



***Research Paper***

**EFFECT OF HERBAL AND CHEMICALLY SYNTHETIC CHOLINE ON  
PHYSIO-BIOCHEMICAL CHARACTERISTICS OF CHICKS**

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**Abstract**

Supplementation of choline in poultry ration is well established to improve growth, performance & to regulate lipid metabolism. Organic poultry is a relatively new expression in Western and Asian countries which is going to expand in other countries also. In this kind of poultry method, farmers do not use chemical compounds at all or in a very low level for sake of costumers. There are a lot of reports indicating the positive effects of herbs like anti-coccidial, anti-oxidant, anti-fungi and etc. Many researchers have shown that herbal products can replace choline chloride in diets for poultry. The objective of this study was to evaluate the use of a choline to replace synthetic choline in diet for broilers from one to 21 and from 22 to 42 days of age. In this study we concluded that supplementation of N- Choline (herbal choline manufactured by Natural Herbs and Formulation Pvt. Ltd. India) can replace synthetic choline and biotin as evident by the comparable bird's growth, viability, hypocholesterolemic effect.

Key words: N- Choline, Feed conversion rate, cholesterol and triglyceride.

**INTRODUCTION**

Nowadays, there are a lot of concerns to finding non-synthetic alternatives for antibiotics among the researchers. The positive effects of herbal plants on broilers have been reported by many studies. Herbs showed anti biotical potential, hypocholesterolemic effects and growth promoting, which have drawn the researcher's attention themselves [1].

Organic poultry is a relatively new expression in Western and Asian countries which is going to expand in other countries also. In this kind of poultry method, farmers do not use chemical compounds at all or in a very low level for sake of costumers [2]. There are a lot of reports indicating the positive effects of herbs like anti-coccidial, anti-oxidant, anti-fungi and etc. Some of medical effects of herbs are related to their secondary metabolites such as phenols, necessary oils, saponins and etc [2]. Herbs have been used for some disease since long time ago because of availability, easy usage, and non side effects.

Supplementation of choline in poultry ration is well established to improve growth, performance & to regulate lipid metabolism [3]. Choline and SAME are an important nutrient in fatty liver disease. Deficiency of choline disrupts SAME production. SAME production decreases with age so dietary supplementation may be required for aged birds prone to fatty liver disease [4].

Choline is usually added to animal diets in the choline chloride form. However, this source has some disadvantages such as high hygroscopicity, the acceleration of oxidative loss of vitamins in

the diet, and the formation of tri-methylamine in the gastrointestinal tract of the birds [5]. Tri-methylamine is a short-chain aliphatic amine that is formed from dietary choline in a reaction catalyzed by enzymes within gut bacteria [6]. This metabolite is found in high concentrations in fish, and is responsible for the characteristic odor of seafood [7]. However, choline is also present in plants in the phosphatidylcholine form, free choline and sphingomyelin. Currently there are natural products, produced from selected plants, with high content of choline in esterified form and with high bioavailability, which may be an important alternative to the use of synthetic choline chloride. Many researchers have shown that these products can replace choline chloride in diets for poultry [8, 9].

The objective of this study was to evaluate the use of a choline to replace synthetic choline in diet for broilers from one to 21 and from 22 to 42 days of age.

## **MATERIALS AND METHODS**

An experimental trial was conducted at the poultry farm, Natural Herbs and Formulations, Mandawar, Dehradun Road, Roorkee. The methodology of research trial and protocol was legally approved by the Natural Herbs and Formulations ethical committee. The vaccinated chicks were randomly divided into three groups with one control ( $T_0$ ) and two treatments ( $T_N$  and  $T_C$ ) having 50 birds in each group with 3 replicates. Chicks in Group-  $T_0$  were offered basal broiler starter and grower feed (as per NRC requirements) without any additional source choline chloride,  $T_N$  was supplemented with N- Choline (supplied by Natural Herbs and Formulations Pvt. Ltd. India) 500 gm/ton of feed and  $T_C$  with synthetic choline chloride (60% pure) 1000 gm/ton of feed. The birds were reared under standard managerial conditions in deep litter system and offered ad-libitum feeding and watering. N- Choline is a polyherbal formulation, scientifically well known to mimic action like that of choline. The inclusion of choline chloride 60% and the vegetal source of choline (Natural Herbs and Formulation) were performed during the whole experimental periods (1 to 21 and 22 to 42 days of age).

