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Analysis of the effects of cynarin and choline chloride on the metabolic processes of broilers

A. Uzatici^{a,*}, K. Çelik^b

^aDepartment of Biga Vocational High School, University of Çanakkale OnSekiz Mart, Çanakkale –Turkey.

^bDepartment of Animal Science, University of Çanakkale On Sekiz Mart, Çanakkale –Turkey.

*Corresponding author; Department of Biga Vocational High School, University of Çanakkale OnSekiz Mart, Çanakkale –Turkey.

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ABSTRACT

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One of the important modifications that have been made in animal feeding is the usage of the natural feeds and the feed supplements having any negative impact on human health. Therefore there has been an increase in the usage of vegetable extracts together with the feeds in the broiler feeding. It is indicated that the vegetable extracts ameliorates the feed consumption and the benefitting from the feed and consequently have the positive impact on the live weight. This study is carried out in order to ascertain the usage opportunities of the artichoke extract (*cynara scolymus*) that has positive productive effects on broilers' feed and the vegetable extract named Bedqen40 that includes choline chlorite and their metabolic impacts on liver enzymes. The study was conducted while using 100 Ross 308 hybrid chicks for 42 days as control and experimental groups. In terms of the live weight at the end of the experiments, there is a significant statistical difference between the groups ($P = 0.0425$). With respect to the daily increase of live weight, the difference between the experimental group and the control group is statistically negligible ($P \geq 0.1104$). There is no difference in terms of the liver enzymes between the experimental group and the control group both at the start and the end of the experiment ($P \geq 0.1792$).

1. Introduction

Nowadays, many types of anabolic substances are used in order to maintain the animal health and the productiveness. These anabolic substances used usually have negative effects on the digestive system and the immune system. For this reason there have been researches for many years on the supplementary products for the development in the poultry farming. Even if the antibiotics and such chemical substances were used in low doses, they caused the resistance on the bacteria. As the animal products that are provided for the edible consumption are risky, thereby they expose residues and cause the death of animals; the usages of these substances have been prohibited (Kutlu et al.,2001).

Despite the aromatic vegetables and their extracts are used as medicines in the treatment of diseases, their stimulative effects on the growth in animal feeding are not taken into consideration. Due to the prohibition of the antimicrobials as stimulants, however, the vegetable extracts as alternative feed supplements have gained importance (Alçiçek et al., 2004). The prohibition of antibiotics as stimulants also increased the attention particularly to the phytogetic feed supplemental substances. Obtaining the cynarin substance from artichoke extract and its usage in the medical science as hepatoprotective triggered the area of utilization particularly in the poultry farming. The motivation of keeping the liver functions within the intended level in the broilers, where intensive farming is dealt, has on the other hand increased the importance of such supplements. It is alleged that the phenols and polyphenols in the artichoke leaves are highly effective in increasing the bile secretion and this has positive effects on the digestion of fats (Speroni et al., 2003, Kraft, 1997). The leaves of artichoke contain the phenolic acids and the Cynarin, which is the main isomer of this extract (Moglia et al., 2008). Cynarin in general makes the liver work normally while directly impacting on the synthesis and secretion functions of the liver (Gebhardt,1997., Kraft, 1997., Llorach et al.,2002,Zhu et al.,2004). Chlorogenic acid, caffeic acid and cynarin, which are the most important substances that artichoke contains, (Scemama et al.,1971)) have cholagogue, choleric and hepatoprotective affects. Moreover the flavonoids have diuretic features due to their synergic effects (Zapesocchnaya et al.,1992). Choline, which is also known as vitamin B4, has become an irreplaceable feed supplemental substance for the poultry in the recent years as a consequence of the researches conducted.

Choline plays an important role in the prevention of the cases such as perosis and hepatosplenomegali particularly in the arthrosis of the chicks. Furthermore choline also plays an important role in the maturation of the hyaline cartilages through penetrating in the cellular structure together with chlorite or citrate and in the transmission of the stimulus throughout the sympathetic neural system making synthesizing the acetyl choline (Emmert et al.,1996). Artichoke contains bioactive substances such as apigenin and luteolin and it is also reported that it has bifidogenic effect on useful bacteria (Costabile et al.,2010), that the extract of the artichoke leaves is beneficial for the functional dyspepsia diseases (Holtmann et al.,2003) and that it mitigates the symptoms of bowel syndrome and dyspepsia (Walker et al., 2001). It is also pointed out that the extract of artichoke leaves shows antioxidative features (Schütz et al.,2004) and that this feature takes its effects through the prevention of the oxidative modification of the blood lipoproteins and the minimization of the existing oxidation risk (Gebhardt, 1997). Besides that it decreases the blood urea concentration as well as the level of cholesterol and fat level in the blood inhibiting the biosynthesis of hepato cholesterol. It has a significant effect on liver increasing the bile secretion (Stoev et al.,2002). It is attested that the addition of artichoke leaves extract to broiler rations stimulates the bile secretion and the total bile acid concentrations (Saenz et al., 2002) the increase in the bile secretion enables more efficient digestion and helps to more effective usage of ration energy through emulsifying the fats and having positive impacts on the digestion of fats and fat metabolism (Kraft.,1997). As a consequence of the researches on the broilers, Abdo et al.,2007, indicated that the 4 % addition of the flour of artichoke leaves to the outset and augmentation ratios containing low energy values remedies the fat and energy usage. It was also claimed in the same research that the observed remedy in the digestion of fat might be caused by the increasing effect of artichoke leaves in bile salts in chicks. In another research conducted with the laying hens, the artichoke extract and the flour of artichoke leaves were added to the rations and it was detected that 8 % addition of the artichoke leaves increases the egg productivity, that it ameliorates the feed conversion ratios, that the digestion of

