Alinteri J. of Agr. Sci. (2020) 35(1): 36-43
e-ISSN: 2587-2249
info@alinteridergisi.com
http://dergipark.gov.tr/alinterizbd
http://www.alinteridergisi.com/
DOI: 10.28955/alinterizbd.713854

Alınteri Journal of Agriculture Sciences

RESEARCH ARTICLE

The Effect of Rose Water (*Rosa damascena mill*) Supplementation in Broiler Rations on Growth Performance, Some Carcass Parameters and Intestinal Histomorphology

Gültekin Yıldız[1] • Özlem Durna Aydın[2*] • Alev Gürol Bayraktaroğlu[3]

[1]*Ankara University, Faculty of Veterinary, Department of Animal Nutrition and Nutritional Diseases, Ankara/Turkey*
[2]*Kafkas University, Faculty of Veterinary, Department of Animal Nutrition and Nutritional Diseases, Kars/Turkey*
[3]*Ankara University, Faculty of Veterinary, Department of Histology and Embriyology, Ankara/Turkey*

ARTICLE INFO

Article History:
Received: 03.04.2020
Accepted: 23.04.2020
Available Online: 08.06.2020

Keywords:
Rose water
Broiler
Performance
Intestinal histomorphology
Carcass characteristics

ABSTRACT

The purpose of this study was to investigate the effect of added to different levels of rose water broiler diets on growth performance, some carcass parameters and intestinal histomorphology. In the literature on the conducted research, there are very few studies about the use of rose water in animal as feed additive. A total of 216 day-old chicks were randomly divided into 3 groups each containing 72 chicks. While the control group was fed with basal ration, the experimental groups were fed with rose water supplementation at 2% and 4% dose, respectively, in addition to the basic ration. At the end of the experiment, the use of rose water in the rations did not statistically affected live weight (LW), live weight gain (LWG) and feed intake (FI), but feed conversion ratio (FCR) was adversely affected. In the study, hot carcass weight was positively affected while some internal organ weights were not affected by the addition rose water. On the 21st and 35th days of the experiment, when histolomorpfology of ileum and jejenum were examined, it was observed that villus height, crypt depth and villus height: crypt depth ratio were not affected by rose water addition. On the 21st day of the study, ileum and jejenum and on the 35th day of the study, ileum villus heights were positively affected by the addition of rose water numerically. In conclusion, hot carcass weight and intestinal health were positively affected by rose water. However, performance and some internal organ weights were not affected.

Please cite this paper as follows:

Yıldız, G., Durna Aydın, Ö. and Bayraktaroğlu, A. G. (2020). The Effect of Rose Water (*Rosa damascena mill*) Supplementation in Broiler Rations on Growth Performance, Some Carcass Parameters and Intestinal Histomorphology. *Alinteri Journal of Agriculture Sciences*, *35*(1): 36-43. doi: 10.28955/alinterizbd.713854

Introduction

The use of antibiotics as a growth factor in farm animals provides significant economic benefits (Jetacar, 1999; Baurhoo et al., 2009). But the long-term use of antibiotics leads to an increase in resistance to antibiotics in bacteria (Smith et al., 2003). This situation concluded with it becoming more difficult to treat bacterial infections. For these negative reasons, the use of antibiotics as a growth factor in animal feed have beenrohibited. As a result of the ban on the use of antibiotics and other growth factor chemical substances, the search began for other alternative feed additive substances (Baurhoo et al., 2009; Su et al., 2009). Prebiotics, probiotics, enzymes, organic acids, plant extracts, and humates have been used as feed additives. Because they are environmentally friendly, they do not adversely affect animal and human health, and they increase the quality and quantity of products obtained (Karademir and Karademir, 2003; Kutlu and Serbester, 2014).

* Corresponding author
E-mail address: odurna36@gmail.com

Aromatic plants and their extracts caught the attention of the science world in the search for new feed additive substances. Plant extracts come to the fore with their antifungal, antibacterial, antiviral, antioxidant and anti-lipidemic properties. (Svoboda and Hampson, 1999; Lambert et al., 2001). Because of this, in our study was used rose water acquired from roses belonging to the species *Rosa damascena Mill* found in Burdur (Lisinia) in Turkey.

