



IRAQI
Academic Scientific Journals



العراقية
المجلات الأكاديمية العلمية

TJAS

Tikrit Journal for
Agricultural Sciences

ISSN:1813-1646 (Print); 2664-0597 (Online)
Tikrit Journal for Agricultural Sciences

Journal Homepage: <http://www.tjas.org>

E-mail: tjas@tu.edu.iq

Influence of the BEDGEN 40™ SFA inclusion in the water on growth performance and hematological parameters of broiler chickens

Ahmed N. Fadhel*, Husham. A. Mandalawi*, Nidhal A. Mustafa** and Atoof A. Aziz*

*Department of Animal Science, College of Agricultural Science Engineering, Sulaimani University

**Department of Animal Resources, College of Agricultural Science, Salahaldin University

Correspondence email: hisham.dawd@univsul.edu.iq

KEY WORDS:

BEDGEN 40™ SFA, broiler, growth performance, blood lipids, packed cell volume and drinking water

Received: 31/08/2022

Revision: 22/11/2022

Proofreading: 26/10/2022

Accepted: 29/10/2022

Available online: 31/12/2024

ABSTRACT

We studied the effect of BEDGEN 40™ SFA inclusion in the water on growth performance and hematological parameters of broilers from 1 to 42 d of age. The experimental design was completely randomized with 3 treatments that consists of C was the control without BEDGEN inclusion, T2 and T3 was treated by BEDGEN as supplements in drinking water (0.35 vs. 0.70 ml/1lt), respectively from 7 to 14 d and 21 to 28 d of age. Each treatment was 4 replicate and the experimental unit was a pen with 20 birds. All diets were based on corn, soybean meal, wheat, and included sunflower oil. From 1 to 42 d of age, inclusion of supplementation of BEDGEN 40™ SFA in drinking water increase body weight, weight gain, feed consumption ($P < 0.05$) and improve feed conversion ratio, also exhibited significant effect on water intake at the last week of age and non-significant effect on blood lipids and PCV ($P > 0.05$) at day 21 and 42, during rearing period except blood HDL and Triglyceride at day 42. It is concluded that BEDGEN 40™ SFA supplementation were well utilized by broilers, at level of inclusion.

© 2024. This is an open access article under the CC by license <http://creativecommons.org/licenses/by/4.0>



تأثير BEDGEN 40TM SFA (مستخلص السينارا) على أداء انتاج روس 308 وبعض متغيرات الدم

أحمد نجاة فاضل*، هشام عبد الستار داود مندلاوي*، نضال عبد الغني مصطفى**، عطف عبد الرحيم عزيز*

* قسم علوم الحيوان، كلية علوم الهندسة الزراعية، جامعة السليمانية، العراق
** قسم الثروة الحيوانية، كلية علوم الهندسة الزراعية، جامعة صلاح الدين، العراق

الخلاصة

درسنا تأثير إدراج BEDGEN 40TM SFA في الماء على أداء النمو والمعايير الدموية للفروج من عمر 1 إلى 42 يوماً. تم اختيار التصميم التجريبي بشكل عشوائي تماماً باستخدام 3 معاملات تتكون من C كان التحكم بدون تضمين BEDGEN ، T2 و T3 بواسطة BEDGEN كمكملات في مياه الشرب (0.35 مقابل 0.70 مل / لتر) ، على التوالي من 7 إلى 14 يوماً و 21 يوماً إلى 28 يوماً من العمر. كانت كل معاملة 4 مكررات والوحدة التجريبية كانت عبارة عن أكتان بها 20 طائر. استندت جميع الوجبات الغذائية على الذرة وفول الصويا والقمح وزيت عباد الشمس. من 1 إلى 42 يوماً من العمر ، أدى تضمين مكملات BEDGEN 40TM SFA في مياه الشرب إلى زيادة وزن الجسم وزيادة الوزن واستهلاك العلف ($P < 0.05$) وتحسين نسبة تحويل العلف ، كما أظهر تأثيراً كبيراً على تناول الماء في الأسبوع الماضي من العمر وتأثير غير معنوي على نسبة الدهون في الدم و ($P > 0.05$) PCV في اليوم 21 و 42 ، خلال فترة التربية باستثناء الدم HDL و الدهون الثلاثية في اليوم 42. وتم الاستنتاج إلى أن BEDGEN 40TM SFA تم استخدامها بشكل جيد من قبل الدجاج اللحم ، على مستوى التضمين. الكلمات الرئيسية: BEDGEN 40TM SFA ، فروج اللحم ، الأداء الانتاجي ، دهون الدم ، حجم الخلايا المعبأة ومياه الشرب.

