Utilisation of oregano (*Origanum Onites*) in laying quails (*Coturnix coturnix japonica*) (2): The effects of oregano on performance, carcass yield, liver and some blood parameters

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ABSTRACT

Nowadays, the natural ways of nourishment attract the attention of people and more emphasis is done on the natural ways of animal feeding which are suitable to the nature of their species. Studies regarding animal feeding based on aromatic plants parallel to their natural requirements became an interesting research topic, particularly after antibiotic supplementation to diets was banned in Europe at the beginning of 2006. This study was carried out to determine the effects of Oregano (*Origanum Onites*) on food conversion ratio, egg production, egg weight, carcass yield, liver weight, blood cholesterol, HDL, retinol, β-carotene, nitric oxide, total protein and glucose in laying quails. Totally 216 laying quails (*Coturnix coturnix japonica*) were divided into six groups, each containing 36 birds. The oregano supplemented experimental groups were as follows: *Group I*; 1 %, *Group II;* 2%, *Group III*; 3%, *Group IV;* 4%, *Group V;* 5%, respectively. The control group received no oregano. Significance of the differences among the groups was examined by one-way ANOVA followed by Duncan test. There were no significant differences between the groups regarding food conversion ratio, egg production, egg weight. In addition, no difference was observed during the organoleptic control of the carcasses as well as the blood parameters, the total cholesterol, HDL, Retinol, β-carotene, nitric oxide, total protein and glucose values among the groups. As a result, no detrimental effect of using oregano was observed on blood parameters and carcass quality in laying quails.

Keywords**:** Oregano, quail, carcass, blood

INTRODUCTION

Plants are used for medical treatment since the prehistoric time (Dragland et all. 2003). There are some important bioactive components [(alkaloids, bitters, flavonoid, bioflavonoid, glycosides, mucilage, saponins, tannins

(Vandergrift, 1998) phenols, phenolic acids, guinones, coumarins, terpenoids, essential oils, lectins and polypeptides) (Cowan, 1999)] in the structure of nearly all the plants. The amount of these compounds in every plant and the interaction between them have important role on the mechanism of action of the plant. However, the effect of these compounds and the polysaccharides on the metabolism is still not fully known (Guo et all. 2003).

Oregano is widely known throughout the world and Turkey is the biggest oregano producer country in the world where the most of the oregano varieties are grown (Beser 2006, Anonym 2006a). All the growth factors and antibiotics are banned in EU since the beginning of 2006 (Anonym 2006b). As a consequence, plant origin new materials are extensively examined to be used instead of synthetic feed additives (Wang and Bourne 1998) those were in use since 1950's. Nowadays, nearly half of the medicines produced in the USA are originated from plants (Cowan, 1999). Besides 40% of the prescriptions given by the doctors are consists of plant origin medicines in developed countries (Dragland et al, 2003).

Oregano has been used for its antibacterial (Ariana et al. 2002, Nascimentol et al. 2000, Harpaz et al. 2003, Uslu et al. 2003, Vigo et al. 2004, Dursun et al. 2003), anti-inflammatory (Blomhroff 2004, Youdim and Deans 2000, Choi et al. 2002), antioxidant (Ingram et al. 2001, Burt and Reinders 2003, Botsoglu et al. 2002, Botsoglu et al. 2003, Akgul and Ayar 1993, Akgul Kıvanc 1988), insecticide (Choi et al. 2002), antispasmodic, expectorant, fungicide (Akgul and Ayar 1993, Akgul Kıvanc 1988), antivirutic (Cowan 1999) properties for centuries.

In order to make use of the naturally existing chemicals in the structure of a plant, it is advisable to use such plants in natural forms rather than in processed forms. This experiment was carried out to determine the positive or negative effects of the oregano plants in natural form to be utilized as feed additive in poultry nutrition and to determine the effects of different rates of oregano usage on the carcass quality, performance and blood parameters in quails.

MATERIALS AND METHODS

A total of 216 Japanese quails (*Coturnix coturnix japonica*) of 42 days of age were used in this experiment. Animals were divided into 6 groups. Each group was then divided into 6 subgroups having 4 females and 2 males in each. Five groups were fed with rations supplemented by 1%, 2%, 3%, 4% and 5% of dried natural oregano leaf respectively. The 6^{th} group was left as control without any supplementation of oregano. The experiment continued for 63 days and egg production and mortalities were recorded daily at the same time of the day. Ration to be used was formulated isonitrogenic and isoenergic according to the (NRC, 1984) recommendations. Preparation of rations was based on maize and wheat with 20% raw protein, 2900 ME kcal/kg. Oreganos were obtained from a local herbalist dealer in Afyonkarahisar province of Turkey. Since the nutrient

contents of Oregano is not available in NRC, alfalfa meal was expressed as the most similar plant in terms of general nutrient properties.

