



The effect of different levels of Oregano powder and soybean oil on carcass characteristics and intestine histology in Japanese quail (*Coturnix japonica*)

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Abstract

This study was designed to investigate the effects of different levels of soybean oil and Oregano powder on carcass quality and intestine histology in Japanese quail. A total of 42 quails with an average weight of 28 ± 1.9 g at 10 days of age were divided into seven treatments (Group 1: control; Group 2: 1% Oregano powder + 0.5% soybean oil, Group 3: 1% Oregano powder + 1% soybean oil; Group 4: 1% Oregano powder + 1.5% soybean oil; Group 5: 1.5% Oregano powder + 0.5% soybean oil; Group 6: 1.5% Oregano powder + 1% soybean oil; Group 7: 1.5% Oregano powder + 1.5% soybean oil). Each treatment was further divided into three replicates (six quails per replicate). At the end of the experiment, two quails of each sex were selected randomly to evaluate the quality of carcass of each replicate. Breast weight increased significantly in group 7 and abdominal fat decreased in group 4. Height and depth of intestinal villi increased significantly ($P < 0.05$) in group 7. Based on these results, we concluded that 1.5% Oregano powder + 1.5% soybean oil improved the performance and intestinal histology of quails.

Keywords: Japanese quail; Oregano powder; soybean oil; intestinal villi

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Introduction

Medicinal plants and their extracts can be used safely for improved poultry performance (Lee et al., 2004). Medicinal plants have anticoccidial, antioxidant and antifungal properties (Heidari et al., 2010). Thus, fewer toxins are produced and liver has less pressure to detoxify. Oregano has high fibre which increases the passage of digestive materials (Nobakht, 2009). Oil of Oregano has antioxidant prosperities that prevent oxidation of fat stored in the thigh, breast and muscle of broilers (Botsoglou et al., 2010). The use of medicinal plants increases villi dimensions in the duodenum and villi height in ileum (Maraashi Saraei et al., 2008). Use of Oregano and cinnamon in the quail feed reduces the intestinal viscosity (Sarica et al., 2007).

Fatty acids and oil are beneficial nutrients to the intestinal mucosa. The beneficial effects have been reported including increasing density and villi length, and increased intestinal absorption. It is an antibacterial agent against microorganisms such as Salmonella,

Clostridium and *Escherichia coli*. It protects modulator of intestinal flora and protects beneficial intestinal microorganisms such as Lactobacilli. It speeds up healing of intestine injuries caused by diseases, intestinal disorders and thus increases digestibility of protein and fat (Haghighi et al., 2010). The use of butyric acid increases crypt depth in three parts of the intestine (duodenum, jejunum and ileum) and reduced the thickness of the intestinal epithelium (Haghighi et al., 2010).

The small intestine plays a key role in the digestion and absorption of food. Mucosa of the small intestine has the greatest speed to demolish and rebuild among body tissues. Evolution of mucosa includes intestinal villi height, width and the number of lining cells (Uni et al., 1998). Reduction of villi length decreases absorption and digestibility of nutrients. Reduced absorption decreases ultimately overall digestibility (Liu et al., 1990). Supplementation of soybean and coconut oils may improve villi height (Cera et al., 1988). Stored fats texture is affected more by vegetable

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Table 1: Basal diet and chemical composition of nutrients

Feed ingredient (%)	Groups						
	1	2	3	4	5	6	7
Corn	36	36	36	36	36	36	36
Soybean meal	35	34.6	34.6	34.6	34.5	34.5	34.5
Wheat	17	16.3	16.3	16.3	16	16	16
Fish meal	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Sunflower Oil	2.7	2.3	1.8	1.4	2.3	1.8	1.4
Oregano powder	0	1	1	1	1.5	1.5	1.5
Soybean oil	0	0.5	1	1.5	0.5	1	1.5
Salt	2	2	2	2	2	2	2
Mineral supplement	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin supplement	0.25	0.25	0.25	0.25	0.25	0.25	0.25
D-L methionine	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Oyster shell	2.47	2.47	2.47	2.47	2.47	2.47	2.47
Calculated nutrients							
ME, kcal/kg	2900	2900	2900	2900	2900	2900	2900
CP (%)	23.17	23.16	23.16	23.16	23.2	23.2	23.2
Calcium (%)	1.23	1.23	1.23	1.23	1.23	1.23	1.23
Phosphorus (%)	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Sodium (%)	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Lysine	1.541	1.51	1.51	1.51	1.51	1.51	1.51
Methionine	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Methionine +Cysteine	0.82	0.82	0.82	0.82	0.82	0.82	0.82

