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THE EFFECT OF PLANT EXTRACTS AS A COMPLEMENTARY ADDITIVE IN THE DIETS OF BROILER CHICKENS ON GROWTH PERFORMANCE AND SOME BLOOD PARAMETERS

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ABSTRACT

Plant extracts and their phytobiotic effects can be included in poultry diets to increase their productivity, physiology and even poultry welfare. Plants active substances are chemical compounds present in the entire plant or in specific parts of the plant that give them therapeutic activity or beneficial effects. Although there is an extraordinary interest in the use of herbal supplements, it is still necessary to carry out additional research on the influence of phytogenic components from different plant families. Therefore, this study aims to evaluate the effects of plant extracts of S. scardica and M. piperita in the growth performance and certain blood parameters of Ross 308 broiler chickens. The experiments included 200 one-day-old broiler chickens of the Ross 308 type. The birds were grouped into 4 experimental groups: G1 (supplemented with S.scardica extract 0.2%), G2 (supplemented with extract of M. piperita 0.2%), G3 (supplemented with combined extract of S.scardica and M. piperita 0.2%) and G4 (control, base diet without extract). Supplementation with plant extracts has resulted in positive effects influencing the samples of all groups to have an increase in their average weight on the 42nd day of their life. Significant changes in Chol-total, Triglycerides and LDL-cholesterol were observed in the first and second experimental groups compared to the control group where the value of $p<0.05$ in broilers treated with mint extract and mountain tea. In the third group, although lower blood lipid values were encountered, the changes were not significant. The concentration of HDL-cholesterol was found to have higher average values in the third group, but without a significant difference compared to the control group.

KEYWORDS: *Plant Extract, Broiler, S.Scardica, M. Piperita*

INTRODUCTION

Although the uses of antibiotics as growth promoters are well documented, their use in animal and poultry feed has been banned by the European Union (Regulation 1831/2003/EC) since 2006 due to the development of bacterial resistance, the presence of chemical residues in meat and increasing consumer health awareness (Attia et al., 2017). As a consequence of this ban, there has been an increase in scientific publications regarding the use of plant extracts and their derivatives to be used as alternative supplements and they have become of extraordinary interest in poultry production. Plant extracts and their phytobiotic effects can be included in poultry diets to increase productivity, physiology and even welfare of birds (Jamil et al., 2020). Active substances of plants are chemical compounds present in the whole plant or in specific parts of the plant that give them therapeutic activity or beneficial effects. These substances have low molecular weight and are

derived from the secondary metabolism of plants, including glucosides, alkaloids (alcohols, aldehydes, ketones, ethers, esters, and lactones), phenolic and polyphenolic compounds (quinones, flavones, tannins, and penoids-coumarins), terpenes (mono and sesquiterpenes, and steroids), saponins, mucilages, flavonoids, and essential oils (Barreto et al., 2008). Compared to synthetic antibiotics or inorganic chemical substances, products of plant origin have been proven to be natural, less toxic, do not accumulate, therefore they are thought to be ideal for use as growth promoters in animal diets (Hashemi & Davoodi, 2011). The positive effects of these components observed in vitro justify further research in this field to determine the optimal concentrations of inclusion in the diet and the mode of action of these plant products to achieve the desired effects in optimal growth performance and resistance to diseases in production of poultry (Hernández et al., 2004). In the last two decades, different aspects of phytobiotics have been studied. Effects as a growth promoter, antimicrobial, antioxidant and anti-inflammatory activity are some of the functions that have been researched. According to the literature, phytobiotics have positive effects on improving performance in poultry. Regarding antimicrobial activity, there is some evidence that supports the assumption that the general mode of action of phytobiotics is by modifying the intestinal microflora and reducing the pressure of pathogens in the intestine (Mohammadi Gheisar & Kim, 2017). Studies conducted by Abedi Gaballu et al., 2015, Vispute et al., 2019, Hajhashemi & Abbasi, 2008 have reported the positive effects of probiotics on the level of lipids in the serum of broilers (Sigolo et al., 2021). Although there is an extraordinary interest in the use of herbal supplements there are concerns regarding their use in an untested manner, therefore it is necessary to carry out additional research on the impact of phytogenic ingredients from different plant families as growth promoters therefore, this study aims to evaluate the effects of *S. scardica* and *M. piperita* plant extracts on growth performance and some blood parameters of Ross 308 broiler chickens.

