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Original Article

The Effect of *Rosemary* on Performance, Blood Parameters, and Quality of Broiler Carcasses

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ABSTRACT

This experiment was performed to evaluate different levels of rosemary on performance, blood parameters, and broiler carcass quality. For this purpose, 180 one-day-old Ross 308 one-day-old broilers were used based on a completely randomized design in 4 treatments, 3 replications, and one pen containing 15 broiler chickens in each replication. Experimental treatments included control (0), 0.5, 1 and 2% of rosemary leaf powder in chickens' diets. During the experimental period, the chickens had free access to water and feed, and the breeding management in terms of exposure, humidity, ventilation, and vaccination was done according to the Ross 308 strain requirements guide. The weighing was done weekly and at the end of the feeding period, weight gain and conversion ratio of chickens were measured. At 42 days of age, 2 chicks with the lowest mean weight difference were selected from each replication to be used to evaluate the quality performance of broiler carcasses. To draw blood during 21 and 42 days of age, one bird was randomly selected from each replicate and killed. Daily weight gain, feed conversion ratio, liver percentage, intestinal percentage, cholesterol, and glycerol were significantly affected and there was a significant difference between treatments ($P<0.05$). However, feed intake, glucose, and other carcass components did not differ significantly between treatments ($P>0.05$) but had a positive effect on the control treatment. Overall, the results showed

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that adding rosemary to the diet of broilers can improve performance and increase the effective quality of carcasses in broilers.

Keywords: *Rosemary,* Blood parameters, Carcass quality, Broiler

INTRODUCTION

According to available reports, the increasing incidence of maternal abnormalities, the occurrence of chronic diseases, the ineffectiveness of antibiotics, the increase in the phenomenon of microbial resistance, and hundreds of other small and large complications are referred to as current health problems in human societies. Therefore, the use of those additives that while maintaining the desired properties, do not have adverse health and environmental consequences, has been considered by researchers around the world for many years. Among the additives that have been considered by researchers, medicinal plants and their products are of special importance. Rosemary is a perennial and very fragrant plant with evergreen leaves that has a special beauty and pleasant smell. The leaves and flowering branches of the plant are used medicinally. This plant is native to the Mediterranean Sea and is currently cultivated all over the world, including Iran (Omidbeigi, 2004).

Debersac *et al.*, (2001) reported that the main constituents of dried rosemary leaves contain 1 and 8-cinnamol oxide monoterpenes (36.1%) and many monoterpenes and terzen monoxide (32.2%). Fu *et al.*, (2007) reported that rosemary essential oil alone and in combination had significant antimicrobial activity against Staphylococcus epidermidis, Escherichia coli, and Candida albicans. Bozin *et al.*, (2007) tested the antimicrobial and antioxidant activities of rosemary and sage essential oil. Ghazaleh *et al.*, (2008) investigated the use of rosemary powder as a stimulant of normal growth in broiler chickens on performance and immune system. The results showed improvement in feed conversion ratio as well as physical properties of chickens. Yesilbeg *et al.,* (2011) investigated the effects of vitamin E, dried rosemary leaves, and rosemary essential oil on yield, meat quality of broilers fed soybean meal, and corn rations. Statistically, feed intake and performance parameters (live weight gain, feed efficiency, and carcass production) were significantly affected.

MATERIALS AND METHODS

In this experiment, 180 one-day-old broilers of Ross 308 strain were used based on a completely randomized design in 4 treatments, 3 replications, and 20 broilers in each replication. Experimental treatments included control, 0.5, 1, and 2% of rosemary leaf powder in chickens' diets. In this experiment, corn-soybean basic diet was used and to determine the nutritional needs of chickens in different breeding periods, including the beginning period (7-21 days), growth and end (22-42 days), preparation and adjustment of experimental diets by UFFDA rationing software was formulated based

on the nutritional needs of the Ross 308 catalog and the diets were balanced in terms of nutrients (Table 1).