Group 1: control; Group 2: 1% oregano powder +0.5% soybean oil; Group 3: 1% oregano powder +1% soybean oil; Group 4: 1% oregano powder +1.5% soybean oil; Group 5: 1.5% oregano powder +0.5% soybean oil; Group 6: 1.5% oregano powder +1% soybean oil; Group 7: 1.5% oregano powder+1.5% soybean oil; composition of mineral used in diet per kg: Zn, 65 mg, manganese 75 mg, 6 mg, copper, selenium, 0.7 mg, iron 75 mg; Combination of vitamin supplement used in the diet per kg: vitamin, 10000 international unit; A, vitamin D3, 9790 international unit, vitamin E, 171 international unit; vitamin 2 K, 2 mg; 12B, 0.02 mg, thiamine, 40 mg, Riboflavin, 4.40 mg, niacin, 22 mg, pyridoxine, 4 mg, biotin 0.03 mg; folic acid, 1 mg; choline chloride, 840 mg

Table 2: Effect of different levels of soybean oil and Oregano powder on weight and carcass components (g) of Japanese quail

Treatments	Carcass weight	Thigh	Thigh	Breast
		percentage	weight	percentage
Group 1	201.12 ^a	18.39 ^a	36.97 ^a	32.01 ^{ab}
Group 2	200.93 ^a	17.94 ^a	36.13 ^a	33.98 ^{ab}
Group 3	188.25 ^a	18.93 ^a	35/66 ^a	36.06 ^{ab}
Group 4	188.64 ^a	18.81 ^a	35.49 ^a	30.56 ^b
Group 5	194.38 ^a	18.43 ^a	35.56 ^a	31.14 ^{ab}
Group 6	189.00 ^a	17.46 ^a	35.49 ^a	31.78 ^{ab}
Group 7	199.28 ^a	18.38 ^a	35.59 ^a	34.88 ^a
SEM	60.99	0.59	1.40	1.21

^{a,b}Different letters on numbers in each column represents significant difference (P<0.05); Group 1: control; Group 2: 1% oregano powder +0.5% soybean oil; Group 3: 1% oregano powder +1% soybean oil; Group 4: 1% oregano powder +1.5% soybean oil; Group 5: 1.5% oregano powder +0.5% soybean oil; Group 6: 1.5% oregano powder +1% soybean oil; Group 7: 1.5% oregano powder+1.5% soybean oil

oils containing high levels of unsaturated fatty acids in comparison with animal-based oils (National Research Council, 2001). The objective of this study was to evaluate the effect of different levels of soybean oil and Oregano powder on carcass characteristics and histology of intestine villi in Japanese quail.

Materials and Methods

In this experiment, 42 Japanese quails from 10 to 42 days of age were distributed into completely randomized design with seven treatments and three replicates (six birds per replicate). Experimental groups include:

Group 1: control (Basal diet)

Group 2: 1% Oregano powder + 0.5% soybean oil

Group 3: 1% Oregano powder + 1% soybean oil

Group 4: 1% Oregano powder + 1.5% soybean oil

Group 5: 1.5% Oregano powder + 0.5% soybean oil

Group 6: 1.5% Oregano powder + 1% soybean oil

Group 7: 1.5% Oregano powder + 1.5% soybean oil

Experimental diets were prepared according to the recommendation of NRC (2001) as shown in Table 1. The experiment lasted for 42 days. To determine carcass quality, two birds were selected from each replicate. After fasting of 10-12 hours, they were killed and carcass quality was determined. Also, 5 cm of the ileum was cut to determine length, width and depth of the crypts (Haghighi et al., 2010).

The obtained data were analyzed by SAS software (SAS, 2002, Version, 9.1) with general procedure, and multiple ranges Duncan test. P value less than 0.05 was considered as significant.

