PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
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Pakistan Journal of Nutrition 10 (1): 10-14, 2011
ISSN 1680-5194

Effect of Different Levels of Coriander Oil on Broiler Performance and Some Physiological Traits under Summer Condition

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Abstract: This study was conducted to investigate the potential effect of coriander oil on broiler performance and some physiological traits. One hundred and thirty five day-old broiler chicks were randomly assigned in to three dietary treatments with three replicate pens per treatment (15 birds/pen). Birds were fed experimental diets containing 0, 0.5 and 1% coriander oil. Feed and water were provided *ad libitum* during the six weeks experimental period. Performance parameter were measured weekly which include body weight, weight gain, feed consumption and feed conversion ratio. While, cholesterol and glucose were measured at the end of the study. Results showed that inclusion of 0.5% (T2) and 1% (T3) coriander oil significantly improve body weight, weight gain, feed intake and feed conversion ratio (g feed/g gain) significantly ($p<0.05$) than those of the control group. The inclusion of coriander oil at levels of 0.5% and 1% significantly ($p<0.05$) decreased plasma cholesterol and glucose. It could be concluded that the inclusion of coriander oil improve broiler performance and lower cholesterol and glucose levels. Therefore, it could be concluded that the inclusion of coriander oil in broiler diet during summer months have a beneficial effect on performance and physiological traits measured.

Key words: Coriander oil, heat stress, broiler performance, cholesterol, glucose

INTRODUCTION

Herbs and spices are most important part of human diet. In addition to boosting flavor, herbs and spices are also known for their preservative and medicinal value (De Souza *et al*., 2005; Saeed and Tariq, 2006), which forms one of the oldest sciences. *Coriandrum sativum* (Coriander) is considered both as an herb and a spice. It has been referred to as antidiabitic (Gray and Flatt, 1999) and hypocholesterolenic (Chithra and Leelamma, 1997; Dhanapakiam *et al*., 2008). The seed of *Coriander sativum* contain 0.5-1% essential oil which is rich in beneficial phytonnutrients including carvone, geraniol, limonene, borneol, camphor, elemol and linalool. Coriander's flavonoides include quercitin, kaempferol, rhamentin and apigenin. It also contains active phenolic acid compounds including caffeic and cholorogenic acid. Isao *et al*. (2004) suggested that the volatile oils have antimicrobial properties against food borne pathogen such as Salmonella species. Aromatic plants and essential oils extracted from these plants have become more important due to their potential antimicrobial and stimulating effects on digestive system (Lee *et al*., 2004). They have a stimulating effect on the digestive system of animals, Through the increasing production of digestive enzyme and by improving the utilization of digestive products through enhanced liver function (Langhout, 2000; Williams and Losa, 2001; Hernandez *et al*., 2004).

Limited research has suggested that some aromatic plants and their components could improve feed intake, feed conversion ratio and caecass yield (Ather, 2000; Bassett, 2000; Hertrampt, 2001; Tucker, 2002).

Aromatic plant, coriander is an annual species of parsley family, native of eastern Mediterranean region and is found in many other parts of the world. Coriander has been used as a medicine for thousands of years and is still used in folk medicine. As a medical plant, coriander has been used to manage diabetes (Swantson-Flatt *et al*., 1990; Graig, 1999), used as antifungal (Bacilico and Basilico, 1999), antioxidant (Chithra and Leelamma, 1999), antimicrobial (Delaquis *et al*., 2002; Singh *et al*., 2002; Egayyar *et al*., 2001), In addition, It has appetizing and stimulatory effects in the digestion process (Cabuk *et al*., 2003). However, no reports to my knowledge is available on the effect of coriander oil on broiler performance, under heat stress. The objective of this study is to investigate the effect of coriander oil on broiler performance and some physiological traits, raised during summer month in Iraq.

