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The effect of Tarragon extract on performance, Carcass quality, Hematologic parameters and microbial flora of intestinal contents in Japanese Quail

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ABSTRACT

This research was conducted to investigate the effects of tarragon extract on performance, carcass quality and hematologic parameters in male Japanese quail over a period of 42 days. In this study, 360, one day old, male Japanese quail chicks are used in a completely randomized manner. 6 experimental treatments and 4 replications are performed on 15 quail chicks in each replication. Treatments in this study include: 1) The basal diet with antibiotics, 2) The basal diet without antibiotics, 3) The basal diet + 0.5% tarragon extract, 4) The basal diet +1% tarragon extract, 5) The basal diet +1.5% tarragon extract and 6) basal diet +2% tarragon extract. Performance-related characteristics, including feed intake, weight gain, and feed conversion ratio are measured weekly. The results indicate that the treatment containing 1.5% tarragon extract does not make a significant difference in feed intake compared with the control treatment. Also, in the treatment with 0.5% tangent extract showed no significant difference in weight gain compared with the control treatment. Conversion ratio was meaningful in some weeks. The best conversion ratio was related to the treatments containing 0.5% and 1% tarragon extract which did not have a significant difference with the control treatment over the whole period of the experiment. Investigation of the carcass characteristics shows that the treatment with 0.5% tarragon extract led to the highest carcass weight and breast weight. But no significant difference observed in the weight of the liver, heart, and thigh. There wasn't any significant difference in hematologic parameters either.

Keywords: Tarragon, Performance, Hematologic parameters, Carcass quality, Male Japanese quail

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INTRODUCTION

The poultry sector is an important part of the production and consumption of animal protein in developed and developing countries; over the past decade, about half of the meat production come from to this sector. Consumer demand for poultry meat is rising. This is due to the medical achievements and health advances in the poultry industry as well as the lower production price for this type of protein compared to the red meat [1].

Quail is one of the types of poultry that has attracted the attention of many producers. Basically, quails are wiry, strong and durable birds which have the ability to grow and reproduce in different climates. This ability comes from their high adaptability with a variety of environmental conditions. They are fast-growing birds and their sexual maturation is completed when they are 1.5 to 2 months of age. At this age the weight of the male and female birds is respectively around 200-180 and 250-200 grams [2].

Animal science researchers have always made great efforts to increase production in the shortest time and with minimum side effects. In recent decades, much attention has been focused on the use of dietary supplements in the diet of breeding animals to evaluate its products [3]. Nowadays, due to antibiotic resistance in poultry [4] and the effects on antibiotic resistance in poultry meat consumers [5], finding a suitable replacement [6] is more pertinent than before. On the other hand, the new methods of tracking antibiotic residues in carcasses increases the motivation of producing meat without antibiotics. Therefore, scientists are looking for alternatives that are safe and appropriate in poultry nutrition. Aromatic herbs and extracts of essential oils are a possible solution due to antimicrobial nature and stimulatory effects on the gastrointestinal tract. Extracts and plant seeds are used in seasonal foods and beverages and their beneficial effects are known for centuries. Tarragon is one of these useful plants. Tarragon stimulates the brain, nervous system, digestive system, circulatory system and the hormonal (endocrine) system. In other words, this plant by itself stimulates all the metabolic systems and thus enhances growth and immune function [7]. Therefore, it seems that the use of tarragon extract in the quail diet can affect the performance and characteristics of the carcass. In this research work the effects of different levels of tarragon extract in the diet on feed intake, weight gain and feed conversion ratio of Japanese quail are investigated. Also, the effects of different levels of tarragon extract on the characteristics of the carcass and hematologic biochemical parameters of Japanese quail are evaluated.

MATERIALS AND METHODS

This project was performed on 360 male, one day old, quail chicks in 6 experimental treatments. Each treatment consists of 4 replications in which each consisted of 15 quail. Initial mean body weight was 7.5 grams. Basal composition of the diet was balanced based on 3,000 kcal of energy, 22.5% protein, 1% calcium, 0.5% phosphorus and 0.16% sodium. Chemical composition of food materials is obtained according to the system [8]; and diets were adjusted based on the achieved chemical composition. Experimental treatments include sex treatments. First treatment includes basal diet with antibiotics; second treatment includes basal diet without antibiotics; third, fourth, fifth and sixth treatments include basal diet plus 0.5, 1, 1.5 and 2 percent tarragon extract respectively. In this research, live weight gain, feed intake and feed conversion ratio were measured in each of the treatments. The following subsections describe the parameters.