### **Physical parameters:**

The physical parameters evaluated at 21 and 42 days of age were, weight gain, feed intake, feed conversion and viability.

### **Biochemical analysis:**

The serum biochemical estimations were carried out in ten birds sacrificed at scheduled intervals from each group. The blood samples were collected directly from heart into tubes without anticoagulant for separation of serum. The serum samples were maintained at  $-20^{\circ}\text{C}$  until analyzed. The individual serum samples were analyzed for cholesterol and triglyceride. The biochemical estimations were done by using Automatic Biochemical Analyzer '3000 revolution' made by Tulip's Diagnostic Pvt. Ltd., Mumbai. The methodology and the set of reagents used in respect of each parameter were as per the recommendations of the manufacturer of the analyzer system.

### **Statistical analysis:**

The data recorded was subjected to statistical analysis to quantify the variation between two treatments for various recorded parameters. Analysis of variance (ANOVA)- The data was analyzed using GENSTAT version 32.0. The sources of factors were various treatments. For better interpretation of the significant results, coefficient of variance (CV) and least significant differences (LSD) were calculated. The values of CV and LSD indicate the treatment to be statistically at par or not. t-statistical test was also performed to know better performer between two treatments.

## **RESULT AND DISCUSSION:**

In view of our study, we measured physiobiochemical parameters at the age of 21 and 42 days after continuously providing N- Choline (Natural Herbs and Formulation Pvt. Ltd.) and chemically synthetic choline. All data was analyzed with GENSTATS 32.0.

The maximum mean weight gain (749.20 gm. and 1623.80) was observed in T<sub>N</sub> after 21 and 42 days respectively whereas minimum mean weight gain (612.30 gm. and 1333.20) was observed in T<sub>0</sub> among the treatments and control. The standard error difference, coefficient of variation and least significant difference were 4.89 (21 days) and 13.07 (42 days), 1.20 % (21 days) and 1.10 % (42 days) at P=0.001 and 16.92 (21 days) and 31.98 (42 days) respectively. Mean body weight gain was recorded to be significantly higher in treatment groups (T<sub>N</sub> and T<sub>C</sub>) than control from 1st to 42 days of experiment, however, the values were non-significantly different among two treatments from 1st to 21 day (**Table 1 and Figure 1**). At 42 day, the mean body weight gain of T<sub>N</sub> group was significantly higher than T<sub>C</sub> (**Table 2 and Figure 2**) suggesting that the supplementation of herbal product lead to comparatively higher body weight gain than the group fed combination of synthetic choline in basal ration.

The results in the present study are in justification with those reported by Kalbande *et al.*, [10] that addition of herbal source of methionine along with feed improved performance in terms of body weight gain and feed efficiency in broilers. Similar results were also given by Simone *et al.*, [11] and Ohta and Ishibashi, [12] that supplementing herbal or synthetic sources of essential amino acids improved feed to gain ratio in broilers.

The feed conversion ratio for T<sub>N</sub> (1.82) was significantly higher than T<sub>C</sub> (1.733) and T<sub>0</sub> (1.53) at the age of 42 days that might be due to improved feed efficiency due to supplementation of either herbal sources or synthetic amino acids in feed. There was no significant difference for feed conversion ratio found at the age of 21 days. The results are well in confirmation with those reported by Ozturkan *et al.*, [13] and Ohta and Ishibashi, [12] that supplementation of choline, methionine and lysine to broilers improved performance in terms of feed efficiency and livability.

Least mortality was observed in the birds that were provided by N- choline in their diet due to anti-oxidative property of herbs used in N-choline. Less mortality was also observed in chemically synthetic provided choline as compared to control. Results of our study were with the explanation of Castro *et al.*, [14] and Reis *et al.*, [15].

