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Effect of natural vitamin E, vitamin C, Choline and herbal liver supplement on serum biochemical parameters in commercial broilers

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Abstract

An experiment was conducted to study the effect of natural vitamin E, vitamin C, choline and herbal liver supplement on serum biochemical parameters of commercial broilers. A total of 150 day-old commercial broiler (Vencobb) chicks were distributed into five treatment groups with three replicates in each group and ten chicks in each replicate. Basal diet (T_1, control) prepared following BIS standards and the experimental diets were prepared by incorporating natural vitamin E, vitamin C, Choline and herbal liver supplement to the treatment groups T_2, T_3, T_4 and T_5, respectively each at 0.1% to the basal diet. The individual serum samples were analyzed for serum glutamic pyruvic transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), serum cholesterol and triglycerides using serum biochemical auto analyzer. Results revealed that supplementation of natural vitamin E have significant effect on serum cholesterol and serum triglycerides values, natural vitamin C have significant effect on SGOT, serum cholesterol and serum triglycerides, natural choline have significant effect on SGPT, serum cholesterol and serum triglycerides and herbal liver supplement have significant effect on SGPT, SGOT and serum cholesterol values.

Keywords: Natural, herbal, commercial broiler, serum biochemical

Introduction

The economics of production is a crucial criterion for broiler production since, after genetic potential, feed is the main element influencing the productive performance and economics of broiler production. Additionally, a significant input that accounts for 70–75 per cent of the whole production cost is feed. The main goals of poultry farmers are consistently to increase bird's health and productivity and feed efficiency by lowering the cost of production per bird. Due to the ban on the use of some antibiotics, dangerous after effects, and cost effectiveness, the use of herbal feed additives is becoming more and more important in the production of chickens (Nadir *et al.*, 2014). Because they may positively affect animal metabolism through their capacity to stimulate digestion, enhance immune response, reduce inflammatory potential, and provide antimicrobial and antioxidant properties, herbs and their purified constituents have been extensively studied in the last couple of decades as alternative growth performance enhancers.

Vitamin E is a fat-soluble vitamin and is recognised to be a powerful antioxidant. (Sahin *et al.*, 2002) [12]. Vitamin E has been shown in numerous studies to enhance meat quality by preventing muscle lipid oxidation in broilers (O'neill *et al.*, 1998; Voljc *et al.*, 2011) [10, 16]. Typically, it is believed that poultry's endogenous production of vitamin C synthesis is insufficient to meet their biological needs, particularly under adverse environmental conditions (Pardue and Thaxton,1986) [11]. When vitamin C was added to the diet of stressed birds, there were noticeable improvements in the growth of the chicks. Supplementation of choline in poultry ration is well established to improve growth, performance & carcass quality and more importantly prevention of fatty liver condition in chickens (Kiran Kumari, 2011) [7]. Naturally, phosphatidylcholine, free choline, and sphingomyelin are all forms of choline that can be found in plants. Traditional and synthetic medications used to treat liver problems do not provide appropriate protection and occasionally have harmful side effects (Guntupalli *et al.*, 2006) [4]. Many herbs toning up the liver of poultry birds for maximum performance and productivity through their therapeutic action, such as liver cell rejuvenation (hepatogenerative), hepato-stimulative, hepato-protective, anti-hepatotoxic, and positive anabolic effect, enables them to reach their full growth and performance potential (Dhumal *et al.*, 2018; Somavanshi *et al.*, 2020) [3, 15].

Dhumal *et al.* (2018) [3] observed significant decreased values for serum glutamic oxaloacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) for herbal liver stimulant supplemented groups at 42nd day except SGOT value at 21st day. This indicated herbal liver stimulant property of hepato-protective and liver tonic, it protected the liver from any damage thereby did not cause any liver dystrophy or other vital organ abnormality where from these enzymes are secreted. Selvam *et al.* (2018) [13] observed that synthetic choline (400 g/ton) and herbal choline (400 g/ton) treated groups shown significant improvement in serum Aspartate aminotransferase activity that was enhanced in choline deficient chickens. Khose *et*

al. (2019) [6] reported that the serum glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT) and alkaline phosphatase (ALP) were significantly ($P < 0.01$) reduced in treatment group in which herbal choline was supplemented at 0.50 kg/ton of feed as compared to control group (no choline supplement) in commercial broiler chickens.