The nutritional specification of clover leaf from NRC was used for purchased oregano from herbalist to formulate the ration

Feed consumption, feed conversion ratio, egg production and egg weight parameters were determined weekly. Animals were weighed individually at the beginning and at the end of the study. One male from each subgroup was slaughtered and blood samples were taken at the end of the experiment. The blood sample analyses were done Nitric oxide metabolites (nitrates + nitrites, NO*x*) were assayed in plasma by colorimetric method of Griess (Miranda et al., 2001).The plasma vitamin A (retinol) concentration was estimated by the method of Suzıkı and Katoh (1990) using a spectrophotometer. Serum high-density lipoprotein cholesterol (HDL-C) levels were determined using Crescent Diagnostics Cholesterol test kit after precipitation of apolipoprotein B containing lipoproteins by phosphotungstic acid and magnesium chloride. Serum total protein, glicose, triglycerides and cholesterol values were measured with commercially available assay kits (Teco Diagnostics, CA, USA) by enzymatic methods. Moreover carcass yield, weight of testicles and livers were recorded. The flavor taste on meat was determined by test panel. Taste analysis was done by 8 persons scoring from 5 to 10. Comparisons among the groups were examined by one-way ANOVA and the significance levels were tested by Duncan test.

Table 1 Formulas of the rations used in the experiment

Feed materials	Control	Oregano 1%	Oregano 2%	Oregano 3%	Oregano 4%	Oregano 5%
Corn	34.7	37	34	36	35	34
Wheat	30	27	28	27	27	26
Full fat soy	9.4	10	14	10.5	13	17
Soy meal	17.5	16	15	14	11	8
Oregano	-	1	2	3	4	5
Fish meal	1.3	2.03	2	2.77	3.46	3.31
Lime stone	5.3	5.35	5.32	5.2	5.1	5.2
DCP	1.07	0.9	0.94	0.8	0.7	0.75
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin premix	0.125	0.125	0.125	0.125	0.125	0.125
Mineral premix	0.125	0.125	0.125	0.125	0.125	0.125
Methionine	0.13	0.12	0.13	0.13	0.14	0.14

DCP=Di-calcium phosphate

RESULTS AND DISCUSSION

Taking the daily feed consumption results into account (Table 2), no significant differences were observed among the groups. For yield results, although the differences weren't found to be statistically important, the value

for control group seems dramatic. This could be due to the magnitude of standard error. FCR results also represent a similarity among groups but significance level of this parameter attracts attention. Regarding the weekly egg weight values, we observed that the weight is constant every week and no significant differences were observed between the treatments or in comparison with the control.

Live weight and slaughter parameters didn't differ among the groups (Table 3). Regarding the blood parameters, significant result was determined for retinol. Minimum values were found at group %2 and % 3 while maximum values were found at the control group.

It was reported that oregano oil extract supplementation to diet did not affect the feed conversion ratio in broiler chickens (Basmacıoğlu et al. 2004, Demir et al. 2003, Hernandez et al. 2004, Sarıca et al. 2005) and sheep (Bampidis et al. 2005). Supporting the findings of our experiment, it was also reported that antimicrobial properties of oregano didn't affect the live weight of broiler birds (Demir et al. 2003, Lewis et al. 2003).

On the contrary to our experiment, Cabuk et al. (2006) and Alçiçek et al. (2004) found that feed conversion ratio was better with oregano oil added groups than the controls in broiler chickens and Denli et al (2004) and Parlat et al (2005) determined the similar results in quails. Likewise, Bampidis et al (2005a) found that feed conversion ratio was better with oregano added group than the control in turkey birds.

There were no differences on serum cholesterol levels at the end of the experiment. It was reported that serum cholesterol level wasn't affected in turkey (Bampidis et al. 2005a) and broiler birds (Sarıca et al. 2005) fed by the oregano oil supplemented ration, supporting the result of this experiment

Weight was not affected by the supplementation of oregano. Differences on carcass yield, testicle weight and organoleptic evaluations between the groups were not significant. For liver weight, difference did not reach to a statistically significant level but was however the highest in control group suggesting that the reduced work load on liver by the antimicrobial, antifungal and antioxidant effect of supplemented oregano in the ration. On the other hand the testicle weight was lowest in control group suggesting that the inclusion of the oregano into the ration may accelerate the mechanism of the reproductive hormones in the body. This effect is also apparent ($p<0.05$) as improved fertility level by oregano supplementation (Bozkurt 2005, Allan and Bilkei 2005) in this experiment (Table 3).