Rosa damascena Mill is a plant native to Europe and Asia, particularly the Middle East, that belongs to the *Rosaceae* family (Ghahreman, 2001). Rosa damascena Mill is the most important species in the production of rose oil. The main rose oil producers in the world are Turkey and Bulgaria (Baydar et al., 2004). The main components of the essential oil belonging to the *Rosa damascena* plant are *B-citronellol* (23%), *nonadecane* (16%), *geraniol* (16%), and *heneicosane* (5%) (32). Various phytochemical contents were isolated from the leaves and petals of *Rosa damascena*, which contains flavonoids, glycosides, terpenes, and anthocyanins (Schiber et al., 2005). *Rosa damascena's* primary active components *are kaempferol, quercetin, gallic acid, cyanidin 3, 5, D-glycoside. B-citronellol, nonadecane, geraniol, nerol, and* kaempferol are the *Rosa damascena* flower's volatile fatty acid's primary chemical components (Loghmani-Khouzani et al., 2007).

Roses are antiseptic, antispasmodic, antiviral, and antibacterial (Boskabady et al., 2011). Rose water was used among the public for medical purposes. It is believed that rose water had healing effects in the instances of many diseases like chronic bronchitis, asthma, skin conditions, cancer, ulcers, and wrinkles (Sharafkandy, 1990; Mirheydar, 1993). Rose oil showed no toxicity or adverse effects when taken orally (Kirov and Bainova, 1999).

In recent years, several studies were conducted focused on the aromatic plants and their extracts. However, in the literature conducted research, there is little information about the performance and intestinal histomorphology parameters of the use rose water in broiler diets. Based on the previously reported favorable effects of plant and its extract, the current study was designed to investigate the effects of different levels of rose water on growth performance, some carcass parameters and intestinal histomorphology of broiler rations.

Materials and Methods

This study was carried out with the permission of the Ankara University Animal Experiments Local Ethics Committee (Decision No: AU-HAYDEK /2016-15-151) report.

Animals, Experimental Design and Feed

A total of 216 day-old chicks (Ross 308 male) were randomly divided into 3 groups of 72 chicks each regardless of gender. Each group was randomly divided into 6 subgroups of 12 chicks each. The rations were based on corn-soybean meal and were offered to the animals from during experimental period (Table 1). All diets were formulated to NRC (1994) nutrient recommendations. Ration nutrient analyses were performed according to AOAC (2000). The animals were fed with corn, soybean meal basal ration and trial continued for 35 days. Each subroups was equipped with manual feeders and automatic nipple drinkers. Water and feed (in mash form) were given *ad libitum*. The house temperature was monitored thermostatically throughout the study. The temperature, which was 32 °C -35 °C on the first day, was gradually lowered and maintained at 22 °C for the last two weeks. Artificial light program as carried out as in commercial conditions (23 h of light throughout the experiment for per day). While the control group (C) was fed with basic ration, the experimental groups were fed respectively with 2% rose water (RW1), and 4% rose water (RW2) added to the basical diet. Rose water is a by product of rose oil production (Lisinia Nature, Burdur, Turkey). Rose water taken from the production factory was added to the ration after dilution of 100 times. The volatile fatty acid profile of the rosewater used in the study is shown in Table 2.

Table 1. The composition of the rations used in the study (%)1

Ingredient	Broiler starter 0-14. days	Broiler grower 15-28. days	Broiler finisher 29-35. days
Corn	51.00	52.25	56.45
Soybean (Full fat), 38%	19.62	18.00	14.00
Vegetable oil	1.00	2.00	3.00
Soybean meal, 48%	24.00	24.00	23.00
DCP	2.40	2.00	2.00
Limestone	0.8	0.85	0.85
Bicarbonate	0.10	0.10	0.10
Salt	0.25	0.25	0.25
DL-Metiyonin	0.37	0.25	0.15
L-lizin	0.2	0.10	0
Vitamin premix[2]	0.10	0.10	0.10
Mineral premix[3]	0.10	0.10	0.10
Anticoccidial	0.06	-	-
Total	100.00	100.00	100.00
Chemical composition, calculated			
Crude protein, %	22.01	21.56	20.03
ME, kcal/kg	3099	3158	3219
Ca, %	1.01	0.92	0.91
Total P, %	0.5	0.44	0.44
Methionine + Cysteine, %	1.09	0.96	0.82
Lysine, %	1.44	1.33	1.14
Analysis Values:			
ME, kcal/kg	3131	3153	3200
Crude protein, %	23.45	21.70	19.60
Ca %	1.04	1.00	0.93
Total P %	0.53	0.50	0.48

