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The Effect of Plant Extracts Added to Drinking Water on Performance of Broiler Chickens

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Abstract: In this study, effect of plant extracts added to broiler chickens drinking water on performance were investigated. For this purpose, 100 broiler chicks (Ross-308) were divided into 4 treatment groups. Each treatment group consisted of 5 replicates, each containing 5 animals. Three days a week, the "commerical product" (Cardiomax®) with 94%plant extract and 6% organic acit (lactic, acetic and formic acid) was added to drinking water of treatments groups at rates of 0%, 0.05%, 0.1% and 0.2% respectively. The difference between treatment groups in terms of live weight characteristics on days 14, 21 and 28 of broiler chickens was statistically significant ($p < 0.05$). Live weight gain was significantly determined on days 14^{th} and 28^{th} ($p < 0.05$). Feed conversion ratios were also found to be statistically significant between treatment groups between 1-5 weeks ($p < 0.05$). There were no significant differences in carcass characteristics and average feed consumption per animal ($p > 0.05$).

Keywords: Herbal extact, Broiler

Introduction

As in almost every branch of livestock sector, it is reported that antibiotics feed growth, increase yield, regulate feed utilization and have protective effects against diseases in the feeding of broiler chickens (Tekeli, 2007; Babaoğlan and Kutlu, 2008; Bilal et al., 2008). However, in recent years, the use of antibiotics in animal nutrition has been prohibited by the European Union (Directive 70/524/EEC and 1831/2003/EC) because of the direct or indirect negative effects that may pose a risk to human health (Babaoğlan and Kutlu, 2008).

Since 01.01.2006, the use of antibiotics as a growth factor has been prohibited in our country. Following the prohibitions, the use of plant extracts in animal feeding was more intense as an alternative to antibiotics, improving performance for use in animal feed or drinking water, effective against stress factors, regulating metabolism, providing appetite, providing resistance in the body and many similar effects. Some of the studies have positive results (Spring et al., 1996; Güler and Dalkılıç, 2005; Karslı and Dönmez, 2007; Adıyaman and Ayhan, 2010; Çetin, 2012).

There are reasons why plant extracts are used in animal rations or in drinking water without treatment purpose. The main reason is the prevention of negative consequences such as residual occurrence in the product or the formation of resistant bacteria as a result of the use of antibiotics. Besides, minimizing the negative effects of stress factors, having effects on metabolism, supporting role in respiratory, circulatory and immune system should be emphasized.

In many studies conducted for this purpose, it has been reported that as a result of alternative uses of plant extracts to antibiotics, secretions related to digestion increase and blood circulation is stimulated significantly and decreases in the level of disease-causing bacteria (Buchanan et al., 2008). The use of aromatic plants in the feeding of broiler chickens and laying hens has become widespread due to all these positive effects.

In nature, 30% of the plant family contains 30% essential oil. However, 3000 of the 9000 plant species found in Turkey is an aromatic plants and spice plants is drug category (Adıyaman and Ayhan, 2010). This means that

our country has a very good plant diversity and potential in terms of obtaining plant extract products and using them in animal feeding and breeding.

In this study to be used in the contribution product (Cardiomax®) in our country, abundant found in plants such as Angel grass "A*ngelica sinensis"*, Hawthorn *"Crataegus oxyacantha*' Walnut *"Juglans regia"* Fennel *"Foeniculum vulgare"*, and Anise *"Pimpinella anisum*" extracts obtained from the extract are found in 94%.

Numerous scientific studies on the use of aromatic plants and their volatile fatty acids against antibiotics and antiparasitics in animal nutrition are available.

According to Çetin (2012), the use of a species of wormwood (A. Annua) in 10% and 20% of broiler chickens and laying hens has prevented the development of parasites in broilers infected with coccidiosis. However, it was found that there was an increase in feed consumption and live weight, and there was no difference in the groups fed with commercial feed in laying hens (Brisibe et al., 2008).

In another study, the effect of virginamycin (25 ppm) and thyme essential oil (100 ppm) added to the quail rations in a study with antimicrobial effect of oregano essential oil was determined. A significant increase in feed consumption and live weight of the group added thyme essential oil was reported (Parlat et al., 2005).