Average Live Weight

At the end of each week, each row of caged chickens, separately, were weighed 3 hours after the cessation of the seed. Live weight is found from the weight of each box, at the end of every period, divided by the number of birds.

$$AverageLiveWeight = \frac{\text{Weight of each box at the end of each period}}{Numberofbirdsineachbox}$$

Average Feed Intake

Food intake of each box was measured on a daily basis. At the end of each day, before weighing the chickens, the remaining seeds were collected from the feeders. Average intake of each chicken was investigated on different days. Overall, the average intake for each chicken is calculated from the following equation.

$$Averagefeedintake\ (grams) = \frac{\text{Food intake of each box at the end of each period (grams)}}{Numberofbirdsineachbox}$$

Feed Conversion Ratio

As mentioned before, the diet for each treatment designated separately and body weight of all chickens at the end of each period (initial and growing) was determined. Based on the above data, feed conversion ratio for each treatment is calculated using the following relation.

$$Feedconversionratio\ (weekly) = \frac{\text{Food intake at the end of each period (grams)}}{Weightgainattheendofeachperiod\ (grams)}$$

Study and Measurement of Carcass Characteristics

At the age of 45 days after being weighed, two birds of each experimental unit, that have the least weight difference with average weight of the unit, were selected and numbered. 12 hours of starvation before slaughter was considered.

Measurement of Blood Parameters
At the end of the experiment period (42 days), 2 birds from each experiment replication were selected and transferred to the veterinary laboratory. Blood samples are taken from underneath the wing of the bird and desired parameters were measured.

Methods of Data Analysis
All data collected during the experiment were analyzed using Excel software. Calculations for the average feed intake, weight gain, feed conversion ratio and density of hematological parameters are performed for the different treatments. Data analysis is performed using SAS software. Comparison of means is also conducted by using Duncan's multiple range tests at the significance level of 0.05. The project statistical model is as follows:

$$X_{ij} = \mu + T_j + e_{ij}$$

X_{ij}*:* Observation of the i^{th} iteration in j^{th} treatment
μ*:* Mean of all the data
T_j*:* The effect of j^{th} experimental treatments
e_{ij} *:* The effect of experimental error

RESULTS AND DISCUSSION

The results related to feed intake by quail chicks during different weeks of the breeding are presented in Table 1. As seen in the table, the difference in feed intake among the experimental treatments was significant only in the fifth week ($P<0.05$) but it was non-significant in other weeks ($P>0.05$).

In the fifth week, the control treatment with antibiotics had a significant difference with the treatments containing 0.5, 1 and 2% of tarragon. But the control treatment without antibiotics and the treatment containing 1.5% of tarragon did not have a significant difference with the control treatment containing antibiotics. Also, in the fifth week, the highest and lowest feed intakes were related to the treatment with antibiotics and the treatment containing 2% of tarragon, respectively.

Based on the results of this study, among the different levels of tarragon, the treatment containing 1.5% tarragon extract demonstrates the highest feed intake and does not have a significant difference with the control treatment. Tarragon extract, due to the presence of antimicrobial agents, has effects on the harmful bacteria of digestive system and improves the digestibility of the food. The results of the quail chicks weight gain during the weeks of breeding are presented in Table 2. As observed in the table, the difference in weight gain among experimental treatments is significant in the second week, the sixth week and the whole period ($P<0.05$).

In the second week, the control treatment with antibiotics has a significant difference with all other experimental treatments ($P<0.05$). The control treatment without antibiotics does not have a significant difference with treatments containing tarragon but it has a significant difference with the control treatment containing antibiotics. The highest weight gain is related to the treatment with antibiotics and the lowest weight gain, in numerical value, is related to the treatments containing 1.5 and 2 percent of tarragon.

In the sixth week, the control treatment containing antibiotics was significantly different with all the experimental treatments ($P<0.05$) and showed the highest weight gain. On the other hand, the lowest weight gain was related to the experimental treatment with 1.5 percent of tarragon extract. During the duration of the breeding period, the control treatment with antibiotic was not significantly different from the treatment containing 0.5 percent tarragon, but it showed a significant difference with the other treatments. The highest and lowest total weight gain during the period was related to the control treatment with antibiotics and the treatment containing 1.5 percent of tarragon, respectively.