[1]As-fed basis.
[2]Provided per kilogram of complete diet: vitamin A, 12,000 IU; vitamin D3, 2,500 IU; vitamin E, 40 IU; vitamin K3, 5 mg; thiamin, 2.5 mg; riboflavin, 6 mg; pyridoxine, 5 mg; pantothenic acid, 15 mg; niacin, 25 mg; folic acid, 1 mg; biotin, 50 μg; vitamin B12, 20 μg.
[3]Provided per kilogram of complete diet: Cu, 5 mg; I, 1 mg, Co, 200μg; Se, 150 μg; Fe, 60 mg; Zn, 60 mg; Mn, 80 mg. Folic Acid 1.000 mg kg^{-1}, Biotin 50 mg kg^{-1}, Copper 5.000 IU kg^{-1}, Iodine 1.000 IU kg^{-1}, Cobalt 200 mg kg^{-1}, Selenium 150 mg kg^{-1}, Iron 60.000 mg kg^{-1}, Zinc 60.000 mg kg^{-1}, Mangan 80.000 mg kg^{-1}.

Table 2. Essential oil acid profile of rose water commercial product (the values are taken from the production facility)

Ingredient	%
Linalool	0.5
B-citronellol	**34.9**
Nerol	6.8
Geraniol	14.1
Eugenol	2.5
Farnesol	9.3

Growth Performance

In study, live weights (LW) were recorded for each subgroup weekly. Live weight gain (LWG) was determined by the difference between these measurements. Each subgroup's feed intake (FI) of animals was recorded weekly and used for the calculation of the feed conversion ratio (FCR).

Carcass Characteristics Parameters Analysis

On the 35th day of the study, one chick from each subgroup was randomly chosen. From each subgroup, one animal was cut off with a suitable method for the determination of the carcass parameters. Carcasses were weighed to determine hot carcass weights after cutting. Carcass composition data were expressed as a percentage of LW. The hot carcass weight is calculated by the following formula:

Hot Carcass Yield, % = (Hot Carcass Weight, g / Live, Weight g) x 100 (1)

Sampling Procedures

On the 21st and 35th days of the experiment, one bird from each subgroup was randomly selected. Birds were slaughtered cut off with a suitable method and the intestinal tract was removed immediately. The tissue samples for histomorphological analysis were taken from the jejunum and ileum. To ensure the uniformity of samples, approximately 2 cm length of the mucosal segments of jejunum and ileum was excised as follows: 8 cm proximal to Meckel's diverticulum (jejunum), and 8 cm proximal to the ileo-cecal junction (ileum), respectively.

Histomorphologic Measurements

Tissue samples were fixed in 10% neutral buffered formaline for 24 h and washed with tap water subsequently dehydrated in graded ethanol solutions, cleared with xylol and embedded in paraffin, respectively. Intestinal segments were sectioned at the thickness of 5 µm with microtome. Cross sections were prepared and stained with Mallory's triple stain modified by Crossman in order to determine the intestinal morphometry (Culling et al., 1985). Villus height was measured from the top of the villus to the crypt mouth, and crypt depth was defined as the depth of the invagination between adjacent crypt mouths. Villus width was measured at the bottom of the villus (Sakamoto et al., 2000). Histological sections were examined under light microscope (Leica DM 2500, Leica Microsystems GmbH, Wetzlar, Germany) and photographed with Leica DFC450 (Leica Microsystems, Heerbrug, Germany) digital microscope camera. The images were evaluated using ImageJ software (Image J, US National Institutes of Health, Bethesda, MD, USA).

