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Effect of dietary supplementation of cinnamon *(Cinnamomum cassia)* powder and synbiotic on haematological and serum biochemical parameters of broiler chicks

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Abstract
A total of 300 day old Vencobb broiler chicks of either sex were randomly distributed into five dietary treatment groups with three replicates with 20 chicks in each group. The treatments were included the T_1 control (basal diet as per BIS 2007); T_2 Basal diet + Bacitracin methylene disalicylate @20 g/ quintal of feed; T_3 Basal diet + Cinnamon powder @ 250 g/ quintal of feed; T_4 Basal diet + Synbiotic @ 50 g /quintal of feed for 7 days and then @ 25 g/quintal of feed and T_5 Basal diet plus the combination of cinnamon and synbiotic. Results revealed no statistical (P>0.05) difference in haemoglobin concentration and packed cell volume percentage among the groups on 21st day of age, but significantly at (P<0.01) increased in broiler fed diets containing synbiotic and synbiotic plus cinnamon than control diet was observed on 42nd day. Creatinine level did not differ significantly (P>0.05) at 21 days and 42 days of experiment. AST and ALT did not differ significantly (P>0.05) among dietary treatments at 21 days and 42 days of age. It was concluded that synbiotic and cinnamon can be used in broiler chick without any harmful effect on their health.

Keywords: Broiler chicks, haematological and biochemical parameter, synbiotic, cinnamon

Introduction
Broiler industry is one of the profitable agro-industries which can effectively tackle the problems of unemployment and underemployment in the rural areas, particularly of small and marginal farmers. It has been transformed from the traditional small-scale backyard farming to large-scale commercial farming in India, with annual growth rates of 5.57 per cent in egg production, 11.44 per cent in broiler production, production of 3.73 million tons of poultry meat and employment of 4.29 million people Index Mundi (2015)[10]. India stands fourth largest producer of poultry meat in the world, valued at US$ 6.6 billion. Poultry production accounts for about 0.66 per cent of India's GDP and 7.72 per cent GDP from the Livestock sector (Prabakaran (2014) [14]. Rajendran *et al.* (2014) [15].

The major growth promoters used in poultry production are various feed grade antibiotics. Now a day due to residual effect of antibiotics on human health the use of many antibiotics in food production is banned or going to be banned. Currently, consumers around the world are increasingly more conscious of the nutritional value and safety of their food and its ingredients. As a result, the demand for alternative products to antibiotics that can be used as prophylactic and growth promoting agents is very high. Many alternative substances obtained from nature and belonging to the groups of prebiotics, probiotics, organic acids, enzymes, silicates, herbs and spices finds a potential substitute for antibiotics.

Hence, the present study was conducted to evaluate the efficacy of the cinnamon and synbiotic on haematology, kidney function and liver enzymes of Vencobb broiler chicks.

Materials and Method
The present investigation was conducted at Poultry Farm and Department of Livestock Production Management of College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan University of Veterinary and Animal Sciences, Bikaner.

Experimental design

A total of 300 day old Vencobb broiler chicks of either sex were procured from the Kewalramani Hatcheries Pvt. Ltd., Ajmer and were equally and randomly divided into 5 treatment groups having 60 broiler chicks in each group was further sub-divided into 3 replicates of 20 chicks each. The treatments included the T_1 control (basal diet); T_2 Basal diet + Bacitracin methylene disalicylate; T_3 Basal diet + Cinnamon powder; T_4 Basal diet + Synbiotic and T_5 Basal diet plus the combination of cinnamon and synbiotic.

Table 1: Design of the experiment

Dietary treatment	Composition
T_1	Basal diet (Control)
T_2	Basal diet + Bacitracin methylene disalicylate @20 g/ quintal of feed
T_3	Basal diet + Cinnamon powder @ 250 g/ quintal of feed
T_4	Basal diet + Synbiotic @ 50 g /quintal of feed for 7 days and then @ 25 g/quintal of feed
T_5	Basal diet + Cinnamon powder @ 250 g/ quintal of feed + Synbiotic @ 50 g /quintal of feed for 7 days and then @ 25 g/quintal of feed

The chicks were fed with starter ration up to 21 days and finisher ration from 22 to 42 days of age as per BIS (2007) [6] recommendations. The chicks under treatment were provided with dietary supplemented ration from day old to the 42nd day of age. During the period of study (0-6 weeks), all the birds were provided with starter diet (with 3056 kcal of metab-olizable energy ME/kg of ration and 22.04% crude protein [CP]) from 0 to 3 weeks of age and finisher diet (with 3163 kcal of ME/kg of ration and 20.08% CP) from 4 to 6 weeks of age.