Table 2: Experimental diets and nutrient analysis of basic experimental diets in different breeding periods

Ingredient	Unit	Starter (7-21 d)	Grower and finisher (22-42 d)
Yellow Corn	%	64	65
Fish meal	%	1.5	1.5
Soybean Meal	%	28.07	26.89
Soybean oil	%	2.9	3
L-Lysine HCl	%	0.03	0.11
DL-Methionine	%	0.19	0.19
CaCo3	%	1.2	1.2
DCP	%	1.4	1.4
Salt	%	0.21	0.21
Vitamin premix**	%	0.25	0.25
Minerals premix*		0.25	0.25
Total	%	100	100
Analyzed composition			
ME	kcal/kg	3049	3059
Crude protein	%	21	19.5
Calcium	%	0.96	0.94
P available	%	0.68	0.64
Methionine	%	0.51	0.45
Lysine	%	0.79	0.71

*Mineral premix provided per kilogram of diet, manganese, 55 mg;zinc, 50 mg; iron, 80 mg; copper, 5 mg; selenium, 0.1 mg; iodine, 0.36mg; sodium, 1.6 g.
**Vitamin premix provided per kilogram of diet, retinylacetate, 8,250 IU; cholecalcipherol 1,000 IU; dl-α-tocopherol, 11 IU; cyanocobalamin,0.012 mg; phylloquinone, 1.1 mg; niacin, 53 mg; choline, 1,020 mg; folacin, 0.75 mg; biotin, 0.25 mg; riboflavin, 5.5 mg.

During the experimental period, the chickens had free access to water and feed, and the breeding management in terms of exposure, humidity, ventilation, and vaccination was done according to the Ross 308 strain requirements guide. Functional factors including feed intake, weight gain, and chick conversion ratio were measured at the end of the week. Also, to measure carcass traits and blood parameters at 42 days of age, 2 chickens with the lowest mean weight difference were selected from each replication, and then slaughter and dry filling were performed by cervical vertebral displacement, and carcass weight factors were measured.

To draw blood during 21 and 42 days of age, one bird was randomly selected from each replicate and killed. Serum segregation was performed by centrifugation of

EDTA-free blood samples at 5000 rpm for 15 minutes. Serum samples were stored in the freezer at -24°C immediately after separation and transferred to the microtube until the relevant parameters were evaluated. To determine glucose, cholesterol, and glycerol, a photometric method was performed by Pars Company. Blood samples were taken from a jugular vein in both stages of the slaughter.

Experimental data were statistically analyzed by MSTATC software and the means were compared with Duncan's multiple range test at a significance level of 5%.

RESULTS AND DISCUSSION

Performance

The results of adding different levels of rosemary to the performance of broilers are shown in Table 2. Chicken weight gain in the starter, grower, and finisher periods was not significantly affected and there was no significant difference between treatments (P> 0.05). Weight gain of chickens was significantly affected throughout the rearing period and there was a significant difference between treatments (P <0.05).

Feed consumption in the starter period was significantly affected and there was a significant difference between treatments (P <0.05) but in other breeding stages, there was no significant difference between treatments (P> 0.05). The feed conversion ratio of the starter period was significantly affected and there was a significant difference between the treatments (P <0.05) but in other breeding stages there was no significant difference between the treatments (P> 0.05).

Table 2: Effects of rosemary on broiler performance

Parameter	Period	Treatment				SEM
		T1 (0)	T2 (0.5)	T3(1)	T4(2)	
Weight Gain (Kg)	Starter (7-21)	0.48938 [a]	0.56705 [a]	0.57232 [a]	0.51591 [a]	0.046
	Grower and finisher (22-42)	2.0886 [a]	2.0167 [a]	2.2078 [a]	1.7897 [a]	0.12
	Total	1.5992 [ab]	1.4497 [ab]	1.6355 [a]	1.2738 [b]	0.099
Feed Consumption (Kg)	Starter (7-21)	0.80194 [b]	0.98621 [a]	0.94658 [ab]	0.81571 [b]	0.0499
	Grower and finisher (22-42)	3.3369 [a]	3.2562 [a]	3.2214 [a]	3.3183 [a]	0.218
	Total	4.1388 [a]	4.2424 [a]	4.1679 [a]	4.1341 [a]	0.248
Feed Conversion Ratio	Starter (7-21)	1.63[a]	1.74 [a]	1.64 [a]	1.64 [a]	0.1
	Grower and finisher (22-42)	2.11 [ab]	2.24 [ab]	1.97 [b]	2.62 [a]	0.16
	Total	1.99 [ab]	2.105 [ab]	1.886 [b]	2.334 [a]	0.12

