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ROLE OF *MENTHA PIPERITA* SUPPLEMENTATION DIET ON BIOCHEMICAL AND VITAMIN D3 LEVEL IN BROILER

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Abstract

This research was conducted to investigate the effect of *Mentha pipertia* leaves powder (MPLP) dietary supplementation on serum biochemistry, creatinine content and vitamin D3 (D25OH) in broiler birds. In four experiments of three replicates, (144) day-old unsexed broilers (Ross 308) were distributed randomly. The dietary treatments were based on the basic diet as control, 1%, 2% and 3% (MPLP) applied to the basic diet. Blood samples were taken at 35 days (6 samples per treatment) for the biochemical, creatinine and vitamin D3 analysis. The results showed the level of globulin and total protein increased by 2% (MPLP) in broiler serum at 35 days of age ($P<0.05$), while albumin, AST, ALT, ALP and total cholesterol decreased significantly on day 35. MPLP (2%) Supplementation caused a noticeable rise ($P<0.05$) in the value of vitamin D3 on day 35 but not statistically different levels of creatinine in broiler serum between treatments. An analysis of biochemistry parameters and levels of vitamin D3 in the serum of broiler indices revealed that 2% of MPLP could have a positive effect on birds' public health due to higher levels of globulin and increased levels of vitamin D3 in broiler serum compared to control and other treatments.

Key word: *Mentha pipertia*, ALT, AST, ALP, vitamin D3, broiler.

Introduction

Poultry production grew faster than other products of meat, such as beef (Windhorst, 2006). Because of the quality of feed conversion and the reduced production costs associated with intensive poultry processing. *In vitro* and *in vivo* scientific researches have indicated that medicinal herbals have antimicrobial, antioxidant, hypocholesterolemic and immune-stimulating properties. Whether utilize the full plant or as leaves, seeds, essential oils and active constituents (Brenes and Roura, 2010). Because of Its antimicrobial and simulative effects on the digestive system, the usage of phytogenics as feed additives is becoming important relevant (Jamroz *et al*., 2003; Jang *et al*., 2004). *Mentha piperita* L. also called Mint is commonly used in herbal medicine and is considered especially helpful in the development of the immune system, its antimicrobial properties and its strong antioxidants and its appetite-enhancing potential, primarily because of its active components (Yalcin *et al*., 2012; Mahmood *et al.*, 2020). The mechanism of action of these medicinal herbs may be by normal gut microflora stabilization, Preventing the colonization of pathogens and a vital role in the production of digestive enzymes and enhancement its activities (Lee *et al*., 2003). Studies show that the use of medicinal plants can contribute effectively to the production of healthy (organic) products, in addition to improving production (Ahmadi-Baharvand *et al*., 2016). Mint belongs to the family Labiate and is one of the oldest medicinal herbs in the world (Bahmani *et al*., 2015) rich in essential oil, the family Labiate has both economic and therapeutic qualities. Thus, this study aimed at determining the effect of various levels of *Mentha piperita* powder in feed on biochemical and vitamin D3 in the broiler serum at day 35.

Material and Methods

From the local hatchery, 144 broiler chicks (Ross 308) had been bought, aged 4 days and weighed (43 g). The birds divided randomly into four treatments based on a completely randomized method, with three replicates of 12 birds. The dietary treatments consisted of the basic

Table 1: Ingredient and chemical composition of starter and finisher diets.

Ingredient	Starter diet 1- 21 day	Finisher diet 22- 35 day
Yellow corn	47	55
Wheat	17	12
vegetable oil	-	1.5
Soybean meal(44%)	29	25
Protein concentrate	6	5
Limestone	0.25	0.75
Premix	0.25	0.25
Common salt	0.5	0.5
Total	100	100
Calculated composition		
*ME (K Cal / Kg diet)	2925	3111
Crud protein	22.01	19.92
Calcium (%)	1.15	1.16
Phosphorus available(%)	0.53	0.52
Lysine (%)	1.27	1.21
methionine+ cysteine (%)	0.87	0.81
ME: Metabolizable energy		

diet as control, 1%, 2% and 3%/kg of leaves of mint powder added to the basic diet. Fresh mint leaves were bought and were dry under sunshade then were ground up to get a powder. The basic diet was formulated and compounded to obtained the nutrient requirements of commercial broilers (NRC, 1994) during the starting stage (1- 21 days) and the growing stage (22-35 days) is shown in table 1. Chicks were brought up for 5 weeks in a battery cage (120/120/80 cm) and had free access to food and water during the experimental time (0-35) days. The lighting program included a 24 h light cycle. On day 21, the ambient temperature was slowly decrease from 33°C to 25°C and then kept steady.