The least mean cholesterol (88.50 mg/dl) was observed in T<sub>C</sub> after 21 days whereas 114.73 mg/dl was observed in T<sub>N</sub> after 42 days among the treatments and control. Mean cholesterol was recorded to be significantly lower in treatment groups (T<sub>N</sub> and T<sub>C</sub>) than control from 1st to 42 days of experiment, however, the values were non-significantly different among two treatments from 1st to 21 day (**Table 1 and Figure 1**). The addition of choline chloride (herbal/synthetic) in the diet of poultry significantly contributed in reducing cholesterol & regulating the fat metabolism. At 42 day, the mean cholesterol of T<sub>N</sub> group was significantly lower than T<sub>C</sub> (**Table 2 and Figure 2**) suggesting that the supplementation of N- Choline (herbal product) lead to reduce cholesterol more efficiently than the group fed combination of synthetic choline in basal ration. The results in the present research were similar to that observed by Kulinski *et al.*, [16].

Triglyceride concentration was observed maximum in control as compared to birds that ingested with either herbal or chemically synthesized choline to the diet. From the data, it can be concluded that in chicks of group T<sub>0</sub> fed diet without any supplementation of choline/herbal source of choline, there was not complete protection to the liver. The results in the present study are in confirmation with those reported by Lombardi *et al.*, [17].

#### CONCLUSION:

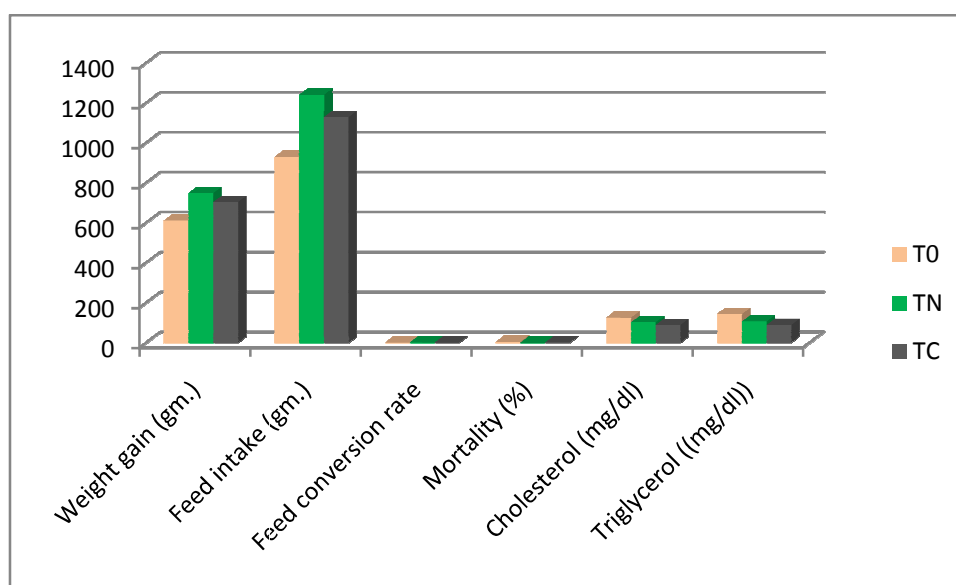
From the present study we can conclude that supplementation of N- Choline (herbal choline manufactured by Natural Herbs and Formulation Pvt. Ltd. India) can replace synthetic choline and biotin as evident by the comparable bird's growth, viability, hypocholesterolemic effect.