There were no differences on carcass weight of quails (Denli et al. 2004), of broiler chickens (Basmacıoglu et al. 2004, Sarıca et al. 2005, Cabuk et al. 2006), of turkey birds (Denli et al. 2004) and of sheep (Bampidis et al. 2005b) fed by oregano supplemented ration comparing to the controls. These reports are in harmony with our findings. On the other hand, in some experiments heart, liver and spleen weights between the oregano added groups and controls were found insignificant (Hernandez et al. 2004, Sarıca et al. 2005, Cabuk et al.

2006). Alçiçek et al (2004) reported that live weight and carcass yield was highest in the group of broiler chickens which was fed by oregano oil supplemented ration comparing to control. This result was also in harmony with our findings.

Table 2 Mean ± s.e. values for daily feed consumption, yield, feed conversion ratio and egg weights of quails from 0 to 63 days

Group	Daily feed consumption (g) x±Sx	Yield (%) x±Sx	Feed conversion ratio (g feed/g egg) x±Sx	Egg weight (g) x±Sx
% 1	21.62±0.7	86.6±3.4	2.28±0.13	11.80±0.2
% 2	20.21±0.6	86.8±3.8	2.00±0.10	11.82±0.2
% 3	22.06±0.5	83.5±4.2	2.33±0.13	11.57±0.2
% 4	22.06±0.5	84.3±4.7	2.38±0.14	11.99±0.2
% 5	21.10±0.4	87.4±1.1	2.10±0.07	11.81±0.2
Control	21.29±0.5	90.1±1.5	2.02±0.05	11.85±0.2
P	0.183	0.779	0.063	0.583

P<0.05

Table 3 Means ± s.e. for live weight and some slaughter parameters of the birds

	Total live weight of birds in subgroups (g)		Carcass and some organ parameters and meat taste score of male birds			
Group	At the onset of experiment	At the end of experiment	Carcass yield (%)	Liver yield (%)	Testical yield (%)	Taste score of meat (5-10)
% 1	1065±17	1271±34	58.43±1.4	1.62±0.1	3.09±0.3	8.88±0.5
% 2	1131±21	1287±22	59.83±0.7	1.79±0.1	2.72±0.2	8.25±0.4
% 3	1112±28	1295±21	59.45±1.0	1.77±0.2	3.12±0.2	8.50±0.4
% 4	1095±28	1292±34	61.71±0.9	1.60±0.1	2.85±0.3	7.13±0.4
% 5	1103±27	1296±20	62.09±1.4	1.73±0.1	3.05±0.2	7.50±0.6
Control	1088±9.4	1293±21	61.36±0.5	1.93±0.2	2.74±0.2	7.75±0.4
P	0.446	0.984	0.125	0.465	0.744	0.091

P<0.05

Table 4 Some blood parameter values for quails

Group	Total Cholesterol (mg/dl)	HDL (mg/dl)	Trygliceri des (mg/dl)	Retinol (µg/dl)	Beta carotene (µg/dl)	Nitric oxide (µg/l)	Total protein (g/dl)	Glucose (mg/dl)
% 1	90.6±9.9	73.3±16	189.8±31	89.64±11^{ab}	275.7±87	42.90±7.0	3.63±0.5	223.8±10
% 2	113.7±4.3	61.0±8.1	243.2±9.2	61.40±10^{b}	174.0±11	44.01±5.4	4.09±0.3	227.0±19
% 3	98.1±4.4	54.1±4.9	228.9±17	64.21±13^{b}	222.4±68	40.01±4.8	3.07±0.1	211.1±19
% 4	116.0±27	50.1±4.1	209.8±24	94.98±8.2^{a}	320.4±58	43.01±5.7	4.00±0.5	251.6±12
% 5	91.7±4.6	40.9±4.0	203.5±24	80.45±5.1^{ab}	332.8±63	45.60±5.3	3.80±0.3	224.3±17
Control	76.9±11	52.9±5.4	239.9±20	107.3±6.7^{a}	379.8±59	31.14±3.0	3.89±0.7	238.6±14
P	0.272	0.167	0.588	0.012	0.221	0.458	0.618	0.565

P<0.05

CONCLUSIONS

It was concluded that natural dried ground oregano leaf supplementation into the ration up to 5% didn't cause any important adverse effect in quails. Therefore more studies should be carried out to determine the optimum supplementation level of oregano into the diets of quails.

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