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Effect of Coriander Seed (*Coriandrum sativum* L.) as Diet Ingredient on Broilers Performance under High Ambient Temperature

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Abstract: This study was conducted to determine the potential effect of coriander seed as growth promoting substance in broiler chicks raised under summer condition in Iraq (32-36°C). One hundred and eighty day-old Arbor Acer broiler chicks were randomly assigned to four dietary treatments with three replicate pens (15 birds/pen). Birds were fed experimental diets containing 0% (T1), 1% (T2), 2% (T3) and 3% (T4) coriander seed. Water and feed were provided *ad libitum* during the experiment. Performance parameters were monitored weekly which include live body weight, weight gain, feed consumption and feed conversion ratio (g. feed/g. gain). Result showed that inclusion of 2% coriander seed in broiler diets improve ($p<0.01$) total means of live weight and weight gain. Further more, feed consumption and feed conversion were significantly ($p<0.05$) higher in the 2% (T3) coriander seed as compared with other treatments. Feeding broiler chicks 2% coriander seed as a diet ingredient resulted in a significant improvement in performance parameter. Therefore, inclusion of 2% coriander seed in broiler diets could be beneficial for improving broiler performance raised during summer months.

Key words: Coriander seed, heat stress, broiler performance

INTRODUCTION

Antibiotics have played an important role in animal production as growth promoters. The use of antibiotic as growth promoters has been banned in many countries, due to public concern about their residues in animal products and the development of antibiotics resistance bacteria (Schwarz *et al*., 2001; Lee *et al*., 2004), which force the nutritionist for searching an alternative to antibiotics.

Herbs and spices are the most important part of human diet. In addition to boosting flavor, herbs and spices are also known for their potential antimicrobial and stimulating effects of digestive system (de Souza *et al*., 2005). In recent years the science has started paying attention to the properties of spice (Chaudhry and Tariq, 2006). Due to the side effects of medicine, The use of natural products as an alternative to conventional medicine and antibiotics has been rise in the last few decades (Ansari *et al*., 2006). Aromatic plants have been used traditionally as antiparasitic, anthelminic, analgesic and stimulating effects in the animal digestive system (Egayyar *et al*., 2001; Singh *et al*., 2002; Lee *et al*., 2004).

Coriander seed (*Coriandrum sativum* L.) a spice has health supporting reputation, It has been referred to as antidiabetic (Gray and Flatt, 1999), anti-inflammatory and cholesterol lowering (Chithra and Leelamma, 1997), anti-fungal (Basilico and Basilico, 1999), antioxidant (Chithra and Leelamma, 1999), antimicrobial (Delaquis *et al*., 2002; Singh *et al*., 2002). In addition it has appetizing and stimulatory effects in the digestive process (Cabuk *et al*., 2003). With all these beneficial properties of coriander seed, report on the value of coriander seed in poultry nutrition are limited. Thus, the objective of this study is to evaluate the inclusion of different levels of coriander seed as diet ingredient on broiler performance raised under summer condition in Iraq.

MATERIALS AND METHODS

This study was conducted at the poultry farm of Animal Resource Department, University of Baghdad, Collage of Agriculture, during summer months to study the effect of inclusion different levels of coriander seed (*Coriandrum sativum* L.) as diet ingredient on broiler performance. A total of 180 day-old broiler chicks were allocated randomly (utilizing a complete randomize design (CRD) to four dietary treatment from 1-42 days of age, with three replicate pens (15 birds/pen). The experimental diets were control (T1), 1% coriander seed (T2), 2% coriander seed (T3) and 3% coriander seed (T4). The experimental diets were formulated to be 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 diseases according to their age. Performance criteria include live body weight, weight gain, feed consumption and feed conversation ratio

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Table 1: Compostion of the experimental diets

	Starter coriander seed				Grower coriander seed			
	Cont.	1%	2%	3%	Cont.	1%	2%	3%
Ingredients	1-4 weeks				4-6 weeks			
Yellow corn	45.00	45.00	50.00	54.00	50.00	49.00	50.00	51.00
Wheat	20.00	19.00	12.00	7.00	19.50	19.50	18.25	15.00
SBM (48%)	25.00	25.00	26.00	26.00	20.00	20.00	19.00	20.00
Protein con.[1] (40%)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Coriander[2] seed	-	1.00	2.00	3.00	-	1.00	2.00	3.00
Corn oil	-	-	-	-	0.50	0.50	0.75	1.00
Calculated composition according to NRC (1994)								
CP (%)	22.12	22.10	22.17	21.91	20.19	20.10	19.56	19.73
Kcal ME/Kg	2965.00	2961.10	2961.00	2967.10	3050.00	3044.00	3066.00	3070.00
Ca (%)	0.80	0.80	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	0.30	0.30
Lysine (%)	1.12	1.11	1.13	1.13	0.99	0.99	0.96	0.98
Meth. + Cys. (%)	0.82	0.82	0.92	0.82	0.76	0.79	0.74	0.74

[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 vitamin and minerals which meet NRC (1994) Requirement.
[2]Coriander seed 2710 Kcal ME/kg; 0.5% protein; 5.5% moisture; 0.2% volatile oil; 19.6% ether extract; 31% crude fiber; 1.2% potassium; 0.02% sodium; 20% carbohydrates; 12 mg/100 mg ascorbic acid; 0.26 mg/100 g B1 and 0.23 mg/100 g B2

were measured weekly during the six weeks experimental period.