The results obtained in this study indicate that the highest weight gain, for the entire duration of the experiment, among the different levels of tarragon extract, was related to the treatment containing 0.5 percent of tarragon, which was not significantly different from the control treatment. The results of consumed feed conversion ratio during different weeks of breeding are shown in Table 3. As can be seen in the table, the conversion factor is not

significantly different among the experimental treatments in the second week, the sixth week and the entire period (P<0.05).

Table 1. The effect the experimental treatments on feed intake (grams)

Treatment	Breeding Period (days)					
	7 - 14	14 - 21	21 - 28	28 - 35	35 - 42	The Period
Control with Antibiotics	85	131	176.25	191.5^{a}	225	808.75
Control without Antibiotics	85.75	130.87	162.5	183.75^{ab}	220.25	783.12
%0.5 tarragon	86.5	129.5	165.62	180.25^{b}	229.62	791.49
%1 tarragon	85.5	123.5	156.62	179.25^{b}	220.75	765.62
%1.5 tarragon	86.125	127.62	155.37	184.125^{ab}	217.75	770.99
%2 tarragon	83.75	126.62	160.75	175.125^{b}	221	767.25
SEM	2.89	4.18	10.53	5.59	6.19	20.89
P-value	0.699	0.166	0.079	0.01	0.118	0.083

Table 2. The effect the experimental treatments on weight gain (grams)

Treatment	Breeding Period (days)					
	7 - 14	14 - 21	21 - 28	28 - 35	35 - 42	The Period
Control with Antibiotics	45.75^{a}	50.87	49.37	48.62	52.87^{a}	247.48^{a}
Control without Antibiotics	37.75^{bc}	47.25	48.75	44.75	45.25^{b}	223.75^{b}
%0.5 tarragon	41.25^{b}	50.37	53.37	44.75	40.75^{bc}	230.49^{ab}
%1 tarragon	38.5^{bc}	45.25	49	45.5	43.5^{b}	221.75^{b}
%1.5 tarragon	34.125^{c}	53.62	48.125	43.125	36.62^{c}	215.62^{c}
%2 tarragon	34.125^{c}	49.25	48.5	45.125	42.37^{bc}	219.37^{bc}
SEM	2.96	4.55	3.67	3.45	4.04	14.63
P-value	0.0002	0.183	0.304	0.297	0.0007	0.035

Table 3. The effect the experimental treatments on feed conversion ratio

Treatment	Breeding Period (days)					
	7 - 14	14 - 21	21 - 28	28 - 35	35 - 42	The Period
Control with Antibiotics	1.87^{d}	2.58	3.61	3.99	4.26^{b}	3.27^{b}
Control without Antibiotics	2.27^{b}	2.76	3.33	4.11	4.86^{ab}	3.49^{a}
%0.5 tarragon	2.09^{dc}	2.57	3.11	4.03	5.39^{ab}	3.43^{ab}
%1 tarragon	2.21^{bc}	2.74	3.19	3.95	5.32^{ab}	3.45^{ab}
%1.5 tarragon	2.53^{a}	2.38	3.22	4.28	6.06^{a}	3.57^{a}
%2 tarragon	2.46^{ab}	2.59	3.32	3.87	5.27^{ab}	3.49^{a}
SEM	0.182	0.203	0.341	0.319	0.703	0.196
P-value	0.0008	0.23	0.323	0.463	0.036	0.006

Table 4. The effect the experimental treatments on blood parameters

Treatment	FBS	TG	Chol
Control with Antibiotics	315.25	234	204
Control without Antibiotics	318.25	238.75	204.5
%0.5 tarragon	316	254.5	202
%1 tarragon	308	275.25	200
%1.5 tarragon	347.25	334.25	233.75
%2 tarragon	323	327	247.75
SEM	19.68	66.91	37.04
P-value	0.112	0.192	0.284

Table 5. The effect the experimental treatments on carcass characteristics weight (grams)

Treatment	Carcass weight	Liver	Heart	Thigh	Breast
Control with Antibiotics	187.5^{a}	15.7	3.6	25.5	82.75^{a}
Control without Antibiotics	182^{a}	13.72	3.47	24.75	81.25^{ab}
%0.5 tarragon	183.75^{a}	13.85	4	25.75	83.25^{a}
%1 tarragon	177.75^{b}	14.20	3.95	24.75	81^{ab}
%1.5 tarragon	177.75^{b}	13.12	3.75	25.25	73.75^{c}
%2 tarragon	178.25^{b}	14.37	3.35	24.75	77.75^{bc}
SEM	2.09	1.04	0.504	0.774	1.76
P-value	0.016	0.298	0.705	0.642	0.012