**Table1:** Effect of natural and synthetic choline on various parameters of bird at the age of 21 days

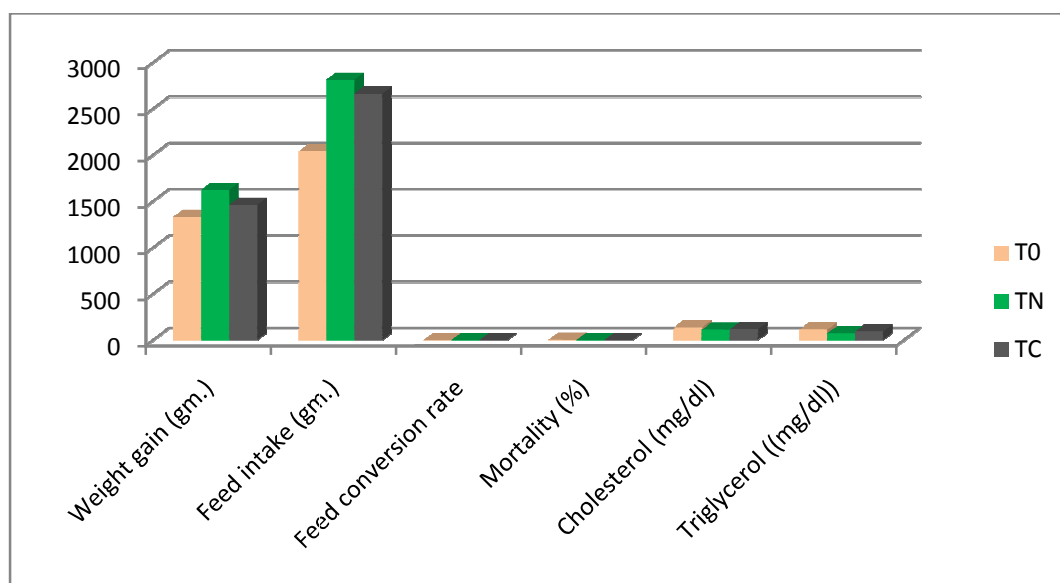
Treatment	Weight gain (gm.)	Feed intake (gm.)	Feed conversion rate	Mortality (%)	Cholesterol (mg/dl)	Triglyceride ((mg/dl))
Control (T <sub>0</sub> )	612.30	930.40	1.520	4.80	126.23	143.97
Herbal Choline (T <sub>N</sub> )	749.20	1241.20	1.657	0.60	102.33	106.27
Chemically Choline(T <sub>C</sub> )	704.60	1129.30	1.603	2.37	88.50	89.67
<b>LSD</b>	<b>16.92</b>	<b>49.26</b>	<b>0.064</b>	<b>2.65</b>	<b>4.38</b>	<b>4.53</b>
<b>CV</b>	<b>1.20</b>	<b>2.20</b>	<b>2.000</b>	<b>51.20</b>	<b>2.10</b>	<b>2.00</b>
<b>SE</b>	<b>4.89</b>	<b>14.24</b>	<b>0.019</b>	<b>0.77</b>	<b>1.79</b>	<b>1.85</b>

**Table 2:** Effect of natural and synthetic choline on various parameters of bird at the age of 42 days

Treatment	Weight gain (gm.)	Feed intake (gm.)	Feed conversion rate	Mortality (%)	Cholesterol (mg/dl)	Triglyceride ((mg/dl))
Control (T <sub>0</sub> )	1333.20	2040.00	1.530	6.57	139.27	115.63
Herbal Choline (T <sub>N</sub> )	1623.80	2814.00	1.820	1.73	114.73	74.30
Chemically Choline(T <sub>C</sub> )	1464.70	2666.00	1.733	3.80	119.10	94.90
<b>LSD</b>	<b>31.98</b>	<b>99.60</b>	<b>0.070</b>	<b>1.40</b>	<b>1.42</b>	<b>2.09</b>
<b>CV</b>	<b>1.10</b>	<b>2.00</b>	<b>2.100</b>	<b>17.30</b>	<b>0.60</b>	<b>1.10</b>
<b>SE</b>	<b>13.07</b>	<b>28.80</b>	<b>0.020</b>	<b>0.40</b>	<b>0.41</b>	<b>0.60</b>



**Figure1:** variation in various physiobiochemical parameters in birds at the age of 21 days after taking natural and chemically synthetic choline in diet.



**Figure2:** variation in various physiobiochemical parameters in birds at the age of 42 days after taking natural and chemically synthetic choline in diet.

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