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

The effect of different inclusion rate of coriander seed in the diet on live body weight are presented in Table 2. From 1-6 week, body weights different significantly between treatments. Birds consuming diet containing 2% coriander seed had a higher weekly body weight on average than those on the other experimental diets. There were no difference in average final body weight between the control group (T1) and 1% coriander seed diet (T2), while birds consuming 2% and 3% coriander seed (T4) had a significantly ($p<0.01$) body weight as a compared to T1 and T2. The birds consuming the diets containing 2% coriander seed (T3) had significantly ($p<0.01$) higher final body weight than those on the other experimental diets (T1, T2 and T4 respectively). The inclusion 2% coriander seed to the diets improved final body weight by 14% over the control group (T1).

The effect of inclusion of coriander seed in the broiler diets on average weekly gain is presented in Table 3. Average gain from 1-6 weeks for the birds consuming the diet containing 2% coriander seed showed a higher weekly gain than those of the other experimental diets. There were no significant ($p<0.05$) differences in average weekly gain of the birds consuming the control and 1% coriander seed (T2) diets. Further more, average weekly gain in both groups (T1 and T2) were significantly lower ($p<0.01$) than 2% and 3% coriander seed diets (T3 and T4). The inclusion of 2% coriander seed (T3) had significantly ($p<0.01$) higher gain on average than birds on the diets T1, T2 and T4 (0%, 1% and 3% coriander seed respectively). The inclusion of 2% coriander seed (T3) to the diets improved final gain by 14.6%, 17.5% and 10.03% above the control, 1% and 3% coriander seed respectively.

From 2-6 weeks of age, feed consumption were significantly ($p<0.05$) improved by the supplementation of coriander seed at levels of 1%, 2% and 3% compared to those (birds) on the control diet (T1) (Table 4). Highest feed consumption ($p<0.01$) obtained in the 2% coriander seed (T3) for the entire experimental period. In spit the elevated ambient temperature (32-36°C) especially during the last two weeks of the experiment, birds that fed diet containing 2% coriander seed had improved their feed intake and weight gain.

The effect of different levels of coriander seed on feed conversion ratio (g. feed/ g. gain) are presented in Table 5. The inclusion of 2% coriander seed resulted in significant ($p<0.05$) better feed conversion ratio as compared with other groups. While, feed conversion ratio on average for treatment 0% (T1) and 1% (T2) coriander seed were significantly lower ($p<0.05$) as compared to 2% (T3) and 3% (T4) coriander seed.

The positive improvement in live body weight, feed conversion, weight gain and feed intake of the birds raised under summer condition (32-36°C) could be due to the essential oils present in coriander seed such as linalool (60-70%), citronellol, geraniol, myrcence, ∞ and γ-terpinene, ∞ and ß-phellan drene and ∞ and ß-pinene (Wichtl, 1994). Cabuk *et al.* (2003) stated that linalool has appetizing in a diet and stimulating effect on digestive process, this was evident in 2% coriander seed group, in spite of the high ambient temperature during the last two weeks of this study, they were able to consume more feed and had better feed conversion

Table 2: The effect of different levels of coriander seed on average weekly live weight (g) of broiler chicks

	Coriander seed (% in diet)				
Week	Control (T1)	1 (T2)	2 (T3)	3 (T4)	Levels of significance
1	124.18±5.92^{b}	121.25±2.05^{c}	137.76±3.42^{a}	126.11±4.36^{bc}	**
2	271.97±3.03^{b}	261.17±3.54^{c}	328.59±6.63^{a}	292.37±7.83^{b}	**
3	483.29±5.45^{b}	466.34±12.13^{c}	622.85±27.18^{a}	541.67±20.96^{b}	**
4	814.01±10.11^{b}	787.37±10.44^{c}	824.74±16.11^{a}	870.58±15.23^{a}	**
5	1245.558±43.28^{b}	1149.71±41.99^{c}	1354.42±20.14^{a}	1322.64±40.78^{a}	**
6	1609.38±43.87^{b}	1555.55±20.74^{b}	1876.81±28.64^{a}	1694.44±33.79^{b}	**

^{a,b,c}Means in the same row with different superscript are significantly different (p<0.01); Mean±Std. error.
T1: Control; T2: 1% coriander seed; T3: 2% coriander seed; T4: 3% coriander seed