INTRODUCTION

The history of herbs is too long as the mankind; these plants were used from the beginning of the world. Many wars have been fought and lands occupied for the purpose of plants and herbs, and even at yet human continuous depend on exotic species for many of our latest medicines and chemicals (Barazesh *et al.*, 2013). 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 (Uzatici and Celik, 2014). 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 (Alcicek *et al.*, 2004).

It is attested that the addition of artichoke leaves extract to broiler rations stimulates the bile secretion and the total bile acid concentrations (Rodriguez *et al.*, 2002) 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. Moreover, that all the experimental groups are economically more effective than the control group (Radwan *et al.*, 2007).

We hypothesized that birds drinking water with BEDGEN 40 inclusion (0.35 vs. 0.70 ml/1lt) could increase in body weight and improved feed conversion ratio and also effect on

blood hematological than birds drinking water without BEDGEN. The aim of this study was to evaluate the effects of BEDGEN 40 inclusion in the water on growth performance, and hematological parameters of broilers from 1 to 42 d of age.

MATERIALS AND METHODS

Husbandry

The experiment was conducted at Animal science department, Faculty of Agricultural Engineering Sciences/ University of Sulaimany. In total, 240 one-day-old Ross 308 chicks were obtained from a commercial hatchery and distributed at random into 12 pens. The floor was covered with wood shavings. Feed was provided in circular feeders. Room temperature was kept at 33°C during the first 3 d of life and then it was reduced gradually according to age until reaching 24°C at 42 d. Chicks received a 23 h/d light program for the first 7 d of life and then, 20 h of light until the end of the experiment. Broilers had free access to feed and water throughout the experiment.

Experimental Design and Diets

There were 3 treatments organized randomized with 2 inclusion of BEDGEN 40 (0.35 vs. 0.70 ml/1lt), respectively in drinking water from 7 to 41d and 21 to 28 d of age and a control without BEDGEN inclusion. Each treatment was replicated 4 times, and the experimental unit was a pen with 20 birds. All diets were based on corn, soybean meal, wheat, and included sunflower oil. For the formation and mixing of the feeds, all diets were formulated according to Fundación Española Desarrollo Nutrición Animal (2010). Broilers had free access to feed and water throughout the experiment. The ingredient composition and the calculated analysis of the diets are presented in Table 1.

Growth Performance and Hematological Parameters

Body weight and feed consumption were determined by pen at 7, 14, 21, 28, 35, and 42 d of age. Feed wastage was recorded daily for each pen, and the mortality rate was also calculated. From these controls, daily body weight gain, daily feed intake, and feed conversion ratio were calculated by week and for the whole period according to Mandalawi *et al.* (2014). Also, weekly water intake was calculated from 14 to 42 d of age. At 21 and 42 d old, 2 birds per box for each replicate were selected to blood lipids and PCV measurements.

Table 1. Ingredient and chemical composition of the experimental diets (% , as-fed basis, unless otherwise stated) from 1 to 42 d of age.

