to the Lauraceae family. Cinnamon primarily contains essential oils and other derivatives, such as cinnamaldehyde, cinnamic acid and cinnamate, which impart a characteristic fragrance. It possesses antioxidant, antifungal, anti-inflammatory, anticancer, antidiabetic, antimicrobial, lipid-lowering and cardiovascular-disease-lowering compounds. Cinnamon has also shown activities against neurological disorders, such as Parkinson's and Alzheimer's diseases (Sangal, 2011; Yang et al., 2020; Adarsh et al., 2020; Bedier, 2020; El-Hack et al., 2020; Qaid et al., 2021; Mustafa et al., 2019; Ali et al., 2018; Singh et al., 2019; Qaid et al., 2022; Chowlu et al., 2019, Vidyarthi et al., 2025). Cinnamon bark contains procyanidins and catechins, which possess antioxidant properties. This plant plays an important role as a spice, but it's essential oils and other constituents also have important activities, including antifungal activity. Cinnamon has also been used as an antitermitic, nematicidal, -mosquito larvicidal, insecticidal, antimycotic and anticancer agent. The presence of a wide range of constituents, like cinnamyl acetate, eugenol, L-borneol, caryophyllene oxide, β-caryophyllene, L-bornyl acetate, E-nerolidol, α-cubebene, α-terpineol, terpinolene and α-thujene has been reported in Cinnamon. Giloe (*Tinospora cordifolia*) is a deciduous climbing shrub protecting the body against diseases. It is also called guduchi, heart-leaved moonseed, 'magical herb' (cures a lot of maladies) and Amrita (imparts everlasting youthfulness, vitality, and longevity). It is one of the most versatile and divine rejuvenating shrubs and is indigenous to tropical areas of India, Myanmar and Srilanka. Giloe leaves, barks and roots contain various bioactive compounds such as alkaloids, glycosides, lactones, sesquiterpenoids, steroids, polysaccharides,-essential oils, a mixture of fatty acids and aliphatic compounds, having various medicinal properties such as immunomodulatory or immunostimulatory, antitumor, cognition, anti-neoplastic, antihyperglycemia, antihyperlipidemia, antituberculosis, gastrointestinal, anti-osteoporotic, anti-angiogenic, anti-malarial and side effects prevention of cancer chemotherapy (Ashour et al., 2020; Granstad et al., 2020; Hussein et al., 2020; Tiwari et al., 2019; Moryani et al., 2021; Mir et al., 2017). The bitter principles present in the leaves, stems, roots and barks are mainly alkaloids like berberine, gilonin and non-glycoside gilonin, gilosterol. Phytoconstituents present are tinosporine, tinosporide, tinosporaside, -cordifolide, cordifol, heptacosanol, clerodane, furanoditerpene, tinosporodine, -clerodane furano diterpene, diterpenoid furanolactone,-tinosporine, b-sitosterol, palmatine, choline, magniflorine,-tembertarine, cordifolioside A, B, C, amritosides A, B, C, and columbin, which act as therapeutic agents and play a vital role in many therapeutic applications. It has anti-spasmodic, anti-inflammatory, anti-arthritic and anti-allergic properties (Chopra et al., 1982; Attia et al., 2017; Namdeo et al., 2020; Abudabos et al., 2017; Raut et al., 2023; Barambe and Garde, 2020; Jain et al., 2023; Ch et al., 2023; Poonia et al., 2023; Chaudhary et al., 2022). It has immunopotentiating activities and is anti-bacterial, anti-allergic, anti-diabetic, analgesic and diuretic. It enhances glutathione stimulating hormone (GSH) and Vitamin C, so functions as an effective antioxidant (Prince et al., 2004). The aqueous extract of the Giloe plant is capable of increasing leukocyte count in mice and it is also proven to have a hepato-protective effect (Ganguly and Prasad, 2011). It has anti-complementary activity and is a potent hepatoprotectant, so effective in preventing hepatotoxicity. Immunomodulatory proteins in their stem increase the number of macrophages and their phagocytic activity (Rege et al., 1999; Aranha et al., 2012). It has been shown that mice pre-treated with G1-4A exhibited protection against mortality due to lipopolysaccharide (Desai et al., 2007). Immunosuppression due to cholestasis (obstructive jaundice) can be overcome by the use of Giloe (Thatte and Dahanukar, 1989). The alcoholic extract of Tinospora cordifolia has shown to activate tumor associated-macrophages (Singh et al., 2004). The aim of this study was to evaluate supplementation effect of Giloe and/or Cinnamon on production performance in broilers.