Kaya and Turgut (2012), in their study, have added sage, thyme and mint extract to the rations of the laying hens in different proportions, resulting in significant results in crust weight, fracture resistance and egg yield. In addition, they concluded that plant extracts have a positive effect on some performance and quality components.

Karslı and Dönmez (2007) reported that they obtained insignificant results in growth performance and feed consumption in their study of the effect of plant extract added to broiler rations under temperature stress. In the study, the effect of plant extracts (Cardiomax®) added to drinking water on the performance of broiler chickens was investigated. It was emphasized that plant extracts are important for ecological production related to product quality as well as animal nutrition and product enhancing effects.

As a result, it is aimed to determine the effect of commercially available plant extracts on the performance of the animals by comparing the effect results of different levels in addition to the dose recommended as feed additive.

Method

In this study, the effects of commercial product (Cardiomax®) containing plant extracts on the drinking water of broiler chicks were investigated. The study was carried out in the broiler chickens in Hatay Mustafa Kemal University, Faculty of Agriculture Livestock Research and Application Farm.

The experimental material consisted of 100 mixed chickens of female male age group belonging to Ross-308 genotype. Broiler chickens at their daily age, specially prepared for them to the end of the trial has been kept. In the study, feeders, drinking bowls, cutting tools and equipment in the farms of Hatay Mustafa Kemal University Research and Application Farm were used.

During the research, the animals were grown on the ground consisting of rough wood shavings and exposed to lighting for 24 hours. Broiler chicks were divided into 4 groups as control group and 3 treatment groups. Each treatment group consisted of 5 replications and 5 broiler chicks were found in each repetition.

The research was continued for 42 days. Feed additive containing plant extract (Cardiomax®) was added to drinking water of broiler chickens 3 days a week. The rate of plant extract was determined as 0%, 0.05%, 0.1% and 0.2%, respectively.

Broiler chicks were fed with broiler chick feed (23% crude protein, 3000 Kcal/kg ME) for the first ten days. In the following days, the animals were fed freely with broiler growth feed (22% crude protein, 3100 Kcal/kg ME) between 11-30 days and with broiler feed (20% crude protein, 3000 Kcal/kg ME) between 31-41 days.

The product consists of 94% plant extract (Angel grass "A*ngelica sinensis"*, Hawthorn *"Crataegus oxyacantha*' Walnut *"Juglans regia"* Fennel *"Foeniculum vulgare"* and Anise *"Pimpinella anisum*") and 6% organic acid

(lactic, acetic and formic acid). This product, the trade name Cardiomax®, has a supportive effect on the heart function and circulatory system.

Weekly feed consumption, live weight, live weight gain and feed conversion rates were recorded during the trial period. The live weights of broiler chickens were determined with a precision scale of 10 g per week. Feed consumption was recorded on a weekly basis and average daily feed consumption was calculated. The feed conversion rate was determined by the ratio of feed amount consumed by the animal during the fattening period to the body weight.

At the end of the experiment, 10 broiler chickens (5 females, 5 males) from each group were fasted for 10 hours and their live weights were determined and slaughtered. Weights of edible internal organs (heart, liver, gizzard), abdominal fat and carcass fragments (Thigh+drumstick, neck, chest, wing and back) were determined. Cold carcass weight was determined from carcasses kept at + 4 ^{0}C for 24 hours after cutting. The feather path was applied to the feather plucking machine. Weighing the edible internal organs of animals and also determined the amount of hot carcass weights and abdominal fat. Cold carcass weight was determined by keeping the carcasses at +4 ^{0}C for 24 hours. Cold carcass weight was determined by keeping the carcasses at +4 ^{0}C for 24 hours.

Mathematical model of experiment: $Y_{ij} = \mu + \alpha_i + e_{ij}$, in the form.

In the model,
Y_{ij}: is the recorded yield of j animal in the treatment group,
μ: population average,
α_i : the effect of treatment,
e_{ij} : error

The statistical analysis of the study was evaluated with SPSS package program (Kinnear and Gray, 1994).

Results and Discussion

The datas on the live weight of broiler chickens are shown in Table 1. As can be seen, the difference between the treatment groups was found to be statistically significant on the 14th, 21st and 28th days of the experiment (P <0.05). Although the difference was not significant (P> 0.05) on the 35th and 42nd days of the study, it was determined that the highest numerical value belongs to the group given 2534.13g and 2% herbal extracts.