Diets	Starter	Finisher
	(1 to 21 d)	(22 to 42 d)
Ingredient		
Corn	32.24	36.34
Wheat	22.50	19.50
Soy bean meal (45,5% CP)	35.50	34.00
Sunflower oil	4.50	5.50
Calcium carbonate	0.80	0.70
Dicalcium phosphate	2.50	2.00
Sodium chloride	0.46	0.46
DL-Met (99%)	0.34	0.34
L-Lys-HCl (78.5%)	0.16	0.16
Vitamin and mineral premix ¹	1.00	1.00
Calculated analysis		
AMEn, kcal/kg	3,000	3,100
CP	22.0	20.0
DM	88.8	88.7
Total ash	6.23	5.63
Ether extract	6.75	7.82

¹ Provided the following (per kilogram of diet): vitamin A (retinyl acetate), 1,000,000 IU; vitamin D3, 300,000 IU; vitamin E (all-rac-alpha tocopherol acetate), 5,000 mg; niacinamide, 1,500 mg; vitamin B1 (thiamine mononitrate) 500 mg; vitamin B2 (riboflavin), 400 mg; vitamin B6 (pyridoxine hydrochloride), 400 mg; vitamin B12 (cyanocobalamin), 1,000 mcg; vitamin C (ascorbic acid), 2,500 mg; calcium-D-pantothenate, 2,000 mg; folic acid, 1,000 mcg; DL-methionine, 3,500 mg; Lysine HCl, 10,000 mg; 3-phytase (EC 3.1.3.8), 5,000 U; iron (Fe E1), 10,000 mg; manganese (Mn E5), 10,000 mg; zinc (Zn E6), 15,000 mg; copper (Cu E4), 1000 mg.

Statistical Analysis

Data on growth performance, blood lipids and PCV were analyzed as a completely randomized design using the GLM procedure of SAS (SAS institute Inc., 1990). For the 3 treatments that arranged as control without BEDGEN 40 inclusion and 2 levels of BEDGEN 40 inclusion (0.35 vs. 0.70 ml/1lt) in drinking water were studied. When the variable studies were significant, the Tukey test was used to show the different between treatment means. Differences among treatments were considered significant at $P < 0.05$.

RESULTS AND DISCUSSION

The effects of different levels of BEDGEN 40 as supplements in drinking water on body weight are show in Table 2, results showed that the body weight (g/bird) was significantly ($P < 0.05$) affected by BEDGEN 40 as supplements. Body weight was significantly higher for T1 and T2groups (0.35 and 0.70 ml/ 1lt drinking water) at all ages except the fourth week of age that there were no significant different between all treatment groups. This may be due to the addition of BEDGEN 40 as supplements in drinking water stimulates the bile secretion and the total bile acid concentrations (Rodriguez *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). These results were in agreement with Uzatici and Celik, (2014) who found that the additive containing cynarin and choline chlorite to the ration of broilers

causes statistically significant difference between the groups only in terms of the life weight at the end of the experiment.

Table 2. The effects of different levels of BEDGEN 40 as supplements in drinking water on weekly body weight (g/bird)

Treatment ¹	1.week	2.week	3.week	4.week	5.week	6.week	1-6.week
C	116.4 ^b	323.4 ^b	632.3 ^b	1153.8	1609 ^{bc}	2638 ^c	2594 ^{bc}
T1	128.2 ^a	347.6 ^a	697.3 ^a	1221.3	1738 ^b	2842 ^b	2798 ^b
T2	126.9 ^a	360.4 ^a	660.9 ^{ab}	1260.5	1802 ^a	3000 ^a	2956 ^a
SEM ²	1.94	7.39	12.23	31.33	28.13	60.15	60.15
Prob							
p-value	0.004	0.018	0.014	0.102	0.003	0.007	0.007

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

²Standard error of the mean (n= 4 replicates of 20 birds each).

In terms of the effect of BEDGEN 40 as supplements on weekly body weight gain there was no significant difference between treatment groups at most ages except the first and last weeks of age (Table 3). So T1 and T2 groups (0.35 and 0.70 ml/ 1lt drinking water) resulted in significantly ($P<0.05$) higher than control group. This result may be due to higher feed consumption in T1 and T2 groups at most weeks of age (Table 4). These results were in agreement with Mariani, (1998) who found that the use of artichoke extract during the first weeks of life may increase the productive response of broilers, as chickens have greater sensitivity to mycotoxins during their first 21 days of life. Results also showed that feed consumption (g/bird) was significantly ($P<0.05$) affected by BEDGEN 40 as supplements in drinking water at most ages except third and last week of age. So T1 and T2 groups (0.35 and 0.70 ml/ 1lt drinking water) resulted in significantly ($P<0.05$) higher than control group. With regard to weekly FCR there were no significant differences between all groups at all ages except at the last week of age (Table 5). So T2 (0.70 ml BEDGEN 40/ 1lt drinking water) resulted in significantly ($P<0.05$) better than other groups and marginally better than other 2 groups at most treatment ages.