Similar letters indicate no significant difference and dissimilar letters indicate a statistically significant difference at the 5% probability level.

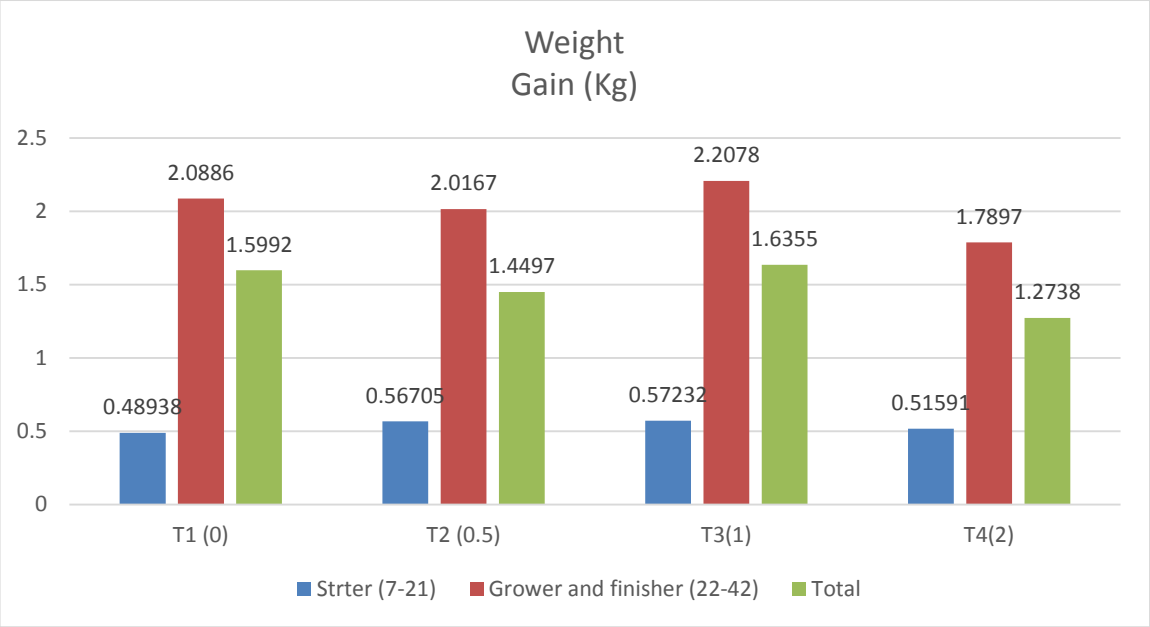

Figure 1: Weight gain in different treatments

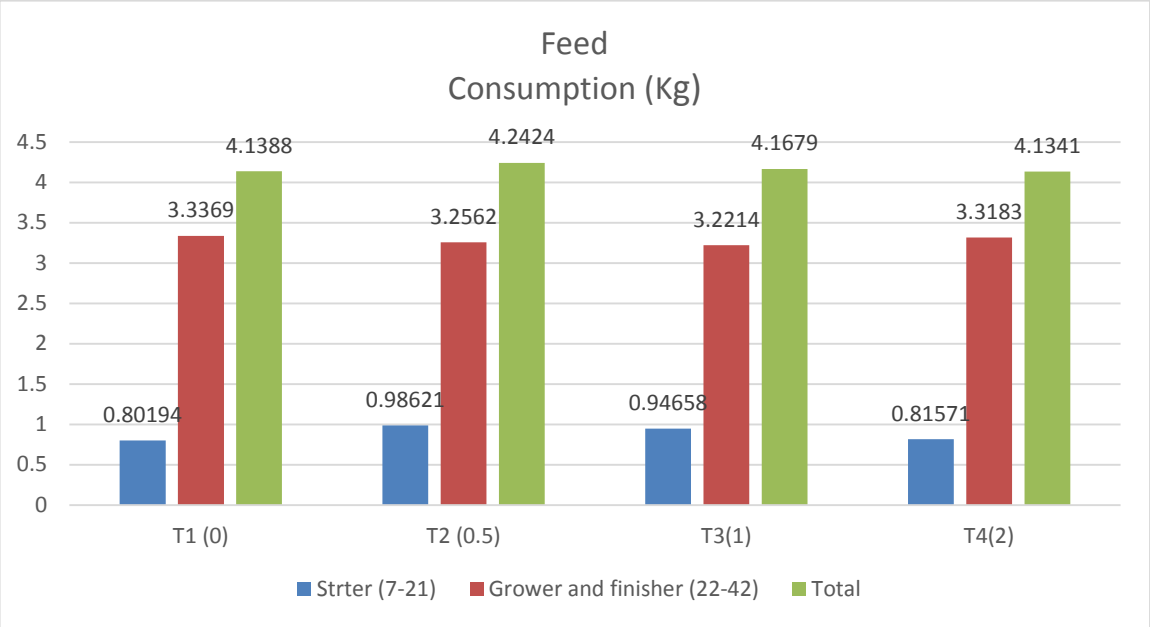

Figure 2: Feed Consumption in different treatments

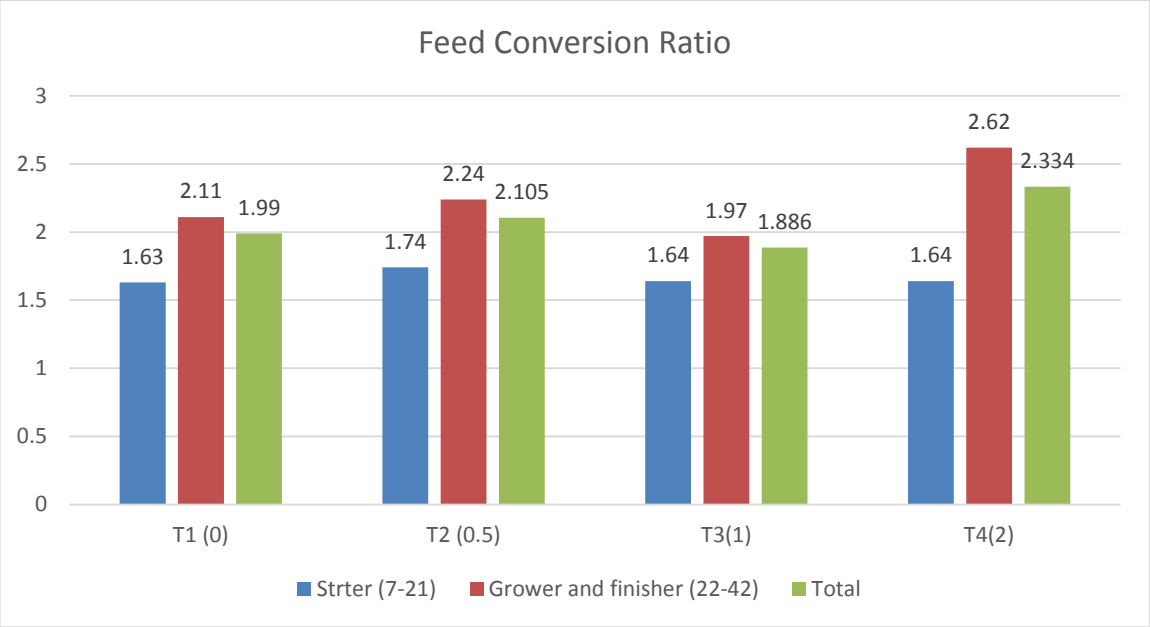

Figure 3: Feed Conversion Ratio in different treatments

Weight gain in treatment 3 had the highest efficiency. This indicates that medicinal plants and their essential oils at appropriate levels are effective growth stimulants and improve health in animals. Treatment 3 significantly reduced the feed conversion ratio compared to the control group, and due to the lower feed intake in these treatments, it can be concluded that rosemary with improved feed intake and better feed conversion ratio improved the performance of broilers.

Improving weight gain compared to the control group can be due to increasing the digestibility and absorption of nutrients in food, reducing antibacterial and antifungal effects in the compounds used in experimental groups by stimulating beneficial microflora and reducing harmful microbial population of the gastrointestinal tract. While helping to improve the health and safety of chickens, they have also improved their performance.

The results of our research are consistent with the results of Cross *et al*., (2007), and, Yasar *et al.,* (2011). Weight gain of chickens in the starter, grower, and finisher was not affected by growth. Due to the presence of crude fiber in rosemary, crude fiber