Table 1. The effect of plant extracts added to drinking water on live weight (g) of broiler chickens

				Days					
		N	Hatching weight	7	14	21	28	35	42
Group	% 0	25	44.79	163.06	320.20 a	748.04ab	1268.93 a	2136.25	2445.48
	%0,05	25	44.59	155.93	331.56 a	743.75a	1256.90 a	2099.75	2412.90
	%0,1	25	45.88	160.98	351.71 b	766.78ab	1234.80 a	2088.60	2409.89
	%0,2	25	45.75	159.53	355.30 b	787.25b	1375.95 b	2112.12	2534.13
Total		100							
SED			0.35	1.33	3.75	6.76	12.77	18.06	21.02
P			0.124	0.287	0.001*	0.096*	0.000*	0.814	0.130

[a,b] Values with different letters within a column differ significantly (P<0.05)

Table 2. shows the average daily weight gains of broilers per week. According to this, a statistically significant difference was found between the treatment groups in the mean live weight increases determined between 8-14 and 22-28 days (P <0.05).

Table 2. The effect of plant extracts added to drinking water on daily live weight gain (g) of broiler chickens

			Days					
		N	0-7	8-14	15-21	22-28	29-35	36-42
Group	% 0	25	17.18	22.45a	61.12	74.64ab	123.90	121.57
	%0,05	25	16.05	25.13ab	58.88	73.30ab	120.40	120.85
	%0,1	25	16.49	27.38b	59.29	67.84a	121.84	125.92
	%0,2	25	16.26	27.94b	61.70	84.10b	109.73	128.57
Total		100						
SED			0.11	0.56	1.09	2.14	3.02	3.55
P			0.204	0.001*	0.766	0.058*	0.366	0.227

a,b Values with different letters within a column differ significantly (P<0.05)

When the average daily feed consumptions (Table 3.) were examined, it was found that the rates of plant extracts did not differ statistically between the groups (P> 0.05).

Table 3. The effect of plant extracts added to drinking water on daily average feed consuption (g) of broiler chickens

			Days					
		N	0-7	8-14	15-21	22-28	29-35	36-42
Group	% 0	25	18.28	40.23	89.56	135.78	178.45	221.14
	%0,05	25	19.78	45.47	92.24	140.14	175.74	225.38
	%0,1	25	20.12	43.87	90.78	132.34	174.89	218.17
	%0,2	25	18.47	48.42	102.48	142.57	175.82	229.78
Total		100						
SED			4.14	14.27	18.31	22.14	41.56	48.94
P			0.352	0.254	0.472	0.412	0.337	0.248

a,b Values with different letters within a column differ significantly (P<0.05)

Feed conversion rates are given in Table 4. In the first five weeks, a statistical difference was found between the treatment groups (P <0.05).

Table 4. The effect of plant extracts added to drinking water on feed conversion rate of broiler chickens

			Days					
		N	0-7	8-14	15-21	22-28	29-35	36-42
Group	% 0	25	1.06a	1.79b	1.46a	1.81b	1.45a	1.82
	%0,05	25	1.22b	1.80b	1.57b	1.91c	1.46a	1.86
	%0,1	25	1.23b	1.60a	1.53ab	1.95c	1.44a	1.73
	%0,2	25	1.14a	1.73b	1.66b	1.70a	1.66b	1.78
Total		100						
SED			0.02	0.06	0.12	0.10	0.18	0.09
P			0.001*	0.000*	0.021*	0.025*	0.003*	0.214

a,b Values with different letters within a column differ significantly (P<0.05)

In the examination of carcass parameters and edible internal organs (Table 5. and Table 6.), it was concluded that plant extract rates did not make a statistical difference between treatments groups (P> 0.05).

At the end of the experiment, the weight of the hot carcass and cold carcass weights were determined to be higher than the other treatment groups due to the detection of live weight at 2534.13g in the treatment group containing the highest 2% plant extracts.

