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Effects of dietary black cumin seeds (Nigella sativa) on performance, carcass traits and some blood parameters in broiler chickens.

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Introduction

Recently it is known that antibiotics as additive stuff has negative effects on animals health and is risky due to cross-resistance amongst pathogens and residues in tissues. Therefore the use of antibiotic growth promoters has been banned in many countries and these led to investigations of alternative feed additives in animal production. One of the alternatives is the supplementation of aromatic plants and/ or their extracts due to their positive effects as antimicrobial (ELGAYYAR ET AL., 2001; WENK, 2003), as stimulant on animal digestive systems and as antioxidants (BOTSOGLOU ET AL., 2002). The black cumin (Nigella sativa) is an annual herbaceous plant that belongs to the botanical family Ranunculaceae, growing especially in the Mediterranean region (CHEIKH- ROUHOU ET AL., 2007) The seeds of Nagella Sativa contains volatile oil (0.5- 1.6%), alkaloids, sterols, saponins and quinines and the seeds are used for traditional medicine as an antispasmodic, antihelminthic, antiseptic, antiarthritic, nerve tonic, appetiser and emmenagogue in the treatment of ascites, asthma and pustular dermatitis (AL-HOMIDAN ET AL., 2002). Some studies mentioned that black cumin seed had positive effect on weight gain and feed conversion ratio (AL-HARTHI, 2004; MANSOORI ET AL., 2006; KHAN ET AL., 2012) on feed intake, dressing percentage and weight of different internal organs (DURRANI ET AL., 2007). The aim of the present study was to examine different level of black cumin powder in diet on broiler performance some carcass characteristics and blood indices.

Material and Methods

A total of 144 seven-days-old Hubbard strains – mixed sex broiler chicks were individually weighed and assigned to floor pens with litter consisting of wood shavings. The chicks were allocated randomly to four equal treatment groups. Each treatment group consisted of three replicates of 12 chicks each and reared to 42 days of age. A basal diet of corn and soja bean meal containing adequate nutrients was formulated. The birds in the control group (treatment 1) were fed the basal diets without black cumin seeds (BCS). Three different levels of black cumin seeds (powder) was added to the basal diet. So it was added to the basal diets at 1.5% (Diet 2), 2.5% (Diet3) and 3.5% (Diet4). Black cumin seeds were mixed carefully with the basal diet. The ingredient and nutrient composition of the diets are presented in Table 1. Water and feed were available ad libitum, and all diets were fed as mash form. Live weight (LW) individually and feed consumption (per pen) of the birds were recorded weekly and were used to calculate broiler performance. At 42 d of age, 3 birds were selected from each treatment group, weighed and slaughtered to determine carcass dressing percentage and edible organ. Also Blood samples were taken at 42 d of age from the brachial vein from 3 birds per treatment group (1 bird per pen). Blood samples were separated by centrifuge, and serum was analyzed for total protein, glucose, cholesterol and albumin using commercial test kits. Experimental data were analyzed by ANOVA using SPSS v. 17.0 (Statistical Packages for the Social Sciences, released August 23, 2008). Duncan multiple rang test was used to test mean differences between all treatment by significance level at $p < 0.05$.

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Table 1: Ingredients and nutrient composition of experimental diets.

Ingredients	Diet1	Diet2	Diet3	Diet4
Corn %	65	65	65	65
Soja bean meal %	25	23.5	22.5	21.5
Protein Concentrate* %	10	10	10	10
BCS %	0	1.5	2.5	3.5
Calculated analysis (%)				
Crude protein (CP)	20.05	19.9	19.80	19.70
Ca	0.86	0.86	0.86	0.86
P	0.62	0.62	0.62	0.63
Metabolisable energy Kcal/kg	3093	3104	3110	3118

*Protein Concentrate content: 30 % CP, 1800 kcal ME, 7.8 Ca, 2.8 P, 1.3 Na, 2.5 Lysine and 2.1 Methionen.

Results and Discussion

- Growth performance

The average daily weight gain (g/ bird/d) was significantly ($p<0.05$) increased only for birds received 2.5% BCS compared to control birds. There was no significant ($P>0.05$) difference between BWG in birds fed diets with different BCS (table 2). KHAN ET AL. (2012) stated that supplementation BCS to the diets had variable effects on chicken performance and indicated in their study that birds fed diets supplemented with 2.5 or 5.0% BCS had significantly greater body weight gain than those fed with the 1.25% BCS diet and the negative control, which are similar to our results. The light high weight gain in our study might relate to the increased feed intake. AL-BEITAWI AND EL-GHOUSSEIN (2008), ASHAYERIZADEH ET AL. (2009) mentioned that supplementation of the diet with BCS significantly improved the body weight gain. In this study, results indicated that birds received 2.5 % and 3.5 % BCS in the diet increased significantly average daily feed intake comparing to bird in control groups or bird getting 1.5% BCS. These results are in agreement with results from earlier studies from GULER ET AL. (2006). Black cumin as feed additives stimulates the activity of digestive system, enhances the diet palatability and appetite and due this increased the amount of feed intake (GILANI ET AL., 2004). In contrast, reported DENLI ET AL., (2004) that supplementation with black cumin seed extract did not significantly affect feed intake of quail. ABBAS AND AHMED (2010), SOGUT ET AL. (2012) reported that Supplementation of ground black seeds to the broilers chicks diet resulted in a significant ($P< 0.01$) decreased feed intake. On other hand, feed conversion ratio (g FI/g WG) was not significantly influenced by supplementing BCS to the diet as shown in table 2. These results are similar to the results of studies from MAJEED ET AL., (2010) and SAEID ET AL. (2013) who reported that diets containing BCS at different level (0.25 – 0.75%) did not significantly influence the FCR at the whole experimental period. Conversely, many authors also reported that Black cumin seed had a significant effect on feed conversion ratio (DURRANI ET AL., 2007 and ABDEL-HADY ET AL., 2009).