Materials and Methods

A total of one hundred and fifty day-old commercial broiler (Cobb) chicks were procured from the Venkateshwara hatcheries Pvt. Ltd. All the chicks were weighed and wing banded individually. The chicks were allocated to five experimental groups each consisting of three replicates with ten chicks each. The chicks were reared in deep litter system and maintained under standard managemental practices till 42 days of age. Birds were vaccinated against Newcastle disease and Infectious bursal disease as per the schedule. Feed and water were provided *ad libitum* throughout the experimental period. The basal diet (control-T_1) was formulated in accordance with the BIS (2007) standards of nutrient requirements. Natural vitamin E, vitamin C, choline and herbal liver supplement were added to the treatment groups T_2, T_3, T_4 and T_5 respectively each at 0.1% to the basal diet. Chicks were vaccinated against ND with B1 strain on seventh day and booster dose with LaSota strain on twenty first day through intra ocular route and IBD with intermediate strain on fourteenth day and on twenty eighth day through intra ocular route. Description of experimental groups is given in Table 1.0.

On day 42, blood samples were collected from two birds from each replicate (20 birds per treatment) and the serum was collected after 8 to 10 hrs as per the standard procedures and was stored at -20°C till subsequent analysis was done. The individual serum samples were analyzed for serum glutamic pyruvic transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), serum cholesterol and triglycerides using serum biochemical auto analyzer as per the recommendations of the manufacturer of the kit.

Main herbal ingredients of test materials (natural products)

Vitamin E: *Berberis vulgaris, Withania somnifera* and *Rheum palmatum.*

Vitamin C: *Ocimum sanctum, Phyllanthus emblica* and *Terminalia belerica.*

Choline: *Acacia nilotica, Curcuma longa, Andrographis paniculate* and *Azadirachta indica.*

Liver supplement: *Eclipta alba, Achyranthus aspera, Solanum nigrum* and *Tinospora cordifolia.*

Table 1: Description of experimental groups

Experimental Group	Description of the treatment	No. of replicates	No. of birds per replicate	Total
T_1	Basal diet	3	10	30
T_2	Basal diet + 0.1% natural vitamin E	3	10	30
T_3	Basal diet + 0.1% natural vitamin C	3	10	30
T_4	Basal diet + 0.1% natural choline	3	10	30
T_5	Basal diet + 0.1% herbal liver supplement	3	10	30
			Total	150

Results and Discussion

The results of the effect of natural vitamin E, vitamin C, choline and herbal liver supplement on serum biochemical parameters at 42nd day in commercial broilers are presented in Table 2.0. At the end of 42nd day, the SGPT values (U / L) were 32.00 (T_1), 32.66 (T_2), 33.33 (T_3), 34.50 (T_4) and 22.16 (T_5). The SGPT levels were significantly lower in the treatment group T_5 compared to T_1, T_2, T_3, and T_4. T_4 showed significantly lower SGPT compared to control group. There was no significant difference ($P > 0.05$) in the SGPT levels among T_1, T_2 and T_3 and also among treatment group T_2, T_3 and T_4. SGOT (U / L) values were 102.83 (T_1), 102.50 (T_2), 99.66 (T_3), 102.67 (T_4) and 91.00 (T_5). The SGOT levels were significantly lower in the treatment group T_5 compared to T_1, T_2, T_3, and T_4. The group T_3 showed significantly lower SGOT than T_1, T_2 and T_4. There was no significant difference ($P > 0.05$) in the SGOT levels among T_1, T_2 and T_4. the serum cholesterol values (mg / dl) were 133.83 (T_1), 130.33 (T_2), 131.17 (T_3), 111.17 (T_4) and 130.33 (T_5). The serum cholesterol levels were significantly lower in the treatment group T_4 compared to T_1, T_2, T_3 and T_5. The group T_1 showed significantly higher serum cholesterol compared to T_2, T_3, T_4 and T_5. There was no significant difference ($P > 0.05$) in the serum cholesterol level among T_2, T_3 and T_5. The values (mg/dl) of triglycerides at the end of the experiment were 114.83 (T_1), 111.83 (T_2), 111.50 (T_3), 81.50 (T_4) and 112.50 (T_5). The serum triglyceride level was significantly ($P \leq 0.05$) lower in the treatment groups T_4 compared to T_1, T_2, T_3 and T_5. The group T_1 is significantly ($P \leq 0.05$) higher than T_2, T_3 and T_4. There was no significant difference ($P > 0.05$) in the serum triglyceride levels were noticed among T_2, T_3 and T_5 and also among treatment group T_1 and T_5.