Table 3: The effect of different levels of coriander seed on average weekly gain (g) of broilers chicks

	Coriander seed (% in diet)				
Week	Control (T1)	1 (T2)	2 (T3)	3 (T4)	Levels of significance
1	82.18±5.92^{b}	79.25±2.05^{b}	95.76±3.42^{a}	84.11±4.36^{b}	**
2	147.78±8.77^{c}	139.92±5.59^{c}	190.83±3.26^{a}	166.36±3.50^{b}	**
3	211.33±7.87^{c}	205.37±8.65^{c}	294.29±24.82^{a}	249.29±13.92^{b}	**
4	330.72±18.08^{a}	320.83±13.39^{a}	301.89±13.17^{a}	328.91±10.7^{a}	NS
5	431.57±32.34^{b}	362.34±18.93^{c}	529.67±26.16^{a}	452.06±20.45^{a}	**
6	364.00±6.21^{c}	405.85±5.11^{b}	424.37±6.50^{a}	371.8±7.12^{c}	**
1-6	1567.58±13.87^{c}	1513.55±20.74^{c}	1836.81±10.64^{a}	1652.43±10.79^{b}	**

^{a,b,c}Means in the same row with different superscript are significantly different (p<0.01); Mean±Std. error.
T1: Control; T2: 1% coriander seed; T3: 2% coriander seed; T4: 3% coriander seed; NS: Not Significant

Table 4: The effect of different levels of coriander seed on feed intake (g) of broiler chicks under summer condition

	Coriander seed (% in diet)				
Week	Control (T1)	1 (T2)	2 (T3)	3 (T4)	Levels of significance
1	158.61±4.57	176.39±14.50	178.03±5.17	156.11±3.09	NS
2	310.12±5.07^{b}	336.79±8.40^{ab}	351.23±7.64^{a}	313.33±12.5^{b}	*
3	411.62±2.52^{b}	407.07±27.78^{b}	510.16±18.87^{a}	427.78±20.03^{b}	*
4	596.72±5.80^{b}	552.27±16.44^{c}	633.40±10.67^{a}	572.85±6.01^{bc}	*
5	783.83±44.83^{bc}	651.39±32.48^{c}	950.89±20.81^{a}	803.77±19.02^{b}	*
6	886.28±20.99^{c}	933.42±15.81^{b}	969.70±15.37^{a}	941.20±10.06^{b}	*
1-6	3147.2±10.59^{c}	3059.3±15.48^{d}	3593.41±63.26^{a}	3215.0±10.40^{b}	**

^{a,b,c,d}Means in the same row with different superscript are significantly different. *(p<0.05), **(p<0.01).
Mean±Std. error; T1: Control; T2: 1% coriander seed; T3: 2% coriander seed; T4: 3% coriander seed; NS: Not Significant

Table 5: The effect of different levels of coriander seed on feed conversation ratio (g feed/g gain) of broiler chicks

	Coriander seed (% in diet)				
Week	Control (T1)	1 (T2)	2 (T3)	3 (T4)	Levels of significance
1	1.93±0.56	2.22±0.32	1.85±0.56	1.85±0.61	N.S.
2	2.10±0.10^{b}	2.40±0.12^{a}	1.84±0.02^{c}	1.88±0.02^{c}	*
3	1.94±1.02^{b}	1.98±0.08^{a}	1.73±0.11^{c}	1.71±0.02^{c}	*
4	1.80±0.03^{b}	1.72±0.25^{c}	2.09±0.01^{a}	1.74±0.12^{d}	*
5	1.81±0.02^{a}	1.79±0.20^{a}	1.79±0.23^{a}	1.77±0.32^{a}	N.S.
6	2.41±0.02^{a}	2.30±0.02^{b}	2.28±0.01^{c}	2.53±0.21^{a}	*
1-6	1.99±0.11^{a}	2.06±0.31^{a}	1.93±0.10^{b}	1.91±0.11^{b}	*

^{a,b,c,d}Means in the same raw with different superscript are significantly different. *(p<0.05), **(p<0.01).
Mean±Std. error; T1: Control; T2: 1% coriander seed; T3: 2% coriander seed; T4: 3% coriander seed; NS: Not Significant

ration as compared to 0%, 1% and 3% coriander seed. In addition inhibits pathogenic microorganism in the digestive system which resulted in no mortality or any disease infection in all coriander seed birds. Which maybe one of the reason for improving bird's performance. This work showed that the inclusion of 2% coriander seed in broiler diets significantly improve final body weight, feed conversion ratio that consumed 2% coriander seed and feed intake in birds reared under summer condition. It could be concluded that the inclusion 2% coriander seed could be used as a natural growth promoter and reduce heat stress via improving birds immunity. This is could be due to its appetizing effect, improve digestive enzyme function and nutrients

were absorbed more efficiently and antimicrobial actions which may increase bird's immunity, and as a consequence improve bird's performance.

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