MATERIALS AND METHODS

The experiment included 200 one-day-old broiler chickens of the Ross 308 type. One-day-old birds, after being weighed, were placed in special cages, 50 birds in each cage with 5 replications. The initial temperature was 36°C, which was gradually reduced by 6 degrees in the first week and then by 2 degrees every week until 20°C in the sixth week. The birds were fed with starter diet (days 1-10), growther 1 (days 11-20), growther 2 (days 21-30) and final diet (days 31-42), (table 1). Food and water were available *ad libitum*

Table 1: Composition of the Basal Diet The Composition of the Raw Material: Food Consisting of Cereals (Corn, Wheat), Vegetable Fat, Premix With Minerals and Vitamins*, Amino Acids

Calculated Chemical Composition (%)	Starter (day 0-10)	Growther 1 (day 11-20)	Growther 2 (day 21-30)	Finisher (day 31-42)
Protein	21	19	18	17
Fats	4	5	5	5
Cellulose	Max 5	Max 5	Max 5	Max 5
Grace	Max 8	Max 8	Max 8	Max 8
The humidity	Max 13.5	Max 13.5	Max 13.5	Max 13.5
Calcium	0.7-0.9	0.6-0.8	0.6-0.8	0.5-0.7
Fosfor	0.5-0.7	0.5-0.7	0.5-0.7	0.4-0.6
Natrium	0.14-0.25	0.14-0.25	0.14-0.25	0.14-0.25
Lysin	1.30	1.15	1.10	1.05
Metionin + cystein	0.92	0.85	0.81	0.79
ME kcal/kg	2850	2900	2950	3000

*Vit. A 12500 IU, Vit. D3 4000 IU, Vit. E 75 mg/kg, Vit. K3 2 mg/kg, Vit. B1 3 mg/kg, Vit. B2 7 mg/kg, Vit. B6 3 mg/kg, Vit. B12 0.04 mg/kg, Pantothenic acid 10 mg/kg, Folic acid 1.5 mg/kg, Biotin 0.15 mg/kg, Iron 40 mg/kg, Copper 15 mg/kg, Manganesium 60 mg/kg, Zinc 100 mg/kg, Iodine 1 mg/kg, Selenium 0.3 mg/kg.

The birds were divided into 4 experimental groups and were treated as follows: G1 (experimental): basic diet and water supplemented with *Sideritis scardica Gris.* extract. (0.2%); G2 (experimental): basic diet and water supplemented with *M. piperita L.* extract (0.2%); G3 (experimental): basic diet and water supplemented with combined extract of *S. scardica Gris*. and *Mentha piperita L.* (0.2%); G4 (control): the birds were fed with basic diet and were served water without extract.

Extraction of Sideritis Scardica Gris. and Mentha Piperita L.

The aerial parts of the plant were cleaned in running water and then dried at room temperature. The dried parts of the plant were then ground with a blender and extracted with 60% alcohol with a Soxhlet apparatus. The mixture was filtered with filter paper and the solvent was evaporated with a rotaevaporator (BÜCHI Waterbath B-480, Germany). The extract was prepared in 0.2% concentration.

Blood Collection for Biochemical Analysis and Serum Separation

After the end of the experimental period (6 weeks), the birds were transferred to the dissection room and after weighing they were subjected to the blood collection procedure. The blood sample was taken from their jugular vein and the blood for biochemical analysis was transferred to vacuum tubes without anticoagulant for the gain of the serum. The test tubes were centrifuged at 3000 rotations/15 minutes and the serum was placed in an eppendorf at -20°C until biochemical analyses. Biochemical analyzes of Chol Tgl and HDL lipids were measured using photometric enzymatic methods, while LDL was determined using the Friedewald equation.