Statistical Analysis

The one-way analysis of variance (ANOVA) method was used for the statistical calculations of the groups and a suitable post hoc test (Duncan's test) was used for the determining yhe importance of the differences between the groups. The statistical analysis was done with the SPSS software package (SPSS, 2011).

Results

The effect of using 2% and 4% doses of rose water use in broiler rations on the parameters of LW, LWG, FI and FCR is given in Table 3. On the 7th and 28th days of the experiment, the LW value among the groups was adversly significant ($p < 0.05$). LWG values among the groups were adversly significant in the first and fourth weeks of the experiment ($p < 0.05$). FI values between the groups were statistically significant in the third week of the experiment ($p<0.05$). In the mentioned week, the lowest feed intake value belongs to the RW1 group. The feed conversion ratio (FCR) among the groups at the 3rd week of the experiment was found to be adversly significant ($p<0.05$). In the mentioned weeks, the lowest feed conversion ratio value belongs to the control group. At the end of the experiment, the use of different doses of rose water in rations did not statistically affect the LW, LWG and FI ($p> 0.05$). However, on the 35th day of the study, FCR value was found to be significant among the groups ($p<0.05$). Feed conversion ratio was the lowest in the control group and the highest in the RW2 group.

The effect of using 2% and 4% doses of rose water use in broiler rations on the parameters of carcass yield, internal organ weights, and 100 g live weight ratios is given in Table 4. In the study, the value of hot carcass weight was positively influenced by the increased doses of rose water ($p<0.05$). Some internal organ weights are no affected by the addition of 2% and 4% rosewater (*Rosa damascena mill)* while hot carcass weight was positively affected ($p<0.05$). The values among groups were not statistically significant in terms of organ the ratio of live weight for these per 100 grams ($p> 0.05$).

Histomorphological measurements of jejunum and ileum at 21st and 35th day of the experiment are given in Table 5. On the 21st and 35th day of the experiment, when histology of ileum was examined, it was observed that villus height, crypt depth and villus height:crypt depth ratio were not affected by rose water addition ($p> 0.05$). However, on the 21st day of the study, ileum and jejenum and on the 35th day of the study, ileum villus heights were positively affected by the addition of rose water numarically.

Table 3. The effect of dietary supplementation of rosewater on the LW, LWG, FI and FCR in the broiler chickens (g)

	Control		RW1		RW2		Signifiance
Performance Parameters	$\bar{x}$	S $\bar{x}$	$\bar{x}$	S $\bar{x}$	$\bar{x}$	S $\bar{x}$	P
Live Weight, g Days							
0	41.78[a]	0.02	41.13[b]	0.08	41.07[b]	0.05	**0.000*** **
7	152.49[a]	1.78	141.69[b]	2.38	142.60[b]	1.39	**0.002*** **
14	389.80	5.11	389.82	4.77	395.46	3.31	0.598
21	828.06	6.53	825.31	5.15	808.81	9.42	0.162
28	1451.39[a]	16.71	1400.38[ab]	20.60	1353.09[b]	34.89	**0.047***
35	2186.07	39.30	2112.91	23.11	2102.35	39.76	0.215
Live Weight Gain, g, Days							
0-7	110.71[a]	1.77	100.56[b]	2.39	101.53[b]	1.38	**0. 003*** **
7-14	237.31	5.97	248.12	6.38	252.85	3.70	0. 155
14-21	438.26	9.39	435.49	3.57	413.34	9.54	0. 085
21-28	623.33[a]	13.39	575.06[ab]	16.81	544.28[b]	28.30	**0. 047***
28-35	734.68	36.20	712.53	16.86	749.26	27.94	0. 657
0-35	2144.29	39.31	2071.78	23.13	2061.28	39.72	0. 220
Feed Intake, g Days							
0-7	142.25	3.69	138.66	4.27	130.58	2.96	0.105
7-14	387.16	5.83	394.11	14.57	418.33	3.9	0. 073
14-21	605.25[b]	18.99	710.02[a]	16.69	687.38[a]	19.58	**0. 004*** **
21-28	946.08	20.64	928.26	30.06	885.03	20.74	0.220
28-35	1286.99	45.27	1174.26	32.25	1230.27	38.81	0.160
0-35	3367.75	66.42	3332.17	49.08	3340.93	62.27	0.909
Feed Conversion Ratio Days							
0-7	1.28	0.01	1.38	0.04	1.28	0.03	0. 130
7-14	1.63	0.04	1.54	0.05	1.61	0.01	0. 237
14-21	1.38[b]	0.04	1.62[a]	0.03	1.66[a]	0.05	**0. 001*** **
21-28	1.51	0.02	1.61	0.01	1.64	0.06	0. 107
28-35	1.76	0.04	1.64	0.02	1.64	0.04	0.098
0-35	1.56[b]	0.01	1.61[ab]	0.01	1.62[a]	0.01	**0.041***