in the gastrointestinal tract of single stomachs is digested less and is effective in speeding up the passage of food through the gastrointestinal tract and reducing shelf life, which weakens digestion and absorption of nutrients and reduces weight gain.

The findings of this experiment are consistent with the results of Karimi *et al.,* (2010) and Ocak *et al.,* (2008).

The increase in feed intake in experimental groups containing rosemary compared to the control group can be due to various reasons. These include factors such as increasing the amount of crude fiber in diets and thus speeding up the passage of digestive contents through the gastrointestinal tract, palatability of foods,

antimicrobial properties of medicinal plants, improving general health and gastrointestinal tract, increasing the secretion of pancreatic enzymes and in The result of appetite indicated more food intake. Because raw fibers are digested to a lesser extent in the gastrointestinal tract and are effective in speeding up the passage of food through the gastrointestinal tract and reducing shelf life, it can increase feed intake to provide energy and nutrients needed by the body.

Findings from this experiment regarding increased feed intake are consistent with the reports of Herandz *et al.*, (2004) and Garcia *et al.,* (2006).

The relative improvement in feed conversion ratio may be related to the antimicrobial effects of the medicinal plants used. Since the use of medicinal plants reduces the microbial population of the gastrointestinal tract, so the rate of breakdown of proteins and amino acids in the digestive tract is reduced and more of them are absorbed and improves the feed conversion ratio. The findings of this experiment in terms of conversion coefficient improvement are consistent with the reports of Cross *et al.