In day 35 two birds per replication were selected randomly and blood samples were collected from the brachial vein and centrifuged (3000 rpm for 15 min) to obtain serum, then serum was frozen at -20°C. the serum biochemical analysis was determined using commercial kits (Human/ Germany) such as total protein (TP), albumin, globulin, cholesterol, creatinine (CR), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and vitamin D3 (Vitamin D 25-OH) by immunoassay (ELISA) (Abbott-architect, United States).

Statistical Analysis

For each trial, the statistical analysis was carried out separately using a completely randomized design. All data was subjected to SPSS (version 19) on way ANOVA procedure.

Result and Discussion

Supplementation with *Mentha pipertia* leaves powder (MPLP) had an evident on the effects of serum constituents in various-level dietary treatments (MPLP) for broiler chicken were summarized in (Table 2). Serum globulin levels varied between (1.145±0.221) and (2.206±0.074) g / L in different treatment groups. The mean globulin value was found to be statistically important in the specific dietary treatments, complemented by 1%, 2% and 3% (MPLP) and higher by 2% (MPLP) relative to the community of birds fed a control diet. Previously, Ahmed and Mostafa, (2016) published similar findings that Mentha had a significant impact on the total protein, globulin and liver enzyme were increased. Tayeb *et al.*, (2019) also found that the medicinal plants had a major effect on the concentration of albumin, globulin, cholesterol and glucose. The serum levels for the total protein level varied between 2.717±0.322 to 3.417±0.122 g / L and the serum albumin level values ranged from 1.211±0.054 to 1.572±0.066 g /L with a substantial difference across different dietary treatment groups and control groups. While such findings are not in line with earlier findings of Mahboubi and Haghi, (2008), was shown that *Mentha puleigum* leaf extracts decreased serum total protein and albumin significantly (P>0.05) in rats. Other study demonstrated that mint supplementation in broiler feed did not show any statistical significance (P>0.05) in albumin and protein values (Durrani *et al*., 2008). The cholesterol values in broiler serum ranged from 117.83±2.120 to 90.166±1.492 mg / dL, which was shown to be substantially lower in cholesterol levels in treatment supplements (MPLP) relative to the control group.

Table 2: Effect of powdered peppermint leaves in three levels on value of globulin, total protein, albumin and cholesterol in serum of broiler chickens (M±SE).

Treatments	Globulin g/L	Total protein g/L	Albumin g/L	Cholesterol mg/dL
T1	1.145 ± 0.221^{c}	2.717 ± 0.322^{b}	1.572 ± 0.066^{a}	117.83 ± 2.120^{a}
T2	2.087 ± 0.088^{b}	3.299 ± 0.120^{ab}	1.212 ± 0.062^{b}	93.166 ± 0.477^{b}
T3	2.206 ± 0.074^{a}	3.417 ± 0.122^{a}	1.211 ± 0.054^{b}	90.166 ± 1.492^{b}
T4	1.899 ± 0.134^{b}	3.271 ± 0.198^{ab}	1.372 ± 0.066^{b}	104.80 ± 1.496^{b}
Significant	*	*	*	*

Different letters mean significantly ($p\leq0.05$) between treatments. T1 (control); T2 (1% of peppermint powder added to basic diet); T3 (2% of peppermint powder added to basic diet) and T4 (3% of peppermint powder added to basic diet).

The results were not in accordance with Khursheed *et al*., (2017) who stated that no major impact on serum glucose, total protein and cholesterol relative to

Table 3: Effect of powdered peppermint leaves in three levels on hepatic enzyme (ALT and AST), creatinine and vitamin D3 in serum of broiler chickens (M±SE).