MATERIALS AND METHODS

This study was conducted at the Poultry Farms, Animals Resources Department, University of Baghdad, College of Agriculture, during summer months to study the effect of inclusion different levels of coriander oil as a diet ingredient on broiler performance and some physiological traits. A total of 135 Arbor acers day-old broiler chicks were assigned randomly to three dietary treatments form 1-6 weeks of age, with three replicate

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Table 1: Composition of the experimental diets

	Starter coriander oil			Grower coriander oil		
	Cont.	1%	2%	Cont.	1%	2%
Ingredient 1%	1-4 weeks			4-6 weeks		
Yellow corn	45.00	45.50	44.00	50.00	50.00	49.00
Wheat	20.00	20.00	20.00	19.50	20.50	20.00
SBM (48%)	25.00	20.00	25.00	20.00	19.00	20.00
Protein con.[1] (40%)	10.00	10.00	10.00	10.00	10.00	10.00
Coriander[2] oil	-	0.50	1.00	-	0.50	1.00
Corn oil	-	-	-	0.50	-	-
Calculated composition of the experimental diet according to NRC (1994)						
Crude P. (%)	22.22	22.18	22.14	20.19	19.83	20.16
ME/kg (kcal)	2965.00	2993.00	2958.00	3050.00	3027.00	3014.00
Ca (%)	0.80	0.80	0.80	0.80	0.80	0.80
P ava. (%)	0.30	0.30	0.30	0.30	0.30	0.30
Lysine (%)	1.12	0.98	1.23	0.99	0.99	0.99
Meth. + Cys. (%)	0.82	0.81	0.81	0.76	0.75	0.76

[1]Protein concentrate provided per kg: 40% crude protein; 2800 kcal. ME/kg; 2.7% lysine; 1.7% methionine; 2.4% methionine + cystine; 8% calcium; 3% available phosphorus; 12% crude fat; 25% ash and vitamine and minerals which meet NRC (1994) Requirement. [2]Coriander 2710 Kcal. ME/kg

pens (15 birds/pen). The experimental diets were control (T1), 0.5% coriander oil (T2) and 1% coriander oil (T3). The experimental diets formulated to isocaloric and isonitrogenic according to NRC (1994). The ingredient and chemical composition of the experimental diets are presented in Table 1. Feed and water were provided *ad libitum* through out the experimental period. Birds were vaccinated against New Castle and Gumboro disease according to their age. Performance criteria includes weekly body weight gain, feed consumption and feed conversion ratio were measured weekly during the six week experimental period. At six week of age blood sample were collected using 6 birds from each treatment for measuring cholesterol according to the method described by Francy and Elias (1968) and plasma glucose according to Astoor and King (1954). Data were subjected to analysis of variance (SAS, 2001 and significant treatment means were separated by Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

Table 2 shows that body weight differ significantly ($p<0.05$) between treatment from 2-6 weeks of age. Birds consuming diet containing 1% (T3) coriander oil had a significantly ($p<0.05$) higher weekly body weight than the control (T1) and 0.5% coriander oil (T3). On the average both 0.5% and 1% coriander oil had significantly higher ($p<0.05$) weekly body weight than those of the control group. Furthermore, weekly live weight for the bird receiving 0.5% coriander oil (T2) was significantly ($p<0.05$) lower than that of 1% coriander oil (T3). Final body weight, birds receiving 1% coriander oil (T3) in their diet had the highest ($p<0.05$) body weight flowed by 0.5% coriander oil (T2).

There were no significant ($p<0.05$) differences in weekly gain between the control (T1) and birds receiving 0.5% coriander oil (T2) in the diet Table 3. While, birds receiving 1% coriander oil 1% (T3) had significantly ($p<0.05$) higher weekly weight gain than T1 and T2. Final gain from 1-6 weeks of age indicated that bird receiving 1% coriander oil (T3) had significantly ($p<0.05$) higher gain than those of the control group and 0.5% coriander oil group. On the average the birds receiving 1% coriander oil were 9% heavier over the control group (T1).

From 1-5 weeks there were no significant difference between the control (T1) and 0.5% coriander oil (T2) in weekly feed intake, While, feed intake for both groups consumed were significantly ($p<0.05$) less feed as of the 1% coriander oil (T3) for the same period. While, by the six week of the study both T2 and T3 consumed significantly higher ($p<0.05$) feed than the control group. Overall feed consumption showed that (T3) consumed significantly ($p<0.05$) feed followed by T2 as compared to the control group (T1). This could be due to the active ingredient in coriander oil makes those birds to with stand the heat stress during this age.