2. MATERIALS AND METHODS

This experiment was conducted during month of December, 2016 to January, 2017 to discern the effect of dietary incorporation of Giloe (*Tinospora cordifolia*) and Cinnamon (*Cinnamomum zeylanicum*) stem and bark powder, respectively in broiler diet on growth performance at Instructional Poultry Farm (IPF), College of Veterinary and Animal Sciences, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.

2.1. Preparation of giloe and cinnamon powder and experimental feed

Standard broiler diets for starter (0–3 weeks) and finisher (4–6 weeks) phases of growth were prepared and provided to all the broiler chicks so as to meet the nutrient requirements as per Anonymous (2007). The feeds were analysed for proximate principles as per standard methods (Anonymous, 1995) (Table 1). Giloe stem and Cinnamon bark were collected from the Medicinal Plant Research Development Centre (MRDC) of G. B. Pant University of Agriculture and Technology, Pantnagar, during December and January. The stems and bark were dried, grinded and stored in moisture-free bags until used.

2.2. Experimental design and treatments

A feeding trial was conducted in March-April using a

Table 1: Proximate composition of broiler starter, finisher feed, giloe stem and cinnamon bark (% DM basis)

Sl. No.	Chemical composition	Broiler starter	Broiler finisher	Giloe stem	Cinnamon bark
1.	Dry matter	93.97	94.06	97.15	95.9
2.	Crude protein	22.89	19.23	7.74	3.5
3.	Ether extract	3.85	3.60	2.5	3.0
4.	Crude fibre	4.11	4.17	26.84	33.0
5.	Total ash	10.24	9.46	6.5	4.00
6.	Nitrogen-free extract	58.91	63.54	56.42	56.50

completely randomized design (CRD), where Giloe and Cinnamon powder were supplemented for six weeks according to the treatments. T_1 was taken as control consisting of basal diet only, while in T_2, T_3, T_4, T_5 and T_6 basal diet was supplemented with 1% Giloe, 2% Giloe, 1% Cinnamon, 2% Cinnamon, and a combination of 1% Giloe and 1% Cinnamon, respectively.

2.3. Experimental birds

For the experimental feeding trial, one-hundred-and-twenty-day-old broiler chicks (Vencobb) were purchased from the adjoining local market, Bajpur, weighing between 35 and 45 g. All the chicks were individually weighed and wing-banded. Then chicks were randomly allotted to six different groups, each with two replicates of 10 chicks, in such a way that average body weight was approximately similar for all the treatment groups.

2.4. Housing, management and feeding schedule

The broiler chicks were housed in a deep litter system and provided ad libitum feed and water throughout the trial period. Adequate light and temperature for 24 hours and ventilation were provided during the experiment. A layer of 4–5 cm thick rice husk was provided as litter material. The standard vaccination schedule was followed during the feeding trial. All the housing and managemental conditions were similar for all treatment groups. The starter diet was provided during 0–3 weeks, while the finisher diet was provided during 4–6 weeks of age in a clean feeder. Fresh and clean water was made available to all the birds during the study. The body weight of individual birds and residual feed was recorded weekly, replicate-wise. The birds were vaccinated for IBD on the 14th day and the RD vaccine (Lasota strain) booster on the 28th day.

2.5. Growth performance

The following parameters were recorded and calculated during the experimental period for growth studies.

2.5.1. Feed intake

A daily record of feed given to different groups was maintained. Leftover feed was weighed weekly. The feed intake in different groups was calculated by subtracting the weight of leftover feed from the weight of total feed offered within a period of time.

2.5.2. Body weight gain

The broiler chicks were weighed individually every week till the end of the experiment. Based on these weights, weight gains in different groups of broilers were calculated weekly.

2.5.3. Feed conversion ratio (FCR)

Body weight gain and feed consumption for a particular period were used to calculate the feed conversion ratio:

Feed conversion ratio =Feed consumed (g)/Weight gain (g)

2.5.4. Performance index (PI)

The performance index of broilers during different periods of growth was calculated by using the formula given by Bird (1995).