Table 3: Effect of different levels of soybean oil and Oregano powder on carcass components (g) of Japanese quail

Treatments	Breast weight	Wing weight	Heart weight	Abdominal fat weight	Liver weight	Gizzard weight
Group 1	64.27 ^{ab}	11.75 ^a	1.99 ^a	4.88 ^a	5.93 ^a	5.45 ^a
Group 2	68.15 ^a	11.13 ^a	2.23 ^a	4.75 ^a	5.93 ^a	5.29 ^a
Group 3	64.22 ^{ab}	11.90 ^a	1.97 ^a	3.60 ^{de}	5.09 ^a	5.92 ^a
Group 4	65.53 ^b	11.93 ^a	1.87 ^a	3.53 ^e	5.53 ^a	5.09 ^a
Group 5	61.08 ^{ab}	12.04 ^a	1.96 ^a	4.37 ^b	5.51 ^a	4.85 ^a
Group 6	60.10 ^{ab}	11.42 ^a	2.33 ^a	4.13 ^{bc}	5.70 ^a	5.45 ^a
Group 7	69.48 ^a	12.12 ^a	1.98 ^a	3.95 ^{cd}	5.34 ^a	4.79 ^a
SEM	3.15	0.56	0.12	0.12	0.39	0.31

^{a,b}Different letters on numbers in each column represents significant difference ($P < 0.05$); Group 1: control; Group 2: 1% oregano powder +0.5% soybean oil; Group 3: 1% oregano powder +1% soybean oil; Group 4: 1% oregano powder +1.5% soybean oil; Group 5: 1.5% oregano powder +0.5% soybean oil; Group 6: 1.5% oregano powder +1% soybean oil; Group 7: 1.5% oregano powder +1.5% soybean oil

Table 4: Effect of different levels of soybean oil and Oregano powder on intestinal histology of Japanese quail

treatments	Length of villi (micron)	Width of villi (micron)	Depth of villi (micron)
Group 1	38.33 ^b	9.00 ^a	12.33 ^c
Group 2	40.67 ^{ab}	9.83 ^a	14.67 ^b
Group 3	40.83 ^{ab}	8.50 ^a	14.50 ^b
Group 4	39.33 ^{ab}	8.67 ^a	17.33 ^a
Group 5	39.17 ^{ab}	8.50 ^a	17.17 ^a
Group 6	45.33 ^a	10.00 ^a	18.33 ^a
Group 7	44.67 ^a	8.83 ^a	18.67 ^a
SEM	1.92	0.77	0.67

^{a,b}Different letters on numbers in each column represents significant difference ($P < 0.05$); Group 1: control; Group 2: 1% oregano powder +0.5% soybean oil; Group 3: 1% oregano powder +1% soybean oil; Group 4: 1% oregano powder +1.5% soybean oil; Group 5: 1.5% oregano powder +0.5% soybean oil; Group 6: 1.5% oregano powder +1% soybean oil; Group 7: 1.5% oregano powder +1.5% soybean oil

Results and Discussion

As indicated in Table 2 and 3, using soybean oil and Oregano powder increased significantly breast (weight and percentage) and reduced abdominal fat weight. The highest breast weight and percentage weight and wings were observed in treatment 7. The lowest weight of abdominal fat was observed in group 4. Hernandez et al. (2004) found that the gizzard and liver weight were not affected by the level of Oregano and Cinnamon in the diet of broilers. These findings are in accordance with the results obtained in our experiment. A report concluded that the concentration of Rosemary's extract caused increase weight of live and carcass yield during the growing and finishing period in quails (Yesilbag et al., 2012). These findings are in accordance with the results obtained in our experiment. It was also reported that 1.5 percent of Nettle and Oregano caused decreased abdominal fat (Heidari et al., 2010). In contrast to our studies, Tabeidian et al. (2005) reported that soybean oil (0, 2,

5.5 and 7.5%) increased liver weight in broilers. Similarly, contrary to our experiment, the study of Nobakht et al. (2011) found the lowest percent of thigh with the usage of 1 percent Oregano in broiler. Griffith et al. (1977) showed that mixture of plant and animal fats have no effect on abdominal fat of broilers.

Soybean oil and Oregano have Cycretine, Carvacrol and Menthol. The Cycretine has a stimulatory effect on the secretion of digestive glands such as pancreatic. As a result, protein, fat and starch are easily digested and absorbed due to increased secretion of enzymes (Nobakht, 2009). In response to the effect of medicinal plants, fat accumulation is prevented and increases the percentage of carcass and decreases the carcass fat (Nobakht, 2009).

According to Table 4, the use of soybean oil and oregano powder increased length and depth of villi of ileum. The highest length and depth of villi of intestine were obtained in treatment 7. Maraashi Saraei et al. (2008) found that the height, crypt depth and ratio of height to crypt depth in the duodenum and ileum were positively affected by the levels of herbs mixture and prebiotic in the diet. Another study reported that Oregano extract decreased intestinal viscosity in quails (Sarica et al., 2007).

Based on these results, we concluded that 1.5 percent soybean oil and 1.5 percent Oregano powder in diet of Japanese quail has positive effect on the performance and intestinal histology of quails.

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