Statistically not significant (p >0.05). The mean ($\bar{x}$) and standard error ($S\bar{x}$) values of 6 subgroups in each group. a, b,c: Differences between the mean values of different letters in the same row are statistically significant * (P <0.05), *** (P <0.01) Groups; C: Control, RW1: 2% rose water added to basal ratio, RW2: 4% rose water added to basal. ratio

Table 4. Effects of dietary supplementation of rosewater on the carcass yield, visceral organ weights and 100 g live weight in the broiler chickens

Groups	**C**			**RW1**		**RW2**		
Carcass parameters	x̄	Sx̄		x̄	Sx̄	x̄	Sx̄	P
Carcass weight	1589.41[b]	88.45		1812.33[a]	55.14	1853.8[a]	50.26	**0.029***
Liver weight	50.54	4.29		49.99	1.02	51.45	2.61	0.941
Heart weight	12.64	1.06		12.62	0.71	12.49	0.79	0.991
Spleen weight	2.37	0.32		3.06	0.23	2.79	0.26	0.245
Bursa Fabricius weight	3.80	0.42		4.79	0.53	4.93	0.41	0.204
Abdominal fat weight	27.41	2.32		27.20	3.74	25.78	1.45	0.897
Carcass ratio g/ 100 g BW	68.09	4.37	69.97	69.97	0.69	70.24	0.40	0.812
Liver ratio g/ 100 g BW	2.16	0.19	1.93	1.93	0.05	1.94	0.06	0.344
Heart ratio g/ 100 g BW	0.54	0.05		0.48	0.01	0.47	0.03	0.442
Spleen ratio g/100 g BW	0.10	0.013		0.12	0.007	0.10	0.009	0.518
Bursa Fabricius ratio g/	0.16	0.01	0.18	0.18	0.01	0.18	0.01	0.605
Abdominal fat ratio g/ 100g CA	1.17	0.10		1.04	0.12	1.04	0.08	0.425

Statistically not significant (p >0.05). The mean ($\bar{x}$) and standard error ($S\bar{x}$) values of 6 subgroups in each group. a, b,c: Differences between the mean values of different letters in the same row are statistically significant * (P <0.05), *** (P <0.01) Groups; C: Control, RW1: 2% rose water added to basal ratio, RW2: 4% rose water added to basal ratio.

Table 5. Effect of rose water supplementation on histomorphology of ileum and jejunum on the 21st and 35th days of the trial (µm)

Histomorphology Parameters	C		RW1		RW2		
	x̄	Sx̄	x̄	Sx̄	x̄	Sx̄	P
Ileum 21							
Ileum villus height (µm)	683.52	33.95	718.24	37.11	738.17	27.31	0.527
Ileum crypt depth (µm)	170.38	15.12	146.33	3.66	143.00	7.98	0.170
Ileum villus height/crypt depth	4.13	0.29	4.85	0.35	5.21	0.25	0.053
Jejenum 21							
Jejenum villus height (µm)	1017.28	77.20	978.06	61.50	1100.39	85.83	0.520
Jejenum crypt depth (µm)	196.28	12.71	163.39	12.80	175.17	3.86	0.120
Jejenum villus height/crypt depth	5.27	0.45	6.22	0.75	6.25	0.40	0.387
Ileum 35							
Ileum villus height (µm)	938.94	64.96	971.11	64.51	984.11	49.82	0.863
Ileum crypt depth (µm)	157.17	15.78	170.89	25.32	181.06	12.26	0.668
Ileum villus height/crypt depth	6.11	0.40	6.18	0.84	5.56	0.45	0.729
Jejenum 35							
Jejenum villus height (µm)	1378.89	38.15	1265.61	81.77	1302.17	34.19	0.366
Jejenum crypt depth (µm)	201.33	7.89	202.72	13.13	218.33	15.22	0.557
Jejenum villus height/crypt depth	6.90	0.32	6.44	0.69	6.08	0.40	0.522