Fresh and dried wheat straw was used as bedding. The pens were thoroughly cleaned and disinfected before starting of experiment. All the chicks were maintained under standard managemental regimen of brooding and lighting. Proper ventilation and biosecurity measures were ensured throughout the trial. Routine, day old vaccinations for Marek's and Ranikhet (F_1 strain) disease were given to the chicks just after hatching and on 4th day respectively. On 14th day all the chicks were vaccinated against Infectious Bursal Disease. *Ad libitum* clean and fresh *water* was provided throughout the trial.

Haematological parameters

About 3 ml blood samples were collected aseptically from wing vein (Brachial vein) of two randomly selected birds from each replicate total 6 sample from each group at 21st and 42nd day of age for the estimation of different haemato-biochemical parameters. Half of the blood was transferred into Ethylene Diamine Tetra Acetic acid (EDTA) containing vacutainer tubes. These anti-coagualted blood samples were subjected to determine Haemoglobin (Hb) concentration and Packed Cell Volume (PCV).The remaining blood sample was transferred to non-EDTA tubes for preparation of serum subsequently, the serum was harvested through centrifugation of sample at 3000 rpm for 15 min and stored at -20°C until further analysis.

Determination of blood Hb and pcv

Hemoglobin was estimated by using Sahli's acid hematin method. PCV was measured by a standard manual technique using macro-haematocrit (Wintrobe) tubes centrifuged at 3000 rpm for 30 min.

Estimation of biochemical parameters

The treatment wise serum samples were analysed for Creatinine and enzymes like Alanine Transaminase (ALT) and Aspartate Amino Transferase (AST) through double beam spectrophotometer using commercial test kits as per manufacturer's protocol.

Statistical analysis

The experimental data were subjected to statistical analysis using one way analysis of variance as described by Snedecor and Cochran (2004) [17] to test for significant variation between treatment groups. Probabilities values of less than 0.05 ($P<0.05$) were considered significant. Comparison of mean values was carried out by Duncan's Multiple Range Test Duncan (1955) [7]. at 95% significant level.

Results and discussion

Haematological parameters

Blood parametric test have been adopted in poultry farms as an important tool to measure the health status of broilers. Haemoglobin concentration and packed cell volume percentage given in Table-2 and Figure 1 and 2. Haemoglobin concentration and packed cell volume percentage on 21st day of age were numerically higher than that of the control group. But there were no statistical differences (P>0.05) observed in haemoglobin and packed cell volume percentage between the control and the other groups. Similar findings were reported by Abdel-Hafeez *et al.,* (2017) [2]. However on 42nd day haemoglobin and packed cell volume percentage was significantly higher at (P<0.01) and (P<0.05) level in broiler fed diets containing synbiotic and synbiotic plus cinnamon than in birds fed control diet. These results were in agreement with the findings of (Abdel-Fattah and Fararh (2009) [1]. Beski *et al*. (2015) [5]. El-Shenway and Soltan (2015) [9]. Whereas the contrast results were recorded by Oliva Das *et al.,* (2016) [13] in broiler chicks.

The higher Hb concentration in the chicks received synbiotic may be due to the acidic media of the intestinal tract caused by prebiotic fermentation which resulted in better iron salt absorption from the small intestine. This might be responsible for better production of vitamins B complex by benefecial bacteria which results in positively affecting blood-forming processes Kander (2004)[11]. Normal iron supply leading to intensification of erythropoiesis was probably as a consequence of hyper synthesis of erythropoietin and it was in agreement of (Sjaasted *et al.* (1996) [16]. Factors that affect erythropoiesis and red blood cell numbers also affect hemoglobin level Sturkie (1986) [18]. Synbiotic could increase the digestibility percentage and availability of many nutrient elements such as proteins, mineral elements and vitamins Naji (2009) [12]. Haemoglobin concentration may increase by absorption of these nutrients.