Performance index=Bdy weight gain (g)/FCR

2.6. Statistical analysis

The experimental data obtained during the study were analysed statistically (Snedecor and Cochran, 1994**)** by using software SPSS 16 with the one-way Analysis of Variance (ANOVA) technique.

3. RESULTS AND DISCUSSION

The data on growth performance of broiler chickens of different treatment groups incorporated with Giloe and Cinnamon powder during 6 weeks experimental period has been presented in Tables 2 to 6.

3.1. Weekly body weight

The average initial body weight during 0–7 days did not differ significantly among different groups (Table 2). Significant differences ($p \leq 0.05$) were found on the 7th day in body weight of broiler chicks between control and T_6, but no significant difference was found between T_2, T_3 and T_4, and also between control and T_5. T_5 differed significantly from T_6. During days 7–14 of the feeding trial, significant difference was observed in body weight. The average body weight between treatment groups T_3 and T_6 was statistically

Table 2: Effect of dietary supplementation of Giloe and Cinnamon powder on the average weekly body weight of broilers

Age of bird	Treatments					
	T_1: Control	T_2: 1% Giloe	T_3: 2% Giloe	T_4: 1% Cinnamon	T_5: 2% Cinnamon	T_6: 1% giloe+1% Cinnamon
1-Day	44.40±1.20	44.00±1.20	41.95±0.55	44.10±1.10	44.60±0.60	43.20±0.20
1st week	116.30^{c}±3.30	123.95^{ab}±1.75	125.30^{ab}±0.80	125.98^{ab}±0.57	121.35^{bc}±0.45	127.37^{a}±0.41
2nd week	260.50^{d}±4.50	278.95^{bc}±1.75	305.53^{a}±4.89	286.65^{b}±5.05	270.33^{cd}±1.98	312.00^{a}±0.59
3rd week	532.40^{c}±8.40	594.95^{ab}±3.25	605.60^{a}±7.93	589.75^{ab}±0.83	583.97^{b}±0.23	585.82^{b}±2.87
4th week	800.35^{c}±10.25	912.35^{a}±2.35	904.00^{a}±12.80	888.85^{ab}±0.15	874.26^{b}±2.14	879.51^{b}±0.61
5th week	1129.0^{b}±40.00	1270.5^{a}±3.50	1235.2^{a}±20.95	1226.5^{a}±16.26	1195.3^{ab}±4.59	1226.0^{a}±16.00
6th week	1453.2^{b}±65.85	1624.2^{a}±3.85	1582.2^{a}±1.46	1561.4^{a}±17.95	1519.0^{ab}±20.06	1594.2^{a}±8.75

^{abc}values bearing different superscripts in a row differ significantly from each other, *$p \leq 0.05$

similar, whereas these two groups differed significantly ($p \leq 0.05$) from T_1, T_2, T_4 and T_5. The average body weight of T_1 significantly ($p \leq 0.05$) differed from that of T_2 and T_4. Significant difference ($p \leq 0.05$) was also observed between T_4 and T_5. The highest average body weight was observed in T_6 (1% Giloe and 1% Cinnamon). During 14–21 days of feeding trial, the body weight of broiler chicks fed diets incorporated with Giloe and Cinnamon powder differed significantly ($p \leq 0.05$). The average body weight in broiler chicks of treatment groups T_2 and T_4, and also of T_5 and T_6 were found statistically similar ($p \geq 0.05$). The body weight of T_5 and T_6 significantly ($p \leq 0.05$) differed from that of T_1 and T_3. No significant difference ($p \geq 0.05$) was found among T_2, T_3 and T_4. In week 4, the average body weight showed a significant difference among the broilers of different treatment groups due to dietary incorporation of Giloe and Cinnamon powder. The average body weight at the 28th day in broiler chicks of treatment groups T_5 and T_6, T_2 and T_3 was statistically similar. The average body weight in T_1 differed significantly ($p \leq 0.05$) from that of all other groups. The average body weight in T_2 and T_3 also differed significantly from that in T_5 and T_6. In week 5, the average body weight showed significant difference among the broilers of different treatment groups due to dietary incorporation of Giloe and Cinnamon powder. The average body weight at the 35th day in treatment groups T_2, T_3, T_4, T_5 and T_6 was statistically similar and differed significantly ($p \leq 0.05$) from T_1. However, the highest body weight was observed in treatment group T_2 (1% Giloe). In week 6 there was a significant difference in body weight among the broilers of different treatment groups due to dietary inclusion of Giloe and Cinnamon powder. The average body weight at the 42nd day in broiler chicks of treatment groups T_2, T_3, T_4, T_5 and T_6 was statistically similar and significantly ($p \leq 0.05$) differed from T_1. However, the highest body weight was observed in treatment group T_2 (1% Giloe). Significant improvement in body weight on supplementation of Giloe alone has also been reported by Gujral et al. (2002) and Kumar et al. (2006). Sang-Oh et al. (2013) studied feeding effect of cinnamon powder in broiler chicken and reported that growth performance increased significantly when cinnamon powder is added @ 3, 5 and 7% in broiler diet.