There was significant difference ($P \leq 0.05$) in serum cholesterol and serum triglycerides but no significant difference ($P > 0.05$) was observed in SGPT and SGOT values in group supplemented with natural vitamin E compared to control group at 42nd day of experiment. Significant difference ($P \leq 0.05$) in SGOT, serum cholesterol and serum triglycerides but no significant difference ($p > 0.05$) was observed in SGPT values in group supplemented with natural vitamin C compared to control group at 42nd day of experiment. Significant difference ($P \leq 0.05$) in SGPT, serum cholesterol and serum triglycerides but no significant difference ($p > 0.05$) was observed in SGOT values in group supplemented with natural choline compared to control group at 42nd day of experiment. Significant difference ($P \leq 0.05$) in SGPT, SGOT and serum cholesterol but no significant difference ($p > 0.05$) was observed in serum triglyceride values in herbal liver supplement treated group compared to control group at 42nd day of experiment.

The results of the present study are in agreement with Jadhav *et al*. (2008) [5] and Sharma and Ranjan (2015) [14] who observed that the serum cholesterol levels in herbal/natural choline supplemented broilers were significantly reduced than in control birds. The results of the present study are also in agreement with Kumari *et al*. (2012) [8] who observed non significant difference in SGPT values between natural vitamin C added group and control group. The results of the present study are also in agreement with Aswal *et al*. (2017) [1] who observed significant difference in serum cholesterol and serum triglyceride values between Amla (natural vitamin C source) supplemented group and control group. The results of the present study are also in agreement with Dhumal *et al*. (2018) [3] who observed significant decreased values for SGOT and SGPT for herbal liver stimulant supplemented groups at 42nd day. The results of the present study are also in agreement with Selvam *et al*. (2018) [13] who observed that herbal choline (400 g/ton) treated groups shown significant improvement in serum aspartate aminotransferase activity that was enhanced in choline deficient chickens. The results of the present study are also in agreement with Khose *et al*. (2019) [6] who reported that the SGPT was significantly reduced in treatment group in which herbal choline was supplemented at 0.50 kg/ ton of feed as compared to control group (no choline supplement) in commercial broiler chickens.

The results of the present study are in disagreement with Kumari *et al*. (2012) [8] who concluded that the amla pomace as natural vitamin C at 250 -700 g per quintal did not have any specific effect on liver gland of broiler chickens.

Natural vitamin C treated groups had significantly lower serum cholesterol level which might be due to the effect of herbal ingredients (Amla) which contains Tannin, which has several effects, as it is a depressant factor on the cholesterol level and other types of body fat. It has been also reported (Aswal *et al*., 2017) [1] that the presence of pectin in amla might have reduced the levels of triglycerides by inhibiting fatty acid synthesis. The presence of the herbs (*A. nilotica and C. longa*) in the (choline) test product used in the current study, which are rich sources of polyphenols and curcuminoids that have hepatoprotective activity and have an impact on the transmethylation pathway and/or osmotic regulation by increasing the liver betaine content, which plays a role in liver lipid metabolism, may be the cause of the significant differences in serum biochemistry between the natural choline supplemented group and control group. The action of herbal liver supplements is a result of their hepato-protective and liver tonic properties, which shielded the liver from harm and prevented the development of liver dystrophy or other abnormalities where these enzymes are secreted.

Table 2: Effect of natural vitamin E, vitamin C, choline and herbal liver supplement on serum biochemical profile (U/L or mg/dl) (Mean ± SE) at the 42nd day in commercial broilers

Experimental group	Diet	SGPT (U/L)	SGOT (U/L)	Cholesterol (mg/dl)	Triglycerides (mg/dl)
T_1	Basal diet	32.00 ± 0.52^{b}	102.83 ± 0.48^{a}	133.83 ± 0.30^{a}	114.83 ± 0.60^{a}
T_2	Basal diet + 0.1% natural vitamin E	32.66 ± 0.67^{ab}	102.50 ± 0.88^{a}	130.33 ± 0.43^{b}	111.83 ± 0.79^{b}
T_3	Basal diet + 0.1% natural vitamin C	33.33 ± 0.33^{ab}	99.66 ± 0.49^{b}	131.17 ± 0.61^{b}	111.50 ± 0.43^{b}
T_4	Basal diet + 0.1% natural choline	34.50 ± 0.34^{a}	102.67 ± 0.33^{a}	111.17 ± 0.61^{c}	81.50 ± 0.76^{c}
T_5	Basal diet + 0.1% herbal liver supplement	22.16 ± 0.60^{c}	91.00 ± 0.86^{c}	130.33 ± 0.42^{b}	112.50 ± 0.49^{ab}

^{a,b,c} Means in the same column with no common superscript differ significantly ($P \leq 0.05$)

Conclusion

Based on the results it was concluded that supplementation of natural vitamin E have significant effect on Serum cholesterol and serum triglycerides values, natural vitamin C have significant effect on SGOT, serum cholesterol and serum triglycerides, natural choline have significant effect on SGPT, serum cholesterol and serum triglycerides and herbal liver supplement have significant effect on SGPT, SGOT and serum cholesterol values.

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