Table 2: Effect of Cinnamon and Synbiotic on haemoglobin and PCV in broilers of different treatment groups at 21st and 42nd day of experimental trial (Means ± Standard error)

Treatments	Haemoglobin (g/dl)		PCV %	
	Day Of Sampling		Day Of Sampling	
	21st Day	42nd Day	21st Day	42nd Day
T_1	7.70±0.11	7.93 ^{b} ±0.20	26.66±0.49	27.33 ^{b} ±0.55
T_2	7.76±0.18	7.96 ^{b} ±0.14	27.0±0.81	27.50 ^{b} ±0.56
T_3	7.93±0.20	8.33 ^{b} ±0.15	27.33±0.55	28.50 ^{b} ±0.42
T_4	8.06±0.04	8.76 ^{a} ±0.10	28.16±0.47	31.33 ^{a} ±0.49
T_5	8.20±0.17	8.90 ^{a} ±0.11	27.83±0.40	30.33 ^{a} ±0.76
Level of significance	NS	**	NS	**

Means in the same column bearing different superscripts are significantly different. ** Highly significant (P<0.01), NS = Non- significant (P>0.05)

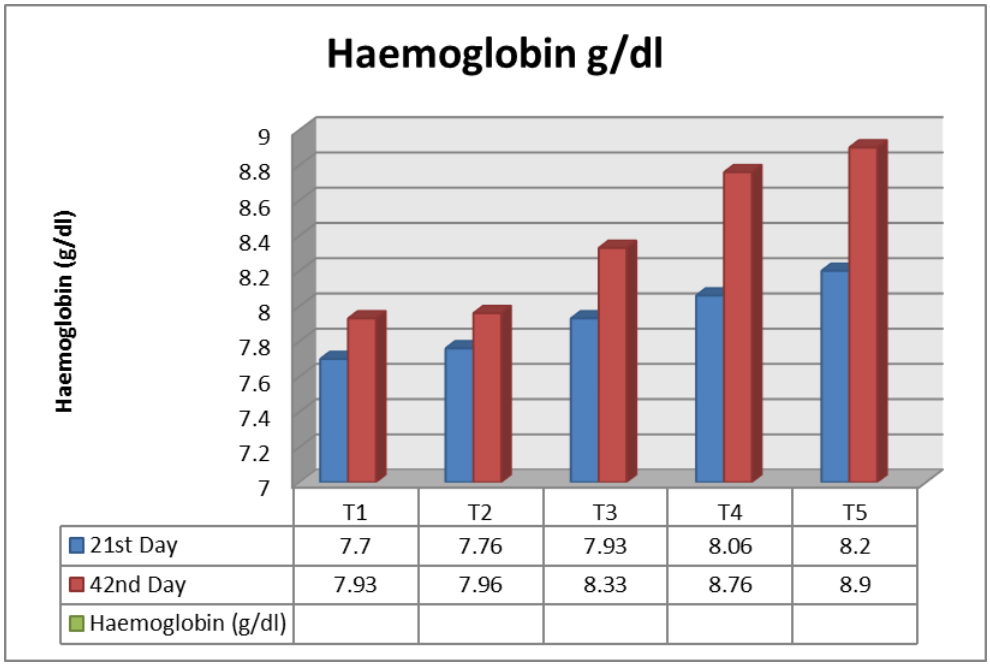

Fig 1: Haemoglobin g/dl values for various treatment groups

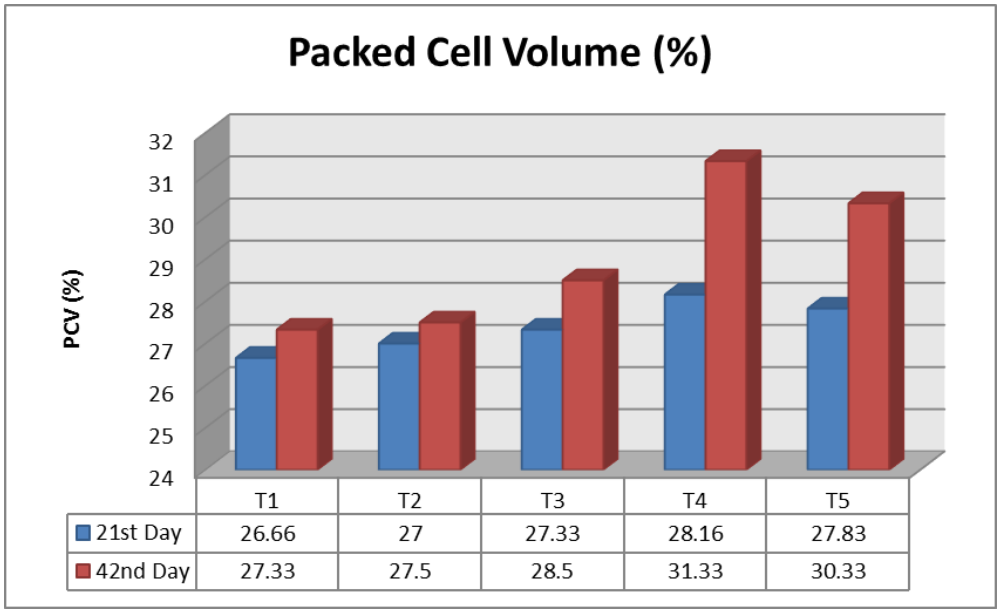

Fig 2: Packed cell Volume % for various treatment groups.

