Biological Forum – An International Journal **6**(2): 53-56(2014)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

An Investigation on Dietary Supplementation of Coriander (*Coriandrum sativum*) Seeds on the Food Intake and Microbial Populations of the ceca of Japanese quail (*Coturnix japonica*)

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(Received 24 July, 2014, Accepted 05 August, 2014)

ABSTRACT: The purpose of the present study was to examine the impact of using coriander seeds in the Japanese quail diet. The researchers intended to examine whether these seeds have an effect on the food intake and the bacterial population of this bird. Hence, a completely randomized experiment was conducted on 360 female Japanese quail chicks. The length of the experiment was 35 days. The experiment included six treatments and there were four repetitions for each treatment. Each repetition included fifteen one-day female chicks in the following way: 1. basic diet consisted of corn, soybean meal, fish meal powder (control diet), 2. Control diet + antibiotic 3. Control diet + 1 % coriander, 4. control diet + 2% coriander, 5. Control diet + 3% coriander, 6. Control diet + 4% coriander. The characteristics of the quails' food intake and the bacterial population of the ceca were measured at the end of the 35-day experiments and then were statistically analyzed and examined. The results of the present study revealed that there was a significant difference in the average food intake of the experimental treatments (experimental diets) between the first and the second breeding periods (weeks). However, there were no significant differences between the experimental treatments in the third, fourth and fifth weeks. Moreover, the analysis of the variance of average population of the *E. coli* bacteria of the ceca at the end of the rearing period when the chicks were 35 days old indicated that there were significant differences between the treatments (P< 0.05).

Keywords: Japanese quail, food intake, coriander, antibiotic

INTRODUCTION

Demand for the consumption of poultry is increasing which is due to medical achievements, merits and health advices. Quail is considered to be a bird which has been bred and produced in Iran for the past two decades and with respect to the climatic conditions of Iran and since this bird is compatible with warm weather conditions, the trend in breeding this bird is increasing. The industrial breeding and rearing of quail has been introduced as a solution in reducing the protein deficiency of the diet and nutrition of the developing countries. Also, since there has been an increase in the demand for the meat and egg of quail in Iran, the importance attached to this bird has increased so that the industrial breeding of quail has become a profitable and productive industry throughout the world (Shukuhmand, 2008). Animal science researchers are doing their best to increase the efficient production and breeding of quail in the shortest possible time and without any serious side effects.

Recently, researchers have focused on investigating the impact of including food additives in the diet of these breeding animals (Mahdizadeh *et al.,* 2004). Since there is an antibiotic resistance in breeding and producing poultry these days and these substances lead to the creation of an antibiotic resistance in consumers (humans), there is an essential need for replacing those poultry with better alternatives. On the other hand, the presence of modern methods of detecting antibiotic residues in the carcass of poultry has motivated the breeders and producers to produce poultry which lack antibiotic. Thus, researchers are seeking safe and appropriate alternatives and options with respect to the nutrition and diet of poultry. Some of the important effects of adding coriander to the diet of animals in general and poultry in particular are that it enhances the daily food conversion rate and increases the carcass efficiency and harnesses the natural growth of the poultry (Cabuk *et al.,* 2003; Delagais *et al.,* 2002; Elgayyar *et al.,* 2001).

MATERIALS AND METHOD

A. Distribution and Randomization of the Chicks in the Experimental Groups

The selection of each experimental group was based on randomization and each four Penn was regarded as a repetition for each treatment. Then, the Penn and treatment number was written in front of each Penn. Hence, each Penn received its own particular diet according to its code and number and the type of designated treatment. Inside each Penn, the chicks were distributed randomly and the weight of each chick was precisely measured.

B. Preparation of experimental diets

the diets consisted of corn, soybean meals, fish meal powder, salt, lysine, di calcium phosphate, limestone, single vitamins (A, B, D, E, K), soya oil, coriander, supplements which were purchased and kept in a dry store one week before the chicks were bought.

C. Formulating the diets

Before conducting the experiments, the table of nutrition needs of broilers created by National Research Council was used to check whether sufficient amounts of proteins to produce energy are included in the diets. The arrangements and formulations of the experimental diets were done by means of the UFFDA (User Friendly Feed Formulation Done Again) software. The metabolizable energy of the entire experimental diets in the whole period was 2900 kcal in Kg. The characteristics which were attributed to the diet consumption included an increase in body weight at the end of each experimental period (week) and also the amount of the fatty acid composition of the breast muscles were measured at the end of a 35-day period.

Table 1. The constituting foods and chemical combinations of the experimental diets.

Constituting foods	Control	Coriander 1%	Coriander 2%	Coriander 3%	Coriander 4%	Antibiotic
corn	03.50	32.49	52.48	72.47	92.46	03.50
Soybean meal	91.36	36	36	36	36	91.36
Fish meal powder	7	53.7	43.7	33.7	23.7	7
Oyster rock	34.1	50.1	46.1	35.1	25.1	34.1
Di calcium phosphate	10.1	02.1	1	1	1	10.1
Vegetable fat	2	2	2	2	2	2
Mineral supplement	3.0	3.0	3.0	3.0	3.0	3.0
Vitamin supplement	3.0	3.0	3.0	3.0	3.0	3.0
salt	27.0	27.0	22.0	22.0	23.0	27.0
Vitamin A	1.0	1.0	1.0	1.0	1.0	1.0
Vitamin D	1.0	1.0	1.0	1.0	1.0	1.0
Vitamin K	1.0	1.0	1.0	1.0	1.0	1.0
Vitamin E	2.0	2.0	2.0	2.0	2.0	2.0
Vitamin B	1.0	1.0	1.0	1.0	1.0	1.0
Vitamin C	1.0	1.0	1.0	1.0	1.0	1.0
Lysine	005.0	06.0	056.0	052.0	048.0	005.0
Coriander	0	1	2	3	4	0
Antibiotic (Flavophospholipol)	0/05	0	0	0	0	0

THE STATISTICAL MODEL AND THE METHOD OF DATA ANALYSIS

Inasmuch as all the breeding conditions such as handling and management, diet, etc for the experimented quails were the same, the researchers used complete randomization which included six treatments and four repetitions for each type of treatment. All the data were gathered and stored as an Excel file. Then, to analyze the collected data, researchers used the SAS software. In order to compare the treatments with each other with respect to the mentioned features, the researchers used Duncan's multiple range test at the .05 value of probability of chance results or 0.95 probability of non-chance results.