Table2: The effect of dietary black cumin seed on the average daily live weight gain, daily feed intake and the feed conversion ratio of broilers chickens (7 - 42 d of age).

Treatments	Average daily gain (g/ bird/d)	Average Feed intake (g/d)	Feed conversion ratio (g feed/g gain)
Control	36.8^{a} ± 1.3	71.6^{a} ± 1.5	1.94 ± 0.14
1.5% BCS	37.6^{ab} ± 1.9	72.1^{a} ± 1.9	1.92 ± 0.14
2.5% BCS	42.2^{b} ± 1.9	78.3^{b} ± 2.7	1.86 ±0.16
3.5% BCS	40.6^{ab} ± 0.6	76.4^{b} ± 2.9	1.88 ± 0.12

$^{a, b}$ Mean values with different superscripts within a column differ significantly ($p<0.05$).

- Carcass traits

No significant effects of dietary BCS were observed on the slaughter weight, the dressing percentage and edible inner organs in this study (Table 3). Similarly to our results, reported AL-BEITAWI AND EL-GHOUSEIN (2008), TOGHYANI ET AL., (2010) that addition with BCS did

not affect significantly carcass traits. On the contrary, GULER et al (2006) mentioned that BCS adding to the diet affected significantly the carcass traits and DURRANI ET AL., (2007) found that addition of 4% black seeds to the broilers significantly ($P<0.05$) increased dressing percentage. Also, HASSAN ET AL. (2004) found that feeding broiler chicks rations includes 0.2% mixture of 1:1:1 crushed Thyme, Cinnamon barks and BCS increase significantly dressing percentage compared with control groups.

Table3: The effect of dietary black cumin seed on the some carcass traits of broilers chickens at 42 d of age.

Treatments	Slaughter weight (g)		Dressing %		edible inner organs %	
Control	1043.3	± 53.6	72.9	± 0.1	6.6	± 1.6
1.5% BCS	1123.3	± 103.4	72.8	± 0.2	6.7	± 1.7
2.5% BCS	1076.7	± 20.5	72.6	± 0.1	6.7	± 1.6
3.5% BCS	1110.0	± 20.8	74.9	± 1.5	8.3	± 2.0

- Some blood parameters

As shown in the table 4, there are a significantly effect of BCS addition on the tested blood parameters. So the total protein and albumin increased ($p<0.05$) and the glucose and the cholesterol decreased significantly with increasing the BCS in the diet. Also higher non significant value was noticed by the second treatment group for serum total protein. The same results were recorded by (TOLLBA AND AND HASSAN 2003; and HASSAN ET AL., 2007) they found significant increasing in serum total protein and albumen. KHAN ET AL. (2012) showed that birds getting 2.5 and 5% BCS in the diet showed an increase ($P<0.05$) in serum total protein than the 1.25% or unsupplemented diet group which similar to the results in this study. As serum protein depends on the availability of dietary protein, the proteins of the BCS diets were more available to the birds (KHAN ET AL., 2012).

Table4: The effect of dietary black cumin seed on some blood parameters of broilers chickens at 42 d of age.

Treatments	Total protein (g/dl)		Albumin (g/dl)		Glucose (mg/dl)		Cholesterol mg/dl)	
Control	2.20^{a}	± 0.01	1.20^{a}	±0.01	117.0^{a}	± 1.53	257.0^{a}	± 1.15
1.5% BCS	2.30^{a}	± 0.06	1.30^{b}	± 0.01	95.0^{b}	± 1.15	247.0^{b}	± 1.73
2.5% BCS	2.60^{b}	± 0.01	1.50^{c}	± 0.02	87.0^{c}	± 1.00	241.0^{c}	± 0.58
3.5% BCS	2.70^{b}	± 0.06	1.60^{d}	± 0.02	84.0^{c}	± 1.20	237.0^{d}	± 1.00

[a, b] Mean values with different superscripts within a column differ significantly

The increase in the total serum protein and albumin in this experiment is in agreement with NASSER ET AL., (1998), who reported that total serum protein as well as albumin was higher significantly when broiler chicks fed rations contains 2% and 3% of BCS in hot climate. BCS adding affected significantly the serum glucose level when compared with groups received different levels and that of the control group. These results do not agree with TOGHYANI ET AL., (2010) who recorded non significant effect for BCS on glucose level and also disagree with El-DAKHAKHNY ET AL., (2002), ZAOUI ET AL., (2002) and MERAL ET AL., (2004), who recorded hypoglycemic effect for BCS addition. Addition of BCS in the diet led to decreasing ($P<0.05$) serum cholesterol level when compared to control. Results agree with those obtained by TOLLBA AND AND HASSAN (2003), HASSAN ET AL., (2007) and AL-BEITAWI ET AL., (2009) who recorded that BCS significantly decreased serum levels of total cholesterol, while TOGHYANI ET AL., (2010) found that serum cholesterol concentrations were not significantly affected by supplementation of BCS. The decrease in cholesterol level may be attributed to the high content of Blak cumin from unsaturated fatty acids which may stimulate the cholesterol excretion into the intestine and the oxidation (KHODARY ET AL., 1996).

It can be concluded that feeding low levels of BCS improved performance characteristics in terms of LBW and feed intake. More studies required in this field to confirm the mechanism and mode of action of active ingredients of black cumin seed.

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