Table 3. The effects of different levels of BEDGEN 40 as supplements in drinking water on daily body weight gain (g/bird).

Treatment ¹	1.week	2.week	3.week	4.week	5.week	6.week	1-6.week
C	10.3 ^b	29.6	44.1	74.5	65.0	146.9 ^b	61.8 ^b
T1	12.0 ^a	31.3	50.0	74.8	73.8	157.7 ^a	66.6 ^a
T2	11.8 ^a	33.4	42.9	85.7	77.4	171.1 ^a	70.4 ^a
SEM ²	0.275	0.895	2.068	3.799	3.597	6.175	1.43
Prob							
p-value	0.004	0.447	0.084	0.114	0.095	0.043	0.007

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

²Standard error of the mean (n= 4 replicates of 20 birds each).

Table 4. The effects of different levels of BEDGEN 40 as supplements in drinking water on daily feed intake (g/bird)

Treatment ¹	1.week	2.week	3.week	4.week	5.week	6.week	1-6.week
C	13.2 ^b	36.5 ^b	61.4	96.7 ^b	114.7 ^b	240.4	94.0 ^b
T1	16.2 ^a	41.9 ^a	64.4	105.4 ^a	123.5 ^a	250.9	100.4 ^a
T2	16.2 ^a	41.8 ^a	60.7	106.0 ^a	124.9 ^a	248.6	99.7 ^a
SEM ²	0.081	0.472	2.195	0.927	0.868	2.760	24.72
Prob							
p-value	<.0001	<.0001	0.478	<.0001	<.0001	0.058	0.001

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

²Standard error of the mean (n= 4 replicates of 20 birds each).

Table 5. The effects of different levels of BEDGEN 40 as supplements in drinking water on feed conversion ratio (g/g)

Treatment ¹	1.week	2.week	3.week	4.week	5.week	6.week	1-6.week
C	1.37	1.24	1.41	1.31	1.77	1.64 ^a	1.52 ^a
T1	1.35	1.34	1.29	1.41	1.68	1.60 ^a	1.51 ^a
T2	1.37	1.25	1.41	1.25	1.64	1.45 ^b	1.42 ^b
SEM ²	0.030	0.029	0.059	0.059	0.084	0.048	0.021
Prob							
p-value	0.854	0.098	0.286	0.187	0.533	0.045	0.014

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

²Standard error of the mean (n= 4 replicates of 20 birds each).

This results may be due to the addition of BEDGEN 40 as supplements in drinking water stimulates the bile secretion and the total bile acid concentrations (Rodriguez *et al.*, 2002) the increase in the bile secretion enables a better digestion (Kraft, 1997). Better FCR may probably be due to improved digestibility of nutrients, because herbs and herbal products can control and bound the growth and colonization of several pathogenic and nonpathogenic species of bacteria in chicken gut. This may lead to a better efficiency in the consumption of feed, resulting in improved growth and feed efficiency (Bedford, M. 2000). These results were in agreement with Deniz *et al.*, (2006) that conducted on the effects of the commercial product (Hepabial carnitine) which added to the drinking water of the broilers in different levels and contain 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 groups were scaled at the end of the 42nd day of the experiment. Moreover, results showed that weekly water intake (ml/ bird) wasn't significantly ($P < 0.05$) but marginally affected by BEDGEN 40 as supplements in drinking water at most ages except the first and the last weeks of age (Table 6). So T1 and T2 groups (0.35 and 0.70 ml/ 1lt drinking water) resulted in significantly ($P < 0.05$) higher than control group. This may be due to the increase in feed intake in these groups at most ages, which increases the need for water that acts as a medium for digestion-related reactions. These results were in agreement with Rodriguez *et al.* (2002) who report an increase in the exogenous hepatic functionality as cholagogue and choleric. In addition to this, the use of artichoke extract during the first

weeks of life may increase the productive response of broilers, as chickens have greater sensitivity to mycotoxins during their first 21 days of life (Mariani, 1998).