Statistically not significant (p >0.05). The mean ($\bar{x}$) and standard error ($S\bar{x}$) values of 6 subgroups in each group. Groups; C: Control, RW1: 2% rose water added to basal ratio, RW2: 4% rose water added to basal ratio

Discussion

Medicinal and aromatic plants in broiler feeding, increased appetite, stimulation of digestion, daily live weight gain, improved feed use and against pathogenic microorganisms in the intestines of broilers by showing strong inhibitory effect, contribute greatly to the formation of a microflora suitable for digestion and health (Dalkılıç et al., 2005). The use of aromatic plants and extracts in animal diets has a positive effect on performance. Essential oils stimulate the digestive system of animals and increase the efficiency of digestive enzymes (Simsek et al., 2005). Due to these properties, essential oils have a positive effect on performance parameters. Further studies are needed to demonstrate the effects of the volatile fatty acids in *Rosa damascena Mill* and its extracts on the performance and intestinal health depending on their effective doses.

In our study in the period of 0-35 days, it was observed that the use of rosewater in broiler diets did not affect LW, LWG and FI, but FCR values increased values. In the study, rose water was added to the groups, LW values were close to each other on the 14th, 21st and 35th days of the study (p> 0.05). However, the LW value of the study at day 28 was lower than the control group (p<0.05). In a study that used Rosmarinus officinalis in broiler diets of 100 mg kg^{-1} and 200 mg kg^{-1}, the results indicated that LW was lower than the control group (Yildirim et al., 2018). This study is the current study supporting the results of our study. However, there are findings about how different aromatic plants and extracts positively affect live weight in broiler rations (Zhang et al., 2013; Hasan et al., 2016). The difference in the results obtained from these studies can be explained by housing conditions, environmental factors, and plant-dependent factors like the type of plant extracts used, dose, containing volatile fatty acids, active substance rate and interaction.

In our study, the addition of different doses of rosewater to broiler rations was no have a positive effect on live weight gain between 21-28 days (p<0.05). There was no significant difference between the groups in 0-35 days (p>0,05). Although there was no negative effect of the high dose throughout the total duration of the study in terms of LWG, it was found lower compared with the control group on the other days. At the beginning of the study, in terms of LWG, RW1 and RW2 groups were found to be lower in the 1.51% and 1.65% levels than the control group, respectively. LWG was low at levels of approximately 3.04% and 3.52%, respectively, at the end of the study. It was reported that there was no effect of any kind on live weight increase in studies where different plant extracts were used (Toghyani et al., 2010; Amad et al., 2011; Farahat et al.; 2017). On the other hand, there are many studies that the use of herbal extracts as a feed additive substance in rations positively affects increases in live weight (Khattak et al., 2014; Wang et al., 2015). The difference between the results is assumed to depend on the effective dose and the active ingredient content of the rose water used and the care feeding conditions.

In our study, the addition of different levels of rosewater in broiler rations, on the 14th-21st days of study increased feed intake. However, there was no significant effect at the end of the experiment. The addition of aromatic plants in broiler rations did not statistically affect the intake of feed, and this find is consistent with the 35-day feed intake results from our study. (Khattak et al., 2014). In a study where Camellia oleifera seed extract was used at a level of 300 mg/kg that was not affected feed intake (Dong et al., 2016). On the other hand, there are studies in which the use of extracts increased (Wang et al., 2015) and decreased feed intake (Yildirim et al., 2018). This situation can be explained as the aromatic plant extract used stimulating feed intake in the animals.