3.2. Weekly body weight gain

The average weight gain between T_3 and T_6 and between T_2 and T_4 was statistically similar (Table 3) in first week. Significant difference ($p \leq 0.05$) was found between control and T_2, T_3, T_4, T_6 and also between T_6 and T_3 with T_5. However, the highest weight gain was found in the T_6 group in week 1. In week 2, the average weight gain in broiler chicks between T_3 and T_6 was statistically similar, whereas these two groups differed significantly ($p \leq 0.05$) from all other groups. A significant ($p \leq 0.05$) difference was also observed between group T_1 and T_4. No significant ($p \geq 0.05$) difference was found between T_2, T_4 and T_5. However, the highest weight gain was observed in group T_6 (1% Giloe and 1% Cinnamon). During week 3 the average weight gain in broiler chicks of control groups T_1 and T_6 was statistically similar and significantly ($p \leq 0.05$) different from T_2, T_3, T_4 and T_5. Significant difference ($p \leq 0.05$) was also observed between T_2 and T_3, between T_2 and T_4 and between T_3 and T_5. However, the highest weight gain was observed in broiler chicks of group T_2 (1% Giloe). In week 4 the average weight gain in broiler chicks of treatment groups T_3, T_4, T_5 and T_6 was statistically similar and differed significantly ($p \leq 0.05$) from T_1 and T_2. Significant difference ($p \leq 0.05$) was also found between treatment groups T_1 and T_2. However, the average weight gain was significantly ($p \leq 0.05$) higher in group T_2 (1% Giloe) compared to other groups. In week 5, the average weight gain during this period did not differ significantly ($p \geq 0.05$). However, the highest weight gain was observed in the group T_2 (1% Giloe). In week 6, the average weight gain during this period did not differ significantly ($p \geq 0.05$). However, the highest weight

Table 3: Effect of dietary supplementation of Giloe and Cinnamon powder on the average weekly body weight gain of broilers

Age of bird	Treatments					
	T_1: Control	T_2: 1% Giloe	T_3: 2% Giloe	T_4: 1% Cinnamon	T_5: 2% Cinnamon	T_6: 1% giloe+1% Cinnamon
1st week	71.90^{c}±2.10	79.95^{ab}±2.95	83.35^{a}±0.25	81.89^{ab}±1.67	76.75^{bc}±1.05	84.17^{a}±0.21
2nd week	144.20^{c}±7.80	155.00^{bc}±0.00	180.24^{a}±4.09	160.67^{b}±5.62	148.98^{bc}±2.43	184.62^{a}±0.18
3rd week	271.90^{d}±3.90	316.00^{a}±1.50	300.06^{c}±3.04	303.10^{bc}±4.22	313.64^{ab}±1.75	273.83^{d}±3.45
4th week	267.95^{c}±1.85	317.40^{a}±0.90	298.40^{b}±4.88	299.10^{b}±0.68	290.29^{b}±1.91	293.68^{b}±2.26
5th week	328.65±29.75	358.15±1.15	331.15±8.15	337.69±16.11	321.02±6.72	346.49±15.39
6th week	324.15±25.85	353.65±7.35	347.09±19.49	334.81±1.69	323.76±24.65	368.15±24.75
Overall	1408.8^{b}±67.05	1580.2a±2.65	1540.3^{a}±0.91	1517.2^{a}±16.85	1474.4^{ab}±19.46	1551.0^{a}±8.55