In terms of the effects of different levels of BEDGEN 40 as supplements in drinking water on blood lipids and packed cell volume at 21 days of age, there were no significant different between all treatment groups (Table 7). Despite the increased weights for T1 and T2 groups (0.35 and 0.70 ml/ 1lt drinking water) compared with the control group at all most ages there were no significant different between them. Moreover, results showed that there were no significant different between all treatment groups for blood lipids and packed cell volume at 42 days of age except HDL and Triglyceride (Table 8).

Table 6. The effects of different levels of BEDGEN 40 as supplements in drinking water on weekly water intake (ml/bird).

Treatment ¹	2.week	3.week	4.week	5.week	6.week
C	574.5 ^a	1466	1570	1904	2291 ^a
T1	665.5 ^b	1565	1712	2034	2466 ^b
T2	649.0 ^b	1527	1584	2060	2494 ^b
SEM ²	10.6	37.6	45.8	46.5	48.6
Prob					
p-value	0.001	0.222	0.105	0.088	0.032

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

²Standard error of the mean (n= 4 replicates of 20 birds each).

Table 7. The effects of different levels of BEDGEN 40 as supplements in drinking water on blood lipids and packed cell volume at day 21

Treatment ¹	PCV	VLDL	HDL	LDL	TRI.G.	Cholesterol
C	23.6	0.077	2.71	0.569	0.412	3.12
T1	23.6	0.130	3.14	0.773	0.625	3.99
T2	25.1	0.128	3.16	0.581	0.650	3.75
SEM ²	0.63	0.03	0.19	0.06	0.09	0.29
Prob						
p-value	0.202	0.275	0.229	0.059	0.189	0.153

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

Table 8. The effects of different levels of BEDGEN 40 as supplements in drinking water on blood lipids and packed cell volume at day 42

Treatment ¹	PCV	VLDL	HDL	LDL	TRI.G.	Cholesterol
C	26.3	0.32	2.91 ^a	0.81	1.74 ^a	3.53
T1	26.0	0.27	2.33 ^b	0.69	1.35 ^b	3.29
T2	25.3	0.27	2.60 ^{ab}	0.56	1.34 ^b	3.40
SEM ²	1.78	0.04	0.13	0.07	0.23	0.19
Prob						
p-value	0.918	0.575	0.041	0.106	0.040	0.688

¹ C= control without BEDGEN 40 inclusion, T1 and T2= inclusion of BEDGEN 40 as supplements in drinking water (0.35 vs. 0.70 ml/ 1lt), respectively.

²Standard error of the mean (n= 4 replicates of 2 birds each).

These results were in agreement with Khosravi *et al.* (2008) who showed that the supplementation of herbal medicines in drinking water did not exert any significant effect on blood hemoglobin level, cholesterol level, packed cell volume and whole blood lipid count of birds. Supplementation of herbal medicines did not exhibit any significant effect on PCV value of broilers Qamar *et al.* (2015). The results of the present study are similar with those observed by Yargeldi and Abas. (2013) who reported that the effect of the addition of cynarin to the broiler diets in different feed forms, to bone structure and some blood parameters, it was stated that the rate of serum triglyceride decreases depending on the addition of cynarin to the ration, that this decrease is statistically important.

CONCLUSION

It was concluded from the results of the study that supplementation of BEDGEN 40™ SFA in drinking water revealed to increase body weight, weight gain, feed consumption, and improve efficiency of feed utilization for the entire experiment. However, inclusion of supplementation of BEDGEN 40™ SFA in drinking water did not affect blood parameters. The data indicate that broilers might benefit from inclusion of BEDGEN 40™ SFA in amounts inclusion in this research without any negative effect on variables studied. Based upon the results of the study, the birds given water supplemented with BEDGEN 40™ SFA showed better performance results along with increased profit margin when they are compared to control groups. Therefore, use of commercial herbal product BEDGEN 40™ SFA recommended to be used in broiler production as an inexpensive and efficient herbal growth promoter without any residual or harmful effects, in place of antibiotic growth promoter.