On the 14th-21st and 0th-35th days of our study, in terms of feed conversion ratio, the RW1 and RW2 groups were higher than the control group. Studies using different plant extracts confirm that feed conversion rate is adversely affected by

increasing doses (Karangiya et al., 2016). These studies are in line with our findings. There are many studies, using in broiler diets of various aromatic plants and extracts, the feed conversion ratio did not affect (Franciosini et al., 2016; Yildirim et al., 2018) and were affect (Durrani et al., 2006; Kumari et al., 2007; Rezaei et al., 2015). The differences observed between the results are thought to depend on the conditions of the poultry, the moisture content of the feed, the environmental factors and the type of plant extracts used, the dose, the amount of volatile fatty acids.

In our study, the values among groups were not statistically significant in terms of organ weight and the ratio of live weight for these per 100 grams. Studies in which the *Rosmarinus officinalis* plant oil and essential oil are compared with probiotics support our findings (Bugdayci and Ergun, 2011; Ciftci et al., 2013). Contrary to these studies, it was reported in studies where (Ocimum sanctum) tulip petal extract was used that some organ weights increased (Hasan et al., 2016). Hot carcass weight is the highest in the groups to which additions of rosewater were made at different levels in the rations, and the control group had the lowest value. It was seen that the addition of rosewater positively affected hot carcass weight directly proportional to dosage increase. It was reported that hot carcass weight was positively affected in the study where Tinospora cordifolia, Azadirachta indica ve Andrographis paniculata were used as three different aromatic plants that exhibited similar effects as the findings of our study (Shraddha et al., 2017). Contrary to these results, there are other studies with regard to hot carcass weight not being affected by the addition of plant extracts extracts (Ciftci et al., 2013; Wang et al., 2015). According to the results of the study, the heart, liver, and abdominal fat weight did not increase in the testing groups, despite the high carcass weight, and spleen weight and *bursa Fabricius* weight increased slightly. The differences observed between the results can be explained with considerable diversity that the plant type of the extracts, region where they were acquired, essential oils they contain, and biological active substance contents show.

Morphological changes in the small intestine, villus height, villus width and villus height crypt depth ratio (VH: CD) may improve poultry performance by improving nutrient digestion and absorption (Calik and Ergün, 2015**)**. In our study, on the 21st and 35th day of the experiment, when histology of ileum was examined, it was observed that villus height, crypt depth and villus height:crypt depth ratio were not affected by rose water addition into broiler diet. However, on the 21st day of the study, ileum and jejenum and on the 35th day of the study, ileum villus heights were positively affected by the addition of rose water numarically. In literature review, no studies have been found which the effects use of rose water and its extract of in broiler diets on intestinal histomorphology. Therefore, it will be discussed with different studies that other aromatic plants and extracts are used as feed additive. In the study of Ghazanfari et al. (2015), they indicated that the use of aromatic plants and their extracts did not affected the mucosal morphology of the jejunum. The result is consistent with our study. However, in the study conducted by Boka et al. (2014), the investigators used 0%, 1%, 2% and 3% black cumin in the laying hens and reported that 2% black cumin increased significantly the villus height, crypt depth, and VH/CD parameters in the jejunum. In a study in which cashew leaf extract was used in Jawa Super chicks, villus length and crypt depth were positively affected (Setiawan et al., 2018). The differences observed between the results are thought to be caused by differences in plant species, obtained regions, essential oils and biological active substance content. In order to explain the effect level of broiler feeding histomorphological parameters from rosewater, many studies should be performed in this field.

In conclusion, hot carcass weight and intestinal health were positively affected by the addition of 2% and 4% rosewater (*Rosa damascena mill)*. However, performance and some internal organ weights were not affected. The use of rose water in broiler rations may increase profitability in the poultry industry by favorably affecting the hot carcass and intestinal health. Therefore, it was concluded that rose water can be used as feed additive in broiler rations. In the literature review, there is little information about the performance and intestinal histomorphology parameters of the use rose water in broiler feeding. New studies to be conducted with winged animals in different doses and species will shed light on the understanding of the potential of being able to use rosewater as a feed additive substance. Our study is a good literature for further studies.

Acknowledgements

We would like to thank Mr. Vet.med. Öztürk SARICA, who gave us the rosewater he produced in "Lisinia Nature". We would like to thank Res. Assist. Taner AYDIN for his support on grammer correction.

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