Kidney and Liver Functions

The presence of serum enzymes and their quantity in the serum can provide some indication of the degree of organ or tissue damage. The serum concentration of AST and ALT can be used to evaluate avian hepatic function because their synthesis occurs in the liver. As presented in Table-3 and Figure-3 the level of creatinine (mg/dl) in broiler chicks received synbiotic numerically higher than control and other groups at 21 days and 42 days of experiment but In contrast

(Ahmed *et al*. (2015) [4] reported significantly ($P<0.05$) increased in creatinine level.

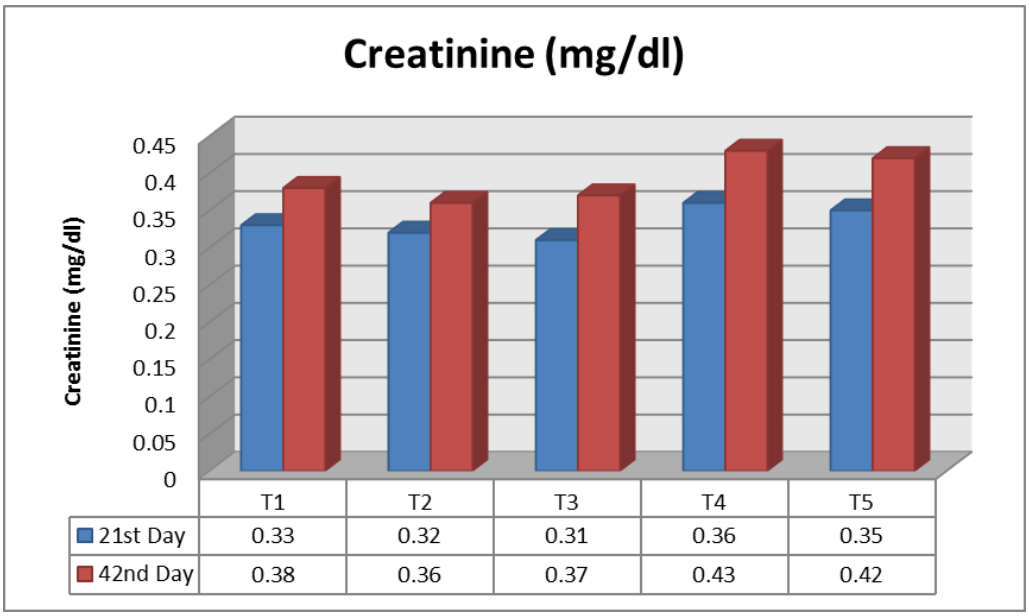

Fig 3: Creatinine (mg/dl) level for various treatment groups.

AST and ALT value given in Table-3 and Figure 4 and 5.In present study There is a numerical decrease in serum AST and ALT in all dietary supplemented groups in comparison with the control group and did not differ significantly ($P>0.05$) among dietary treatments at 21 days and 42 days of age. Present findings were in line with the findings reported by different research workers. Elfaki and Mukhtar (2015) [8] who found non-significant effect of synbiotics supplementation on serum AST and ALT values in broiler birds. Similar non-significant effect was reported by Abdel-Fattah and Fararh (2009) [1]. Abdel-Raheem and Abd-Allah (2011) [3]. El-Shenway and Soltan (2015) [9]. Oliva Das *et al*. (2016) [13]. On synbiotics supplementation in broiler chicks, whereas (Ahmed *et al*. (2015) [4] detected significant increase of ALT and numerically increase in AST on synbiotic supplementation at 42nd days of trial. The present results are being given support towards normal functioning of liver in all supplemented groups.