REFERENCES

- Alcicek, A., M. Bozkurt and M. Cabuk, (2004). The effect of mixture of herbal essential oils, an organic acid or a probiotic on broiler performance. *S. Afr. J. Anim. Sci.*, 34: 217-222.
- Barazesh, H., M. B. Pour, S. Salari and T. M. Abadi. (2013). The effect of ginger powder on performance, carcass characteristics and blood parameters of broilers. *Int. J. Adv. Biol. Biomed. Res.* 1: 1645-1651.
- Bedford, M., (2000). Removal of antibiotic growth promoters from poultry diets: implications and strategies to minimize subsequent problems. *World's Poultry Science Journal*, 56: 347-365.
- Deniz, G., I.I. Turkmen, F. Orhan and H. Biricik, (2006). Effect of hepabial carnitine supplemented to drinking water on the performance of broilers under different stress conditions. *Revue Med. Vet.*, 157: 115-120.
- Fundación Española Desarrollo Nutrición Animal, (2010). FEDNA Standards for the Formulation of Compound Feed. de Blas, C., Mateos, G. G., Rebollar, P. G., ed. *Fund. Esp. Desarro. Nutr. Anim.*, Madrid, Spain.
- Khosravi, A., Boldaji, F., Dastar, B. and Hasani, S, (2008). The use of some feed additives as growth promoter in broilers nutrition. *Int. J. Poult. Sci.*, 7: 1095-1099.

- Kraft, K., (1997). Artichoke leaf extract: Recent findings reflecting effects on lipid metabolism, liver and gastrointestinal tracts. *Phytomedicine*, 4: 369-378.
- Kutlu, H.R. and M. Gurgulu, (2001). Alternatives for growth promoters as antibiotic additives in poultry feeding stuffs. *Feed Mag. J.*, 27: 45-62.
- Mandalawi, H. A., Kimiaetalab, M. V., Obregon, V., Menoyo, D., Mateos, G. G., (2014). Influence of source and level of glycerin in the diet on growth performance, liver characteristics, and nutrient digestibility in broilers from hatching to 21 days of age. *Poult. Sci.* 93, 2855-2863.
- Mariani GVC., (1998). Efeito de aflatoxinas sobre o desempenho produtivo de frangos de corte em diferentes períodos de desenvolvimento corporal. Universidade Federal de Santa Maria.
- Qamar, S. H., A. U. Haq, N. Asghar, S. U. Rehman, P. Akhtar and G. Abbas, (2015). Effect of herbal medicine supplementations (arsilvon super, bedgen 40 and heap- cure herbal medicines) on growth performance, immunity and haematological profile in broilers. *Advances in Zoology and Botany* 2: 17-23.
- Radwan, N.L., Z.M.A. Abdo and R.A. Hasan, (2007). Effect of feeding artichoke leaves meal on productive and reproductive performance of Mandarah hens. *Int. J. Poult. Sci.*, 6: 826-830.
- Rodriguez, T.S., D.G. Gimenez and R.D.L.P. Vazquez, (2002). Choloretic activity and biliary elimination of lipids and bile acids induced by an artichoke leaf extract in rats. *Phytomedicine*, 9: 687-693.
- SAS (Statistical Analysis System). (1990). SAS/STAT. User's Guide. SAS Institute Inc. Cary. North Carolina.
- Uzatici, A., K. Celik, (2014). Analysis of the effects of cynarin and choline chlorite on the metabolic processes of broilers. *Asian Journal of Animal Sciences*, 3: 86-92.
- Yargeldi, K. and I. Abas, (2013). The effects of cynarin, a plant ingredient, supplementation on bone structure and some serum indicants in broilers fed different feed forms. *J. Fac. Vet. Med. Istanbul Univ.*, 39: 9-19.
- Barazesh, H., M. B. Pour, S. Salari and T. M. Abadi. (2013). The effect of ginger powder on performance, carcass characteristics and blood parameters of broilers. *Int. J. Adv. Biol. Biomed. Res.* 1: 1645-1651.