^{abc}values bearing different superscripts in a row differ significantly from each other, * $p \leq 0.05$

gain was observed in treatment group T_6 (1% Giloe+1% Cinnamon). From 0-42 days average body weight gain was significantly ($p \leq 0.05$) higher in treatment groups of broiler chickens fed diets incorporated with Giloe and Cinnamon powder. There was improvement in body weight gain due to dietary incorporation of Giloe and Cinnamon powder; however, treatment groups T_2, T_3, T_4 and T_6 were statistically ($p \geq 0.05$) similar. The average weight gain in treatment group T_1 differed significantly from that of T_2, T_3, T_4 and T_6. The highest weight gain was observed in treatment group T_2 (1% giloe). The use of Giloe alone as well as in combination with bael had significant effect on body weight gain in earlier trials conducted by Singh et al. (2014). The result of the present study is corroborated by the findings of Kulkarni et al. (2011), Bhardwaj et al. (2011), Rajeshwari et al. (2012), and Bhardwaj et al. (2012).

3.2. Cumulative feed consumption

The feed intake in broiler chicks among treatment groups did not differ significantly ($p \geq 0.05$) in first week (Table 4). In week 2 the feed intake in broiler chicks among treatment groups did not differ significantly ($p \geq 0.05$). There was no significant ($p \geq 0.05$) difference in average feed intake in broiler chicks among treatment groups during week 3. In week 4 the feed intake in broiler chicks of treatment groups T_2 and T_6 was statistically similar and differed significantly ($p \leq 0.05$) from all other groups. The significant difference ($p \leq 0.05$) was also observed among treatment groups T_1, T_3 and T_4 and also between treatment groups T_1 and T_5 and between T_1 and T_6. Feed intake during 28-35 days did not differ significantly ($p \geq 0.05$). However, the highest feed intake was observed in group T_6 (1% Giloe and 1% Cinnamon). Feed intake during 35–42 days did not differ significantly ($p \geq 0.05$). However, the highest feed intake was observed in treatment group T_2 (1% Giloe). From 0–42 days, the cumulative feed intake did not differ significantly ($p \geq 0.05$) among different groups. The present study results that the use of Giloe increases feed intake, corroborate well with the findings of Sarag et al. (2001) and Gujral et al. (2002) who recorded an increase in feed intake due to the inclusion of Giloe in the diet of broiler chicks.

3.3. Weekly feed conversion ratio

The feed conversion ratio in broiler chicks among treatment

Table 4: Effect of dietary supplementation of Giloe and Cinnamon powder on the cumulative feed consumption (g) of broilers

Age of bird	Treatments					
	T_1: Control	T_2: 1% Giloe	T_3: 2% Giloe	T_4:1% Cinnamon	T_5: 2% Cinnamon	T_6: 1% Giloe+1% Cinnamon
1st week	119.28±2.72	123.72±2.65	127.10±0.07	127.23±2.72	128.36±0.52	121.80±2.95
2nd week	406.57±20.55	408.10±19.90	437.08±10.81	406.12±4.01	406.86±4.34	454.17±1.42
3rd week	405.17±8.53	390.84±9.17	424.60±5.81	415.33±11.85	442.26±5.60	403.11±23.24
4th week	537.23^{d}±2.37	555.46^{c}±4.75	577.38^{b}±7.95	593.48^{a}±2.68	583.15^{ab}±0.79	560.88^{c}±1.57
5th week	618.16±59.22	624.69±7.08	622.32±18.77	619.90±34.63	582.55±7.38	631.04±28.44
6th week	661.52±55.98	671.29±28.71	642.31±39.52	669.94±0.37	641.40±52.17	645.98±41.60
Overall	2747.9±143.93	2774.1±57.47	2830.8±3.74	2832.0±27.20	2784.6±44.83	2817.0±36.37