fat is high in the experimental groups in comparison with the control group and moreover that all the experimental groups are economically more effective than the control group (Radwan et al., 2007). Furthermore choline also plays an important role in the maturation of the hyaline cartilages through penetrating in the cellular structure together with chlorite or citrate and in the transmission of the stimulus throughout the sympathetic neural system making synthesizing the acetyl choline (Emmert et al., 1996). Fatty liver (steatohepatitis) is resulted from the putrefaction of the apoprotein within lipoprotein or the inhibition of lipoproteins from lipid and protein synthesis or the inadequacy of secretion mechanism. This inhibition is usually resulted from the lack of substance called lipotropic factors. The lack of lipotropic substance triggers the accumulation of triglycerides even if the synthesis ratios of the fatty acids and free fatty acids are normal. This fatty liver type arises from the choline deficiency; because this deficiency is in essence resulted from the insufficiency of the methyl groups received from the methionine as it is synthesized with the labile methyl groups received from choline transmethylation and methionine. Thusly the choline has an influence as lipotropic substance in the treatment of fatty liver that is resulted from the deficiency of methionine and betaine. Inversely, the biochemical incidents using the overdose of methyl groups or a poor diet in terms of protein (containing methionine) or lecithin (containing choline) conduce to the fatty liver (Aras et al., 1971). As lipoidosis also increase together with the selection conducted toward the increase of live weight in broilers, it is seen that the sole remedy is the amelioration of the factors regarding the nutrition and the adjustment of lipotropic factors such as methionine, lysine and choline that decrease the lipoidosis in animals (Demir, 1989). Choline is completely a colamine with methyl. It is the structural component of choline - phosphatides and the metabolism of lipids. It evolves into acetylcholine, which is important for axons, with acetylation. The requirement of choline is dependent on several factors; provided that the ration is rich enough in terms of folic acid and vitamin B1, the metabolism is capable of synthesizing choline sufficiently and therefore the nonexistence of this substance would not emerge in its absence in the food and feed. The retrogression in the growth of chickens and the decrease in the rate of ovulation and hatching are observed in the deficiency of choline. The insufficiency of choline and vitamin E plays especially an additional role in emergence of perosis depending on the deficiency of manganese (Öztürkcan, 1990).

2. Materials and methods

2.1. Ethical Committee of the University of Çanakkale Onsekiz Mart, Decision No: 2012/05-06

The research has been conducted in the Poultry Research Unit of the Zootechnics Department of the Faculty of Agriculture in the University of Çanakkale Onsekiz Mart. 100 Ross 308 hybrid broiler chicks that were procured from a commercial company were used in the research. The research was conducted in the cages that are separated in to 2 groups, one of which were the control group including 50 chicks while the other one is the experimental group. The experimental chicks were given the broiler starter feed from the 1st day until the 21st day and the finish feed from the 22nd day until the 42nd day, which is the slaughtering day; their drinking water was always kept available in front of them. Bedgen40 substance was mixed homogenously to the chicks' feed in the experimental group in the proportion of 150 gram/tonne. The feeds used in the research were procured from a private feed factory. The live weights of the animals were measured in the 1st, 2nd, 3rd, 4th and 6th weeks.

2.2. Blood sampling and serum analysis

Blood samples were also collected in the 3rd and 6th weeks and these samples were rapidly brought to the Central Laboratory of the University of Çanakkale Onsekiz Mart after being located into a cool box in order to extract the syneresis afterwards. Serum was obtained after centrifuging the entire blood in 2500 rpm for 10 minutes. Aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) levels in the serum that belong to the liver functions were completed in the blood in Roche Cobas 501 automatic analyzer system and AST, ALT, ALP and Gamma-Glutamyl Transferase (GGT) enzyme levels were analyzed by using the enzymatic measurement method.

3. Results and discussion

The increase of the live weights of the chicks, which were used in the research, after their 42 days of nutrition and the values of the liver enzymes in the 3rd and 6th weeks were given in Table 1. In terms of the live weight at

the end of the experiments, there is a significant statistical difference between the groups ($P = 0.0425$). In respect to the daily increase of live weight, the difference between the experimental group and the control group is statistically negligible ($P \geq 0.1104$). There is no difference in terms of the liver enzymes between the experimental group and the control group both at the start and the end of the experiment ($P \geq 0.1792$). In the research conducted to observe the effects of choline and betaine, which were added to the chick rations in different levels, on carcass quality and blood serum composites, it was stated that the level of albumin within the blood serum increases and it has no effect on cholesterol and AST and ALT, which are the liver enzymes (Hassan et al., 2005).