Table 5. The effect of plant extracts added to drinking water on carcass parameters (g) of broiler chickens

						Carcass parameters			
		N	Final live weight	Hot carcass weight	Cold carcass weight	Thigh + drumstick	Breast	Wing	Back
Group	% 0	25	2445.48	1834.11	1812.11	507.39	670.48	161.27	434.90
	%0,05	25	2412.90	1855.54	1814.36	510.84	651.77	156.77	440.38
	%0,1	25	2409.89	1831.51	1805.47	487.48	668.03	153.46	451.37
	%0,2	25	2534.13	1900.59	1858.79	506.94	679.68	167.10	450.62
Total		100							
SED			21.02	51.20	48.21	18.21	16.64	8.56	11.45
P			0.130	0.271	0.348	0.412	0.368	0.487	0.512

a,b Values with different letters within a column differ significantly (P<0.05)

Table 6. The effect of plant extracts added to drinking water on edible internal organs (g) of broiler chickens

			Edible internal organs			
		N	Heart	Liver	Gizard	Abdominal fat
Group	% 0	25	16.89	57.73	59.24	38.05
	%0,05	25	17.56	56.79	58.44	54.60
	%0,1	25	18.06	55.84	59.48	45.13
	%0,2	25	17.10	57.21	60.09	54.45
Total		100				
SED			0.23	0.37	0.66	5.65
P			0.288	0.361	0.873	0.213

a,b Values with different letters within a column differ significantly (P<0.05)

According to the results obtained from the study with broiler chickens, it was determined that as the ratio of plant extract increased between the treatment groups, the number of live weight and daily live weight increase was recorded numerically. On the 14^{th}, 21^{th} and 28^{th} days (Table 1.), there was a statistically significant difference between the groups on the 14^{th} and 28^{th} days (Table 2.) (P <0.05). In terms of feed consumption characteristics, except for the 35^{th} day, the numerical high consumption of the animals was determined in other weeks (Table 3.). This can be explained by the fact that the appetite of animals is positively affected by the increase in herbal extract rate. The increase in feed conversion rate with the increase in dose is due to the high feed consumption in the groups with high herbal extract rates. When carcass parameters were considered, no statistically significant difference was found between treatment groups (Table 5.).

Conclusion

In recent years, there have been unjustified and scientifically unreasonable criticism that broiler chickens are unhealthy. Commercially available broiler chickens are hybrids with superior yield characteristics, improved genetic structures and highest environmental sensitivity. These animals with high genotypic value give high quality and quantity of product in a short time when environmental conditions are provided which can best show their genetic potential. Feed is one of the most important environmental elements. By making improvements in the quality of feeds, it is known that protein and energy levels are given at levels appropriate to the needs of the animals and growth and development stimulating additives (antibiotics etc.) are used. Recently, the use of antibiotics has been limited and the use of herbal essences, oils and extracts has increased, which will not pose a risk to human health and will not cause any negative consequences.

The use of plant extracts has become widespread in recent years as alternative growth factor instead of antibiotics in poultry farming. In addition to increasing the digestive enzymes of herbal essences, fat and extracts, it has been reported at the end of studies conducted by many investigators that it provides significant

benefits from the internal organs of the animals, especially increasing liver function, appetite and feed consumption. (Şimşek ve ark., 2005; Alçiçek ve ark., 2003; Ather, 2000; Bassett, 2000).

On the other hand, after the field interviews, it was found that the breeders had the findings of reversing the linear relationship between weight gain and mortality in broiler chickens. However, in broiler breeding, it was stated that the use of 1 liter of plant extract for 10 tons of live weight 3 days a week, especially in male broiler chickens decreased after 28 days of ascites and hydropericard cases. Despite all this information, it is useful to carry out academic studies in order to reveal the effects of plant extracts in more detail.

In this study, it is aimed to determine the effects of plant extracts on performance by adding different levels of broiler chickens to drinking water (0%, 0.05%, 0.1% and 2%). According to the results, numerical improvements were observed in the performance of broiler chickens. In order to determine the physiological effects of herbal extracts in animals, parallel studies can be performed considering the applicability of different doses as well as efficiency periods and indoor climate characteristics.

Recommendations

The use of plant extracts instead of antibiotics in broiler production is important in order to get more healthy and high quality products.

Plant extracts have an indirect effect on the production of healthier products for humans as well as their direct effects such as stimulating growth, appetizing, improving feed and providing physiological comfort to animals.

Therefore, the use of herbal extract in animal nutrition and breeding should be encouraged and disseminated.

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