^{abc}values bearing different superscripts in a row differ significantly from each other, *$p \leq 0.05$

groups did not differ significantly ($p \geq 0.05$) in week 1 (Table 5). The feed conversion ratio in broiler chicks between treatment groups T_3 and T_6 was statistically similar, whereas these two groups differed significantly ($p \leq 0.05$) from T_1 and T_5. A significant ($p \leq 0.05$) difference was also observed between T_1 and T_4. However, a better feed conversion ratio was observed in group T_3 during second week. In week 3 the feed conversion ratio in broiler chicks among treatment groups did not differ significantly ($p \geq 0.05$). However, the better feed conversion ratio was found in group T_2. In week 4 feed conversion ratio during this period in broiler chicks of treatment groups T_1, T_4 and T_5 and also treatment groups T_3 and T_6 was statistically similar. The feed conversion ratio in treatment groups T_1, T_4, and T_5 differs significantly ($p \leq 0.05$) from T_2, T_3 and T_6. Significant difference ($p \leq 0.05$) was also observed between T_2 and T_3, and between T_2 and T_6. However, the feed conversion ratio was significantly ($p \leq 0.05$) better in treatment group T_2 (1% Giloe) compared to other groups. In week 5 Feed conversion ratio during this period in broiler chicks in treatment groups T_1 and T_3 and also T_4, T_5 and T_6 was statistically similar. The feed conversion ratio in broiler chicks of treatment groups T_1 and T_3 differed significantly ($p \leq 0.05$) from T_2, T_4, T_5 and T_6. T_2 also differed significantly ($p \leq 0.05$) from T_4, T_5 and T_6. However, the feed conversion ratio in broiler chicks of treatment group T_2 (1% Giloe) was significantly better compared to the other groups. In week 6 feed conversion ratio during this phase in broiler chicks of treatment groups T_4 and T_5 was statistically similar and differed significantly ($p \leq 0.05$) from T_6. The feed conversion ratio of treatment group T_1 differed significantly ($p \leq 0.05$) from T_3 and T_6. However, the better feed conversion ratio was found in treatment group T_6 (1% Giloe and 1% Cinnamon). From 0–42 days, the feed conversion ratio varied from 1.76 in treatment T_2 (1% Giloe) to 1.95 in treatment T_1 (control) of broiler chickens and differed significantly ($p \leq 0.05$) among different groups of broiler chickens. The better feed conversion ratio was observed in treatment groups T_2, followed by T_6 and T_3. The inclusion of Giloe improved feed conversion ratio, and it increased with an increase in the level of Giloe inclusion, which corroborate with the results of the study of Sarag et al. (2001). Improvement in

Table 5: Effect of dietary supplementation of Giloe and Cinnamon powder on feed conversion ratio of broilers

Age of bird	Treatments					
	T_1: Control	T_2: 1% Giloe	T_3: 2% Giloe	T_4:1% Cinnamon	T_5: 2% Cinnamon	T_6: 1% Giloe+1% Cinnamon
1st week	1.66±0.01	1.55±0.09	1.53±0.01	1.56±0.06	1.67±0.03	1.45±0.03
2nd week	2.82^{a}±0.01	2.63^{abc}±0.13	2.43^{c}±0.00	2.53^{bc}±0.06	2.73^{ab}±0.02	2.46^{c}±0.01
3rd week	1.49±0.01	1.24±0.02	1.42±0.01	1.37±0.02	1.41±0.01	1.47±0.10
4th week	2.01^{a}±0.01	1.75^{c}±0.01	1.94^{b}±0.00	1.98^{a}±0.00	2.01^{a}±0.01	1.91^{b}±0.02
5th week	1.88^{a}±0.01	1.74^{c}±0.01	1.88^{a}±0.01	1.84^{b}±0.02	1.82^{b}±0.02	1.82^{b}±0.00
6th week	2.04^{a}±0.01	1.90^{abc}±0.12	1.85^{bc}±0.01	2.00^{ab}±0.01	1.98^{ab}±0.01	1.76^{c}±0.01
Overall	1.95^{a}±0.01	1.76^{d}±0.04	1.84^{bc}±0.00	1.87^{bc}±0.00	1.89^{b}±0.01	1.82^{cd}±0.01

body weight gain and feed conversion ratio in supplemented groups may have been due to active materials in Giloe and Cinnamon, causing greater feed utilization efficiency. In accordance with the present results, Sang-Oh et al. (2013) observed an increase in body weight, weight gain, and better feed conversion ratio in Cinnamon-fed broiler chicks. It may have been due to improved health and immune status of birds associated with increased serum levels of immunoglobulins. Dietary Cinnamon powder had also been reported to have antibacterial (Valero and Salmeron, 2003; Hernandez et al., 2004) and antioxidant properties.