*, (2002) and Alcicek *et al*., (2003).

Carcass Characteristics

The results of adding different levels of rosemary to the carcass characteristics of broilers are shown in Table 3. The percentage of liver and small intestine was significantly affected and there was a significant difference between treatments (P <0.05). But other parameters were not affected and there was no significant difference between treatments (P> 0.05).

Table 3: Effects of rosemary on carcass characteristics of broilers

Parameter	Unit	Treatment				SEM
		T1 (0)	T2 (0.5)	T3(1)	T4(2)	
wings	%	12.0938[a]	11.7082[a]	12.3811[a]	11.9768[a]	0.3989
Abdominal fat	%	1.2350[a]	1.0316[a]	1.1359[a]	0.9959[a]	0.2436
Neck	%	5.6615[a]	5.3467[a]	5.2528[a]	6.1394[a]	0.4497
Liver	%	1.8184[ab]	1.9904[a]	1.6531[b]	1.9595[ab]	0.09606
colon	%	0.1265[a]	0.13721[a]	0.12585[a]	0.13527[a]	0.02037
carcass	gr	1469.9[a]	1455[a]	1497[a]	1300.09[a]	99.465
Pancreas	%	0.19577[a]	0.15521[a]	0.16731[a]	0.16479[a]	0.01173
back	%	20.019[a]	20.515[a]	19.551[a]	21.608[a]	0.9684
thigh	%	30.439[a]	30.808[a]	32.166[a]	31.111[a]	0.88065
gizzard	%	1.8343[a]	1.6708[a]	1.6722[a]	1.9011[a]	0.1345
cecum	%	0.27330[a]	0.30774[a]	0.40196[a]	0.34109[a]	0.05579
breast	%	40.197[a]	43.214[a]	42.018[a]	40.990[a]	1.4094
small intestine	%	2.0463[ab]	2.4273[a]	1.8154[b]	2.1850[ab]	0.1578
Spleen	%	0.8202[a]	0.07746[a]	0.07454[a]	0.09064[a]	0.008906