Table 1

Live weight and liver enzyme means (\bar{X}) its standard errors (SE) and P values.

		Trial(T)		Control(C)		P
		Means \bar{X}	Standard Error	Means \bar{X}	Standard Error	
	Start of Experiment	86.6	13.65	77.8	13.38	0.6434
Live Weight	Week 1	225.4	13.65	217.8	13.38	0.6908
	Week 2	482.0	13.65	492.4	13.38	0.5902
	Week 4	973.7	13.65	961.2	13.38	0.5124
	Week 6	1976.2	13.65	1937.2	13.65	0.0425
Daily Live Weight Increase	Week 1	19.7	1.07	20.0	1.04	0.8678
	Week 2	36.7	1.07	39.2	1.04	0.1104
	Week 4	35.2	1.07	33.4	1.04	0.2297
	Week 6	71.6	1.07	69.6	1.04	0.1872
Start of Experiment	AST	224.4	11.10	212.4	12.41	0.4785
	ALP	1669.1	219.32	2123.7	245.21	0.1792
	GGT	22.4	1.57	22.2	1.76	0.9278
	ALT	3.6	0.33	3.4	0.37	0.7197
End of Experiment	AST	317.4	15.70	316.2	17.55	0.9615
	ALP	1241.4	151.47	1018.58	169.34	0.3361
	GGT	24.3	1.67	24.3	1.87	1.0000
	ALT	3.7	0.45	3.9	0.50	0.7907

In the research conducted to observe the effect of the addition of cynarin, which is the vegetable extract substance to the broiler diets in different feed forms, to bone structure and some blood parameters, it was also stated that the rate of serum triglyceride decreases depending on the addition of Cynarin to the ration, that this decrease is statistically important and that the serum ALP level in the 3rd and 6th weeks of the experiment are not significant (Yargeldi et al., 2013). In the research conducted on the broiler chicks, it was reported that 4 % addition of artichoke leaves to the rations increases the total protein rate in the blood from the day 0 to 28 and decreases the level of blood lipid and total cholesterol; however this effect is statistically negligible (Abdo et al., 2007).

In the research conducted on the laying hens, it was further stated that the addition of artichoke leaves extract and dried artichoke leaves to the ration does generally not affect to the blood parameters, however 10 % addition of artichoke leaves decreases the level of blood lipid and cholesterol pointedly (Radwan et al., 2007).

It was stated that the addition of artichoke leaves extracts stimulates the bile secretion and increases the total bile acid concentration (Saenz et al., 2002), and the increase in the bile secretion enables a better digestion (Kraft, 1997). In the 42 days of research of (Roosbeh et al., 2013), conducted on the effects of 1.5 % addition of artichoke extract to the broiler rations on the immunity cells and blood biochemical parameters, they indicated that the values of blood urea, cholesterol and triglyceride decreased, however there was no statistical difference between the HDL and LDL values on the control and experimental groups. In the research of (Deniz et al., 2008), conducted on the effects of the commercial product (Hepabial carnitine), which is added to the drinking water of the broilers in different stress conditions and contains the artichoke extract on the growth performance, on the body weight, the feed consumption and feed conversion rate, they discovered that the carcass efficiency, the body weight, the weight gain and the hot carcass weight were found important when the control and the experimental

group were scaled at the end of the 42nd day. In the research of (Abdo et al., 2007), conducted for the usage of artichoke leaves as the source of energy in the broiler rations, it was pointed out that there are significant decreases in the biosynthesis of cholesterol and the blood components and that 4 % addition of artichoke leaves to the rations causes an increase in the blood proteins and a decrease in the total blood lipids.

Rama Rao et al.,2001, researched about the addition of choline to the breeding broilers' rations that are fed with different sources of energy and their effects on their performances; and they proved that the content of fat in the liver might be decreased through adding 760 mg/kg more choline to the rations based on different sources of energy. When the total liver lipid contents of the slaughtered animals were analyzed at the end of the experiment, which was conducted to research the effects of choline, methionine and mezo-inositol on the fatty liver (Gül, 2009), it was ascertained that despite of the differences among the groups in terms of total liver lipid contents as absolute value, these differences are statistically negligible ($P > 0.05$).

4. Conclusion

It is ascertained in this research that the additive containing 159 gram/tonne cynarin and choline chlorite to the rations of broilers causes statistically significant difference between the groups only in terms of the live weight at the end of the experiment ($P = 0.0425$), that the difference between the experimental group and the control group is statistically negligible in respect to the daily increase of live weight ($P \geq 0.1104$), and that there is no difference in terms of the liver enzymes between the experimental group and the control group both at the start and the end of the experiment ($P \geq 0.1792$).

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