3.5. Weekly performance index

The performance index in broiler chicks between treatment groups T_2 and T_4 was statistically similar (Table 6). However, the control group differed significantly ($p \leq 0.05$) from T_3 and T_6, and T_5 differed significantly ($p \leq 0.05$) from T_6. The performance index in broiler chicks between treatment groups T_1 and T_5 and between T_3 and T_6 was statistically similar. However, treatment groups T_3 and T_6 differed significantly ($p \leq 0.05$) from the other groups, and also T_4 differed significantly ($p \leq 0.05$) from T_1, T_3, T_5 and T_6. The highest performance index was found in T_6 (1% Giloe and 1% Cinnamon). In week 3 the performance index in broiler chicks of group T_3, T_4 and T_5 and also of group T_1 and T_6, was statistically similar. Significant ($p \leq 0.05$) difference was observed between T_1 and T_2 and T_2 with T_3, T_4, T_5 and T_6. The performance index of the T_2 (1% Giloe) group was significantly ($p \leq 0.05$) higher compared to other treatment groups. In Week 4 performance index during this period in broiler chicks of treatment groups T_3 and T_6 was statistically similar. The performance index in treatment groups T_3 and

Table 6: Effect of dietary supplementation of Giloe and Cinnamon powder on the performance index of broilers

Age of bird	Treatments					
	T_1: Control	T_2: 1% Giloe	T_3: 2% Giloe	T_4: 1% Cinnamon	T_5: 2% Cinnamon	T_6: 1% Giloe+1% Cinnamon
1st week	43.34^{c}±1.54	51.84^{abc}±4.92	54.66^{ab}±0.36	52.79^{abc}±3.27	45.91^{bc}±1.44	58.19^{a}±1.12
2nd week	51.14^{c}±2.95	59.01^{bc}±2.88	74.32^{a}±1.53	63.60^{b}±3.82	54.55^{c}±1.19	75.05^{a}±0.38
3rd week	182.47^{c}±1.39	255.58^{a}±3.57	212.05^{b}±1.40	221.25^{b}±0.15	222.45^{b}±0.34	186.93^{c}±15.46
4th week	133.64^{d}±1.26	181.38^{a}±0.52	154.22^{b}±2.92	150.74^{bc}±0.00	144.51^{c}±1.70	153.79^{b}±2.79
5th week	174.74±14.90	205.35±1.01	176.22±3.36	183.97±7.27	176.91±5.16	190.25±8.33
6th week	158.84±11.89	187.06±15.74	187.57±9.52	167.33±1.60	163.42±11.59	209.82±14.70
Overall	722.23^{d}±30.92	900.52^{a}±21.67	838.10^{bc}±0.12	812.87^{bc}±10.25	780.73^{c}±8.04	853.95^{ab}±1.61

T_6 differed significantly ($p \leq 0.05$) from T_1, T_2, and T_5. The treatment group T_4 differed significantly ($p \leq 0.05$) from T_1 and T_2. The performance index of group T_2 (1% Giloe) was significantly ($p \leq 0.05$) higher compared to all other groups. In Week 5, performance index during this period did not differ significantly ($p \geq 0.05$). However, the highest performance index was observed in treatment group T_2 (1% Giloe). In Week 6 performance index during this period did not differ significantly ($p \geq 0.05$). However, the highest performance index was found in treatment group T_6 (1% Giloe and 1% Cinnamon). Overall (Days 0–42, the performance index during 0–42 days of the feeding trial was significantly higher in treatment group T_2, followed by T_6 and T_3. The growth performance of broiler chicks fed diets containing Cinnamon powder significantly increased when compared to that of control chicks. It could be related to the fact that aromatic herbs had some growth-promoting, appetite, digestion and antimicrobial effects (Kamel, 2001) and anti-heat stress properties for growing birds and may have stimulating effects on the animal digestive system (Langhout, 2000).

4. CONCLUSION

Giloe and Cinnamon incorporated at 1% in the diet of broilers had improved the growth performance. During the starter phase (0–21 days), incorporation of Giloe and Cinnamon powder in the diet of broiler chicks did not influence the feed intake, but a significant ($p \leq 0.05$) improvement in feed conversion ratio and maximum performance index was found in group supplemented with 1% giloe in basal diet. During the finisher phase (21–42 days), the feed intake, body weight in broiler chicks did not differ significantly.

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