Similar letters indicate no significant difference and dissimilar letters indicate a statistically significant difference at the 5% probability level.

The use of herbs due to their antimicrobial effects and active ingredients in them improves the efficiency of digestion and absorption of various nutrients, including amino acids, and improves carcass traits in broilers. Because the use of medicinal plants reduces the microbial population of the gastrointestinal tract, so the rate of breakdown of proteins and amino acids in the digestive tract is reduced and more of them are absorbed and stored in the body, improving the percentage of carcass components and reducing conversion. Protein is converted to fat and smaller amounts of fat can accumulate in the body. The results of this experiment are consistent with the results of Alcicek *et al.,* (2003) and contradict the result of Sarika *et al.,* (2005). The difference between the results may be due to differences in the levels of use of medicinal plants, the type of medicinal plant used, the chickens used, and the management conditions.

The active ingredients in rosemary increase liver metabolism and increase liver weight Debersak *et al.,* (2001). Treatment 4 had the highest relative weight of the gills among the experimental groups, considering that the gills are responsible for regulating the movement of the gastrointestinal tract and it is believed that high growth of this organ has a positive effect on nutrient digestibility and growth of chickens. Rosemary improves the digestibility of nutrients and increases the growth of chickens. Increased gastrointestinal weight, gingival activity, pancreatic enzyme activity, and higher concentration of bile acids, positive changes in the morphology of the small intestinal mucosa lead to higher levels of absorption. These compounds improve the performance of the animal. Nutrient availability in chickens develops continuously with the growth of the gastrointestinal tract. To ensure maximum growth, proper nutrient-to-nutrient ratios are essential to allow the gastrointestinal tract to reach its desired capacity early in the growth period. Findings with the results are consistent with the results of Debersak *et al*., (2001) & Montagne *et al.,* (2003) & Cabuk *et al.,* (2006), and Awad *et al.,* (2008) but does not match the results of Hernandez *et al.,* (2004).

Blood Parameters

The results of adding different levels of rosemary to the blood parameters of broilers are shown in Table 4. Cholesterol and glycerol levels were significantly affected and there was a significant difference between treatments ($P < 0.05$). But glucose was not affected and there was no significant difference between treatments ($P > 0.05$).

The results showed that plant extracts had a positive effect on blood lipids and glucose. Saponins and polysaccharides can lower serum glucose, lipid cholesterol levels. Herbal additives can affect the concentration of serum triglycerides by reducing the hepatic synthesis of fatty acids (Lee *et al.,* 2003). The interaction between the components of the diet and the active components of these compounds. Insulin plays a major role in the metabolism of lipids and ketoacids. Lack of insulin

leads to the release of fatty acids from adipose tissue. When blood glucose levels rise, insulin secretion leads to the synthesis of fatty acids and triglycerides (Pasalar, 2003). The findings of this experiment are consistent with Ghazalah and Ali (2008) and Yesilbag *et al.,* (2012).