In the second week, the difference between the control treatment with antibiotics and the treatment including 0.5% of tarragon is not significant. But the control treatment with antibiotics has a significant difference with the control without antibiotics, containing 1, 1.5 and 2 percent of tarragon treatments ($P<0.05$). The lowest, and therefore the best, conversion ratio is related to the control treatment with antibiotics and the treatment containing 0.5% of tarragon. The highest, and therefore the worst, conversion ratio is related to the treatment containing 1.5% of tarragon. In the sixth week, the difference between conversion ratio of the control treatment with antibiotics and the treatment containing 1.5% of tarragon is significant ($P<0.05$). During the entire period, the differences between conversion ratio of the control treatment with antibiotics and the control treatment without antibiotics and also the treatment containing 1.5% and 2% of tarragon are significant. The best and worst conversion ratios, numerically, are related to the control treatment with antibiotics and the treatment containing 1.5% tarragon, respectively.

In the current study, the best feed conversion ratio in the whole of experiment period was related to the control treatment with antibiotics and the treatments containing 0.5 and 1 percent of tarragon. It seems that tarragon extract improves the average weight gain and feed conversion ratio by speeding up the digestion and shortening the transit time through the gastrointestinal tract. Improvement in feed conversion ratio may be due to a reduction in the number of pathogenic bacteria and an increase in the number of beneficial bacteria in the gut. This leads to a reduction in the incidence of diarrhea, reducing the competition with the host for nutrients, increasing access to energy and protein, and increasing functions of the immune system.

Medicinal plants effect the performance of broilers in different aspects. In these plants there are effective substances such as Cinnamaldehyde and Capsaicin. These substances can have stimulating effects on increasing the secretions of digestive latexes from organs such as the pancreas and liver. Sufficient secretion of these latexes leads to better digestion, absorption and metabolism of nutrients. The result would be reflected as improvement in the performance efficiency [9].

The results of hematologic parameters are shown in Table 4. As seen in the table, the hematologic parameters such as cholesterol, triglycerides and Fasting Blood Sugar (FBS) are not significantly different among the experimental treatments ($P>0.05$).

The results related to carcass characteristics of quail chicks are in Table 5. As seen in the table, carcass weight and breast weight have significant differences among the experimental treatments ($P<0.05$) but the differences of weight of the liver, heart, thigh, among the experimental treatments, are non-significant ($P>0.05$).

The carcass weight in the control treatment with antibiotics has a significant difference with the treatments containing 1, 1.5 and 2 percent tarragon but it does not have a significant difference with the control treatment without antibiotics and the treatment containing 0.5 percent tarragon. The maximum of carcass weight, numerically, is related to the control treatment with antibiotics and the minimum is related to the treatments containing 1 and 1.5 percent of tarragon. The breast weight in the control treatment with antibiotics has a significant difference with the treatments containing 1.5 and 2 percent tarragon. The maximum and minimum of breast weight are related to the treatment containing 0.5 percent of tarragon and the treatment containing 1.5 percent of tarragon, respectively.

Based on this experiment results, it was observed that among various levels of tarragon, the treatment containing 0.5 percent of tarragon caused the highest carcass weight which had no significant difference compared with the control treatment. The highest weight of breast was also related to this treatment. This difference was not meaningful for the other components of the carcass (liver weight, heart weight, leg weight).

CONCLUSION

The effects of tarragon extract is investigated on performance, carcass quality and hematologic parameters in male Japanese quail over a period of 42 days. Based on the experiment results, the treatment containing 1.5% tarragon extract does not make a significant difference in feed intake compared with the control treatment. Also, in the treatment with 0.5% tangent extract showed no significant difference in weight gain compared with the control treatment. The best conversion ratio was related to the treatments containing 0.5% and 1% tarragon extract. Investigation of the carcass characteristics shows that the treatment with 0.5% tarragon extract led to the highest carcass weight and breast weight. But no significant difference observed in the weight of the liver, heart, and thigh. There wasn't any significant difference in hematologic parameters either. According to the results, some suggestions

are offered for future researches; there is no doubt that, further research is needed to recommend the tarragon usage in diets. Because very little research has been done about using tarragon in quail nutrition, in the world, no specific recommendation can be given. On the other hand, investigations on the effect of different levels of tarragon extract on the female quail egg production

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