The effect of coriander oil on feed conversion ratio (g feed/g gain) is presented in Table 5. Feed conversion ratio were significantly ($p<0.05$) better for birds receiving basal diet with coriander oil. Feed conversion ratio were significantly ($p<0.05$) better for T2 and T3 as compared to the control from 1-6 weeks of age. Furthermore, the inclusion of 1% coriander oil (T3) showed a significantly ($p<0.05$) feed conversion ratio than the control and 0.5% coriander oil. The overall feed conversion (from 1-6 weeks of age) illustrated that there were no significant differences between T2 and T3, While both groups had significantly ($p<0.05$) better feed conversion ratio as of the control. The final feed conversion was 2.01, 1.96 and 1.94 for T1, T2 and T3 respectively.

Table 2: Effect of coriander oil on broiler weekly body weight (g) raised under summer months (32-36°C)

		Coriander oil (% in diet)		
Week	Control (T1)	0.5 (T2)	1 (T3)	Levels of significance
1	124.16±4.23	126.80±3.23	132.63±3.02	NS
2	271.97±3.03^{c}	284.04±8.69^{b}	314.03±3.28^{a}	**
3	481.63±6.33^{c}	530.56±6.35^{b}	605.0±10.92^{a}	**
4	814.01±11.12^{c}	883.33±11.43^{b}	914.01±5.63^{a}	*
5	1245.59±12.31^{c}	1324.50±10.12^{b}	1388.03±9.19^{a}	*
6	1609.58±12.22^{c}	1690.28±9.60^{b}	1773.86±12.97^{a}	*

^{a,b,c}Means in the same raw with different superscript are significantly different. *(p<0.05), **(p<0.01). Mean ± Std. error; T1: Control; T2: 0.5% coriander oil; T3: 1% coriander oil; NS: Not Significant (p<0.05)

Table 3: Effect of inclusion of coriander oil on weekly weight gain (g) for broiler chicks from 1-6 weeks of age

		Coriander oil (% in diet)		
Week	Control (T1)	0.5 (T2)	1 (T3)	Levels of significance
1	82.16±5.92	84.80±4.33	90.63±3.02	NS
2	147.80±8.78^{b}	157.44±9.49^{b}	181.39±1.63^{a}	*
3	209.66±8.05^{c}	246.51±6.68^{b}	290.97±10.86^{a}	*
4	372.38±6.76^{c}	352.78±8.44^{b}	409.72±15.29^{a}	*
5	431.57±9.81^{b}	441.16±10.91^{b}	473.30±12.0^{a}	*
6	364.0±5.11^{b}	365.78±6.14^{b}	385.84±5.81^{a}	*
1-6	1567.58±9.29^{c}	1648.28±7.66^{b}	1731.86±8.11^{a}	*

^{a,b,c}Means in the same raw with different superscript are significantly different. *(p<0.05); Mean ± Std. error; T1: Control; T2: 0.5% coriander oil; T3: 1% coriander oil; NS: Not Significant (p<0.05)

Table 4: Effect of coriander oil on weekly feed intake (g) of broiler chicks from 1-6 weeks of age

		Coriander oil (% in diet)		
Week	Control (T1)	0.5 (T2)	1 (T3)	Levels of significance
1	158.61±4.57	175.83±3.81	172.50±7.50	NS
2	310.12±5.07^{b}	329.86±6.73^{b}	355.12±8.22^{a}	*
3	411.62±8.14^{b}	397.22±6.22^{b}	463.89±6.01^{a}	*
4	592.72±2.11^{b}	581.94±3.24^{b}	595.55±1.03^{a}	*
5	783.83±4.11^{b}	786.11±3.21^{b}	827.22±6.15^{a}	*
6	886.28±10.99^{c}	961.87±6.79^{b}	986.26±7.81^{a}	*
1-6	3147.20±15.21^{c}	3232.80±10.13^{b}	3400.40±15.19^{a}	*

^{a,b,c}Means in the same raw with different superscript are significantly different. *(p<0.05); Mean ± Std. error; T1: Control; T2: 0.5% coriander oil; T3: 1% coriander oil; NS: Not Significant (p<0.05)