Table 3: Effect of Cinnamon and Synbiotic on Liver functions in broilers of different treatment groups at 21st and 42nd day of experimental trial (Means ± Standard error)

Treatments	AST (U/L)		ALT (U/L)		Creatinine (mg/dl)	
	Day Of Sampling		Day Of Sampling		Day Of Sampling	
	21st Day	42nd Day	21st Day	42nd Day	21st Day	42nd Day
T_1	197.76±5.74	222.19±3.78	29.66±4.99	34.31±2.76	0.33±0.018	0.38±0.010
T_2	176.82±9.73	207.65±5.53	28.50±4.17	33.74±4.65	0.32±0.011	0.36±0.016
T_3	168.10±11.19	198.93±10.19	24.42±1.27	31.41±3.24	0.31±0.009	0.37±0.013
T_4	153.56±16.49	185.55±16.52	23.26±3.07	27.92±3.60	0.36±0.033	0.43±0.031
T_5	165.77±16.68	195.44±12.64	23.84±2.61	29.08±1.47	0.35±0.024	0.42±0.022
Level of significance	NS	NS	NS	NS	NS	NS

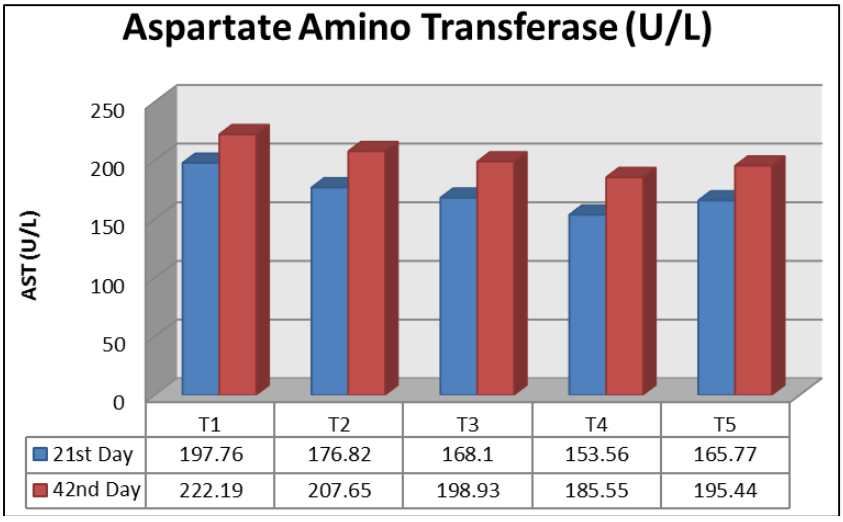

Fig 4: Aspartate Amino Transferase (U/L) level for various treatment groups.

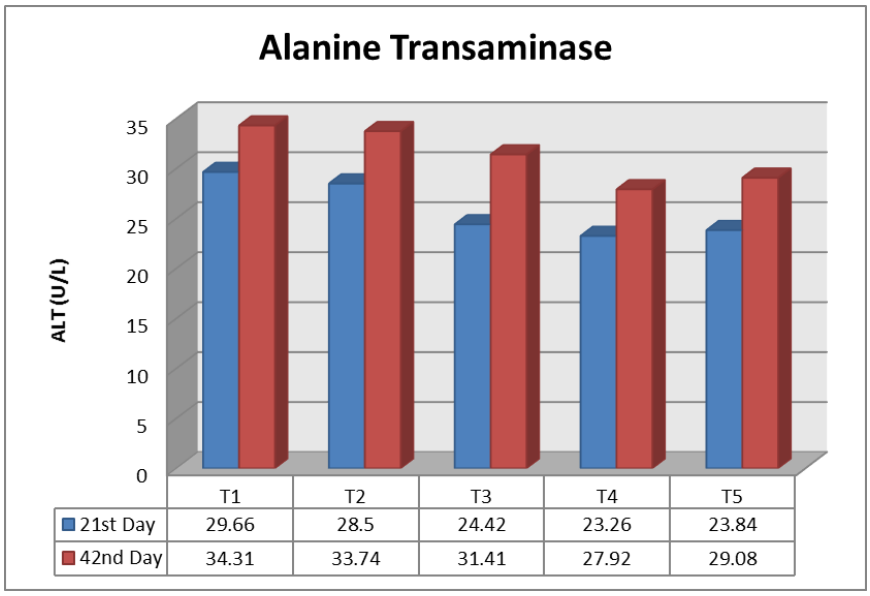

Fig 5: Alanine Transaminase (U/L) level for various treatment groups

Conclusion

Based on present finding it was concluded that synbiotic was most effective herbal feed additive and can be used as an alternative to antibiotic growth promoter in broiler chicks without any harmful effect on their health as detected by normal physiological blood profile.

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