The statistical programs Microsoft Office Excel (2007) and SPSS version 26 were used for statistical processing and presentation of the results. The data are expressed in mean ±, standard deviation (SD) and relative frequency (%). The value of $p<0.05$ is considered statistically significant.

RESULTS

A total of 200 broiler chickens of both genders were included in this study. The average initial weight of the chickens was 46.75±0.46 g/bird. Significant changes in the weight gain of the birds were observed in the three experimental groups treated with extracts of mountain tea and mint compared to the control group. The changes in growth performance are shown in figure 1.

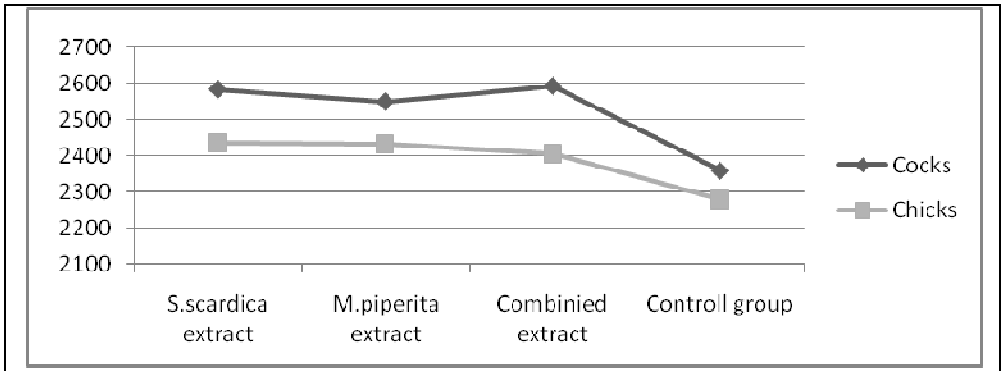

Figure 1 The effects of Plant Extracts on the Growth Performance of Broiler Chickens.

From the figure above, it can be seen that the highest average weight of the birds was obtained in the third experimental group of the male gender. Supplementation with plant extracts has resulted in positive effects influencing that the experimental samples of all groups have an increase in their average weight on the 42nd day of their life. As for the female experimental groups, here too, an increase in the average weight of all groups compared to the control group is observed. The highest average weight of 2436±331.97g was found in the first group treated with *S.scardica* extract, while the lowest in the third group, the group treated with combined extract.

Table 2: The Effects of Herbal Extracts of Mountain Tea and Mint on the Lipid Parameters of Ross 308 Broiler Chickens

	G1		G2		G3		G4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Chol (mmol/L)	2.91	0.60	2.78	0.47	3.24	0.31	3.22	0.44
Tgl (mmol/L)	0.59	0.10	0.63	0.16	0.64	0.17	0.73	0.26
HDL (mmol/L)	2.08	0.34	2.06	0.34	2.25	0.28	2.12	0.28
LDL (mmol/L)	0.54	0.33	0.65	0.28	0.65	0.40	0.82	0.37

The above table shows the results obtained from the analysis of the lipid parameters of broiler chickens. The data are expressed in mean and standard deviation. Dietary supplementation with herbal extracts of mint and mountain tea has resulted in a decrease in the concentration of total cholesterol, triglycerides and LDL-cholesterol measured in the serum of broilers. The lowest average values of cholesterol concentration were found in the first and second groups (experimental groups), while the third experimental group has an average close to the control group. Regarding the other lipid parameter, triglycerides, in the three experimental groups, a lower average value was observed compared to the control group. HDL-cholesterol Also called "good" cholesterol, it is a lipoprotein that binds cholesterol from the blood and sends it back to the liver, from where it is then eliminated from the body. High levels of HDL-cholesterol can reduce the risk of heart disease. From the obtained results, the highest average value of HDL-cholesterol was obtained in the third experimental group, 2.25 mmol/l, treated with a combined extract of mint and mountain tea.