Table 5: Effect of coriander oil on feed conversion (g feed/g gain) of broiler chick from 1-6 weeks of age

		Coriander oil (% in diet)		
Week	Control (T1)	0.5 (T2)	1 (T3)	Levels of significance
1	1.94±0.12^{b}	2.08±0.10^{a}	1.90±0.02^{b}	*
2	2.11±0.01^{a}	2.11±0.01^{a}	1.95±0.02^{b}	*
3	1.96±0.11^{a}	1.63±0.03^{b}	1.60±0.02^{c}	*
4	1.80±0.02^{b}	1.45±0.22^{c}	1.93±0.02^{a}	*
5	1.83±0.01^{a}	1.81±0.11^{b}	1.74±0.02^{c}	*
6	2.42±0.11^{b}	2.65±0.22^{a}	2.56±0.01^{c}	*
1-6	2.01±0.03^{a}	1.96±0.01^{b}	1.94±0.03^{b}	*

^{a,b,c}Means in the same raw with different superscript are significantly different. *(p<0.05); Mean ± Std. error; T1: Control; T2: 0.5% coriander oil; T3: 1% coriander oil

The inclusion of coriander oil at level of 0.5% and 1% in broiler diets resulted in a significant (p<0.05) decrease in plasma cholesterol (Table 6). These result maybe explained according to Dhanapakiam *et al.* (2008), who illustrated that the concentration of LDL and VDL cholesterol while that the HDL cholesterol was increased in the animal fed coriander seed. The inhibition in the enzyme activity maybe due to that this is the key enzyme in pathway of cholesterol biosynthesis in the liver is 3-enzyme 3-methylglutaryl CoA (HMG-CoA) reductase activity (Crowell, 1999). Since the coriander oil reduce the activity of this enzyme HMG-CoA which is the key regulatory enzyme in cholesterol synthesis. As a result, a hypocholestermic effect of coriander oil can be

Table 6: Effect of different levels of coriander oil on plasma cholesterol and glucose of broiler chicks raised under summer condition (6 weeks of age)

	Coriander oil (% in diet)			
Parameter	Control (T1)	0.5 (T2)	1 (T3)	Levels of significance
Cholesterol (mg/100 ml plasma)	187±0.15[a]	176±0.16[b]	175±0.19[b]	*
Glucose (mg/100 ml plasma)	180±0.14[a]	177±0.23[b]	174±0.13[c]	*

[a,b,c]Means in the same raw with different superscript are significantly different. *(p<0.05); Mean ± Std. error; T1: Control; T2: 0.5% coriander oil; T3: 1% coriander oil

expected. Ase *et al*. (1995) illustrated that a 5% inhibition of (HMG-CoA) reductase lowered serum cholesterol by 2% in poultry. Chithra and Leelamma (1997) reported that coriander enhance bile acid synthesis and increase degradation of cholesterol to fecal bile acid and natural sterols which resulted in lowering serum cholesterol.

The inclusion of different levels of coriander oil on plasma glucose was presented in Table 6. The data revealed that there was a significant (p<0.05) decrease in plasma glucose as inclusion rate of coriander oil increased. Birds receiving 1% coriander oil had significantly (p<0.05) lower plasma glucose than T1 and T2. Furthermore, birds receiving 0.5% coriander oil had significantly (p<0.05) lower plasma glucose as compared to the control (T1). This decrease in plasma glucose in T2 and T3 could be related to the action of the active compound in coriander oil which may in turn play in glucose metabolism in the animal tissue which cause a degradation of glucose and lower its level in the blood. Furthermore, it's reducing the stress (high ambient temperature) on the birds through its role in lowering cortisol hormone (Gray and Flatt, 1999). While, the increase in plasma glucose for the control birds could be due to the increase in gluconeogensis through the increase in epinephrine, nor epinephrine and glucagons which resulted in an increase of plasma glucose from sources other than carbohydrate (Siegle, 1971, 1980, 1985; Freeman, 1997, 1988). These metabolic changes caused by high environmental temperature would explain why the control group (T1) had lower body weight, weight gain, feed consumption and feed conversion ratio. In conclusion it could be stated that the inclusion of coriander oil at levels of 0.5% or 1% improve broiler performance and plasma cholesterol and glucose.

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