Table 6: Effects of rosemary on blood parameters

Parameter	Unit	Treatment				SEM
		T1 (0)	T2 (0.5)	T3(1)	T4(2)	
Glucose	mg/dl	195.08 [a]	203.58 [a]	191 [a]	199.83 [a]	17.5463
Cholesterol	mg/dl	137.46 [a]	133.05 [ab]	134.83 [b]	134.13 [b]	5.02
Glycerol	mg/dl	43.36 [a]	40.61 [ab]	43.09 [b]	40.63 [b]	4.062

Similar letters indicate no significant difference and dissimilar letters indicate a statistically significant difference at the 5% probability level.

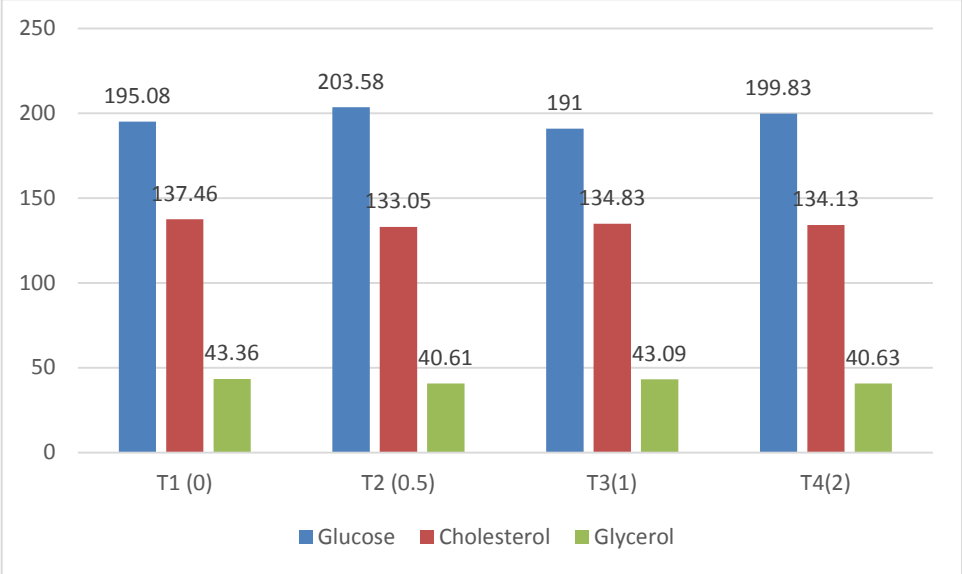

Figure 4: Blood parameters in different treatments

CONCLUSION

In general, the experimental results of this study show that the use of rosemary as an herbal additive can be grown without the side effects of alternative growth stimulants. The results obtained in this study show that the additive used can be effective in improving the health of the bird and the elimination of harmful bacteria and treatment number 3 had the best performance.

REFERENCES

Alcicek A, Bozkurt M & Cabuk M. (2003). The effect of an essential oil combination derived from selected herbs growing wild in Turkey on broiler performance. *South African Journal Animal Science*, 33: 89-94.

Awad, W., Ghareeb, Kh. and Bohm, J. (2008). Intestinal structure and function of broiler chickens on diets supplemented with a synbiotic containing *Enterococcus faecium* and oligosaccharides. *International Journal of Molecular Sciences*. 9, 2205-2216.

Bozin, B., Mimica-Dukic, N., Samojlik, I. and Jovin, N. (2007). Antimicrobial and antioxidant properties of rosemary and sage (*Rosmarinus officinalis L. and Salvia officinalis L., Lamiaceae*) essential oils. *Journal of Agricultural and Food Chemistry*, 55, 7879-7885.

Brenes, A., & Roura, E. (2010). Essential oils in poultry nutrition: Main effects and modes of action. *Animal Feed Science and Technology, 158*(1), 1-14.

Cabuk, M., Bozkurt, M., Alcicek, A., Akbas, Y. and Kucukyimaz, K. (2006). Effect of a herbalessential oil mixture on growth and internal organ weight of broiler from young and old breederflock. *South African.J. Anim. Sci.* 36(2).

Cross, D. E., R. M. McDevitt, K. Hillman, and T. Acamovic. (2007). The effect of herbs and their associated essentialoils on performance, dietary digestibility and gut microflora in chickens from 7 to 28 days of age. *Journal of British Poultry Sciences*.48, 496–506.