Table 3: Significant Changes in Lipid Parameters of Broiler Chickens Treated with Plant Extracts

	Experimental Group	Mean±SD	P value
Chol	G1 vs. G4	2.91±0.60 vs. 3.22±0.44	0.04
	G2 vs. G4	2.78±0.47 vs. 3.22±0.44	0.006
	G3 vs. G4	3.24±0.32 vs. 3.22±0.44	0.85
Tgl	G1 vs. G4	0.59±0.10 vs. 0.73±0.26	0.01
	G2 vs. G4	0.63±0.16 vs. 0.73±0.26	0.10
	G3 vs. G4	0.64±0.17 vs. 0.73±0.26	0.15
HDL	G1 vs. G4	2.08±0.34 vs. 2.12±0.28	0.65
	G2 vs. G4	2.06±0.34 vs. 2.12±0.28	0.49
	G3 vs. G4	2.25±0.28 vs. 2.12±0.28	0.10
LDL	G1 vs. G4	0.54±0.33 vs. 0.82±0.37	0.006
	G2 vs. G4	0.65±0.28 vs. 0.82±0.37	0.04
	G3 vs. G4	0.65±0.40 vs. 0.82±0.37	0.12

Significant changes in Chol-total, Triglycerides and LDL-cholesterol were observed in the first and second experimental groups compared to the control group where the value of $p<0.05$ in broilers treated with mint extract and mountain tea. In the third group, even though lower blood lipid values were encountered, the changes were not significant. The concentration of HDL-cholesterol was found to have higher average values in the third group, but without a significant

difference compared to the control group.

DISCUSSIONS

Stress conditions are an inevitable part of poultry production systems. There is a growing interest in the use of herbs and medicinal plants in poultry feed to overcome these problems (Khodadust et al., 2015). Considering the wide variety of existing plants, the biggest challenge in using plant extracts as alternative to the use of antibiotics is to identify and measure the effects of different components present in essential oils in animals (Rizzo et al., 2008). Medicinal plants, due to the content of secondary metabolites, have positive effects on the function of the immune system and on the growth performance of broilers. Most of these plants normally function as antiparasitic, antibacterial, antifungal, antiseptic, etc. (Yousefdoost et al., 2019). In general, changes in body weight gain were observed in chickens fed with different experimental diets, although dietary supplementation with different plant extracts is contradictory to some studies conducted by Alcicek et al., 2004; Acamovic and Broker, 2005; Bampidis et al., 2005; Griggs and Jacob, 2005 (Al-Kassie, 2010), although our results agree with the studies conducted by Ocak et al. 2008 where it was found that broilers fed with a diet rich in mint grew faster ($p<0.05$) than broilers fed with control diets and a diet rich in thyme (Ocak et al., 2008). Even the researcher Abdel-Wareth et al., 2019 in his study also obtained results that are consistent with the results of our study which resulted in an increase in the average weight of broilers supplemented with mint. Florou-Paneri 2004, analyzing the effect of mountain tea on the performance of broilers, obtained similar results to our study and gave positive results by improving body weight gain after an infection with *Eimeria tenella* compared to the control group (Florou-Paneri 2004).

The biochemical parameters in the serum are closely related to the health condition of the chickens. Barbalho et al., in their study, investigated the effect of peppermint extract on plasma lipids in rats, showing that the use of peppermint extract improves the lipid profile. They stated that peppermint extract significantly lowers triglycerides, total cholesterol, LDL cholesterol, VLDL-cholesterol and increases HDL-cholesterol in blood serum (Ameri et al., 2016). Abdel-Wareth & Lohakare (2014) found that supplementation of peppermint leaf powder up to 2% in diets of laying hens reduced cholesterol levels but increased total protein levels with increasing levels of peppermint leaf powder (Rahman et al., 2021). Chickens fed with a diet supplemented with mint had lower values of Cholesterol, Triglycerides and LDL also in the study of Tufarelli et al., 2022, data that correlate the results obtained in our study.

CONCLUSION

From this study, we concluded that dietary supplementation with mint extract and mountain tea has had positive effects on the health of broiler birds, as well as improved blood lipid parameters. The data on the effect of mint correlate with other researchers who have researched in this direction, while regarding the effect of mountain tea, the studies are poor, therefore additional research is needed until their recommendation for use in the poultry industry.

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