$Y_{ij} = \mu + T_i + E_{ij}$

The amount of each control: Y_{ij}

The average population: μ

The *i* th effect of the treatment: T_i

Experimental or computational error: E_{ij}

RESULTS

A. Food Intake

During the first and second breeding periods, there were significant differences between the food intake of the experimental treatments (experimental diets). However, there were no significant differences between the experimental treatments in the other breeding periods, i.e. the third, fourth and fifth periods (P< 0.05). As it was illustrated in table one above, the highest consumption was attributed to the treatment including 0.01 % coriander in the first week and the treatment including 0.04% coriander in the second week. Noticing the obtained results reveal that in all the experimental periods, the first and second experimental treatments including .01% and .04 % coriander had the highest food intake rate but in the rest of the breeding periods, the average food intake among the treatments were almost the same. That is, there were no statistically significant differences among them. In a similar vein, Hamodi *et al.,* (2010) studied the impact of the coriander seeds as a major factor on dependent variables such as performance and physiological features. In their experiment, a number of broilers (ArboAceer) were randomly included in four groups with three repetitions of diet and were bred for 42 days. The chicks were fed according to the following diets: T1 (control), T2 (.01%), T3 (.02%) and T4 (.03%). When the experimental treatments finished, it turned out that the highest food intake was related to T3 (.02% coriander) which was higher than those of other groups.

Table 2. The comparison of the mean values of food intake from week one up to the end of week five.

Treatments	Week one (0-7 days)	Week two (8-14)	Week three (15-21)	Week four (22-28)	Week five (29-35)
Control	15.79±0.005^{b}	40.68±0.076^{e}	84.833±1.25^{a}	132.143± 3.909^{a}	153.726±4.31^{a}
.01 coriander	15.77±0.02^{bc}	43.22±0.010^{d}	83.818±2.75^{a}	132.802± 2.621^{a}	148.651±5.02^{a}
.02 coriander	14.83±0.007^{e}	43.93±0.007^{c}	82.750±0.984^{a}	125.678± 2.614^{a}	150.996±8.68^{a}
.03 coriander	19.44±0.015^{a}	43.81±0.047^{c}	84.833±1.26^{a}	127.187± 1.299^{a}	157.458± 3.400^{a}
.04 coriander	15.13±0.015^{d}	45.31±0.212^{a}	82.854±0.941^{a}	124.729± 4.339^{a}	152.583±2.58^{a}
antibiotic	15.74±0.015^{c}	44.65±0.05^{b}	84.417±1.55^{a}	134.033± 0.853^{a}	156.418±2.64^{a}

Mean values having the same index are not statistically significant (P<.05)

COUNTING BACTERIAL POPULATION FOR *E. coli* AND LACTOBACILLUS IN CECA

Table 3 below shows the comparison of mean values for the bacterial population of *E. coli* at the end of the breeding period. According to the obtained results, it can be argued that regarding the given experimental treatments, the diet including 0.04 corianders had the highest *E. coli* at the end of the period. Then, the diets including 0.01, 0.03 and 0.02 coriander were ranked respectively with regard to the population of *E. coli* bacteria and the control treatment was at the end of the rank. The diet including had the lowest population of Lactobacillus. As it was observed, the diet including antibiotic had the lowest bacterial population of *E. coli.*

Table 3. A comparison of the mean bacterial populations for *E. coli* and *Lactobacillus* in the ceca.

Treatments	*E. coli* bacterial population	*Lactobacillus* bacterial population
Control	37.50±8.967abc	59.00±7.106a
0.01 coriander	61.00±10.132a	67.75±18.834a
0.02 coriander	20.00±2.708b	81.75±18.263a
0.03 coriander	31.75±5.153bc	82.25±18.363a
0.04 coriander	55.75±15.057ab	77.50±14.227a
Antibiotic	34.25±1.652abc	60.25±16.499a

The mean values having identical indexes are not significantly different from each other

DISCUSSION

With respect to the results of the experiments mentioned above, it can be maintained that using coriander seeds at the levels of .01 and .04 in the initial weeks of breeding quail will result in an increase in the food intake. As mentioned above, in as much as coriander has antimicrobial and antibiotic features, hence, it can enhance the food intake. The plant of coriander is considered to be an herbal and medicinal plant which can be used for treating diabetes and different types of fungi. Moreover, the anti-oxidative and antimicrobial features of coriander have been acknowledged (Hamodi *et al.*, 2010). University researchers in Portugal conducted experiments in which they investigated the impact of oil obtained from coriander with 12 different strains of bacteria such as *E. coli*, *Salmonella*, and *Bacillus cereus*. Also, the studies which were carried out on the major oils obtained from coriander seeds revealed that this oil has a negative impact on Gram positive bacterial, Gram negative bacteria and *Saccharomyces cerevisiae* (Kohara *et al.*, 2006).

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