Cross, D.E., T. Acamovic, S.G. Deans, and R.M Cdevitt. (2002). The effects of dietary inclusion of herbs and their volatile oils on the performance of growing chickens. *Brit. Poult. Sci.,* 43: 33–35

Debersac, P., Vernevaut, M.F., Amiot, M.J., and Suschetet, M. Siess, H. (2001). Effects of water-soluble extract of rosemary and its purified component in rat liver. *Food. Chem. Toxicol*., 29,109-117.

Fu, Y., Chen, L., Shi, X., Wang, z. and Sun, S. (2007). Antimicrobial activity of clove and rosemary essential oils alone and in combination. *Phytotherapy Research*, 2, 989-994.

Garcia, A. C. L., Rohde, C., Audino, G. F., Valente, V. L. S., & Valiati, V. H. (2006). Identification of the sibling species of the Drosophila willistoni subgroup through the electrophoretical mobility of acid phosphatase-1. *Journal of Zoological Systematics and Evolutionary Research*, *44*(3), 212-216.

Ghazalah, A. A. and Ali, A. M. (2008). Rosemary leaves as a dietary supplement for growth in broiler chickens. *International Journal of Poultry Science*, 7 (3), 234-239.

Hernández F, Madrid J, García V, Orengo J & Megías MD. (2004). Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. *Poultry Science*, 83, 169–174.

Karimi, A., Yan, F., Coto, C., Park, J., Min, Y., Lu, C., Waldroup, P. (2010). Effects of level and source of oregano leaf in starter diets for broiler chicks. *The Journal of Applied Poultry Research, 19*(2), 137-145.

Lee, K. W., Everts, H., Lankhorst, E., Kappert, H.J., Beynen, A.C. (2003). Addition ofβ-ionone to the diet fails to affect growth performance in female broiler chickens. *Anim. Feed Sci. & Technol*.106: 219–223.

Montagne, L*.,* Pluske, J. R. and Hampson, D.J. (2003). A review of Interactions between dietary fiber and the intestinal mucosa, and their consequences on digestive health in young non ruminant animals. *Animal Feed Science and Technology*. 108,95-117.

Ocak N., Erenter G., Burak A.K.F., Sungue M., Altop A. and Ozmen A. (2008). Performance of broilers fed diets supplemented with dry peppermint (*Mentha piperita L.*) or thyme

(*Thymus vulgaris L.*) leaves as growth promoter source. *Czech. J. Anim. Sci*. 53, 169-175.

Omidbeigi, R. (2004). Production and processing of medicinal plants. Volume III. Fekr Rooz Publications. Page 283.

Pasalar, p. (2003). Biochemical Abstract. Written by Diane Kalbi. Sixth Edition. University of Tehran Publishing Institute.

Sarica, S., M. Corduk, and K. Kilinc. (2005). The effect of dietary L-carnitine supplementation on growth performance, carcass traits, and composition of edible meat in Japanese quail (Coturnix coturnix japonica), *J. Appl. Poult. Res.,* 14,709–715.

Yasar, S., Namik, D., Fatih, G., Gokcimen, A. and Selcuk, K. (2011). Effects of inclusion of aeriel dried parts of some herbs in broiler diets. *The Journal of Animal and Plant Sciences*, 21(3), 465-476.

Yesilbag, D., Eren, M., Agel, H., Kovanlikaya, A. and Balci, F. (2011). Effects of dietary rosemary, rosemary volatile oil and vitamin E on broiler performance, meat quality and serum SOD activity. *British Poultry Science*, 52(4): 472-482.

Yesilbag, D., Gezen, S. S., Biricik, H. and Bulbul, T. (2012). Effects of a rosemary and oregano volatile oil mixture on performance, lipid oxidation of meat and haematological parameters in Pharaoh quails. *Brit. Poult. Sci*. 53(1): 89-97.