Treatment	ALT U/L	AST U/L	ALP U/L	Creatinine mg/dL	VIT D3 ng/ml
T1	291±8.2[a]	19.75±0.59[a]	2.96±1.1[a]	1.65±0.044[a]	26.44±1.36[d]
T2	290±17.23[a]	18.35±0.32[b]	2.82±1.15[b]	1.65±0.02[a]	28.36±0.69[c]
T3	224±7.1[b]	16.26±0.27[c]	2.21±0.86[c]	1.63±0.062[a]	33.15±0.71[a]
T4	287±14.5[a]	18.8±1.62[b]	1.75±0.66[d]	1.65±0.066[a]	29.7±0.65[b]
Significant	*	*	*	N. S	*

Different letters mean significantly ($p \leq 0.05$) between treatments. T1 (control); T2 (1% of peppermint powder added to basic diet); T3 (2% of peppermint powder added to basic diet) and T4 (3% of peppermint powder added to basic diet).

control was observed in the mint leaves supplementation with or without enzyme at both 1 or 2 percent rates. Furthermore, the results of this study were not comparable to another scientific report which showed that adding various doses of Nigella sativa and mint was no important effect on protein, albumin, total cholesterol and triglyceride (Toghyani *et al*., 2010). However, the findings of this study agreement with the study of earlier researchers who recorded the use of 1.5 percent artichoke leaving meal in the diet plus 200 mg / g mint extract in drinking water noted the lowest amount of blood cholesterol in broiler chicken compared to the diet community feeding control (Roozbeh *et al*., 2013). Due to the fact that Mint comprises polyphenolic compounds and has potent antioxidant properties (Dorman *et al*., 2003), may be contributed to the reduced biochemical value in the table 2 in all treatments was supplemented with powder of peppermint leaves in diet.

Table 3 presents data on blood serum liver enzyme levels (ALT, AST and ALP). They range from 224±7.1b to 291±8.2a U / L, 16.26±0.27c to 19.75±0.59a U / L, 2.21±0.86c to 2.96±1.1 U / L respectively. The result of this study showed a substantial decrease in this enzyme in treatment which was complemented by 2 percent (MPLP) relative to control and other treatments. The reason for this result was attributed to the presence of compounds such as eugenol, caffeic acid, Rosmarinus acid, flavonoids and ±-tocopherol which have antioxidants and anti-per oxidant characteristics (Twegh, 2020). Knekt *et al*., (2002), it has been reported that exhibits antioxidant and antitumor effects on flavonoid compounds. Could be 2 percent (MPLP) more impact from other levels by activating mint's antioxidant properties. Sharma *et al.,* (2006) concluded that peppermint extracts substantially decrease the amount of liver enzymes in mice's blood, including ALT, AST and ALP. Such researchers have expressed that peppermint extract has a protective function in mice against arsenic-induced toxicity because of the active ingredients of ±-tocopherol, caffeic acid and menthol.

The creatinine result is present in a range between 1.63±0.062 and 1.65±0.066 mg / dL in the table 3. In contrast with control treatment, dietary supplementation with 1%, 2% and 3% had no major effect on serum creatinine level. The result of this study agreement with Hasan and M Šadeq, (2020) was a 1% additive, 0.5% of peppermint to broiler's diet or water had no significant impact on broiler's biochemical serum compared to control treatment.

Table 3 data for vitamin D3 ranged from 33.15±0.7 to 26.44±1.36 ng / ml. The current study showed a substantial increase in the amount of vitamin D3 in the third treatment relative to other and control treatments. The findings of this study are in consent with former observations suggesting that chicks need vitamin D3 for mineral use, skeletal development and growth efficiency of broiler chicks, however, several metabolites of this nutrient have been documented to have increased biological efficacy for optimal bird efficiency (Edwared, 2002). The 2% (MPLP) additive for broiler chicks can be used to improve the amount of vitamin D3 in the blood.

Conclusion

Mint powder was demonstrated hepatoprotective influence and showed positive effects in broiler serum on certain biochemical parameters and vitamin D3 levels, while no significant effect of *Mentha piperita* on creatinine parameters was detected. So, these findings justify further investigation into the mentioned plants in various dosages and circumstances in order to obtain more wide-ranging results.

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