

Effect of Supplemented Black Seed (*Nigella sativa*) on Growth Performance and Carcass Characteristics of Broilers

B. Sogut, H. Inci and G. Ozdemir
Department of Animal Science, Faculty of Agriculture,
University of Bingol, 12000 Bingol, Turkey

Abstract: This study was conducted to investigate the effect of dietary supplementation with black seed on the performance in broilers. A total number of 120, 1 day old broiler chicks (Ross 308) were randomly allocated 4 treatments with 3 replications. The experiment lasted for 6 weeks. The dietary treatments consisted of the basal diet as control, 3, 5 and 7% black seed added to the basal diet. Body weights and feed intake of broilers were measured weekly. As a result, supplementing black seed did not have significant effect on broiler body weight, feed consumption and carcass characteristics. However, it can be concluded that feeding low levels of black cumin seed tended to improve performance characteristics in terms of body weight, feed consumption and carcass characteristics. The black cumin seed may reduce lipoidosis in the broilers.

Key words: Broiler, black seed, growth, carcass, body weight, Turkey

INTRODUCTION

Using antibiotics as growth promoters in poultry diet has been prohibited by many countries due to residual side effects and growing resistance to antibiotics of disease causing bacteria in humans (Baserisalehi *et al.*, 2007; Sepehri and Abbass-Zadeh, 2006). Thereby, researchers focused on the use of natural plant extracts as supplements alternative to antibiotics to control disease in growing birds and positive results were observed (Jamroz and Kamel, 2002; Nobakht *et al.*, 2012).

Medicinal plants such as Black cumin seeds (*Nigella sativa*) were recommended as a non-antibiotic growth promoters (Harzallah *et al.*, 2011; Al-Beitawi *et al.*, 2009; Guler *et al.*, 2006). Black seed plant (*Nigella sativa*) which belongs to Ranunculaceae family is present in Turkey and Middle East countries capaciously. The main active components of black seeds include such as thymoguinone, thymol and carvacol which are important pharmacologically active substances (Harzallah *et al.*, 2011; Toghyani *et al.*, 2010; Nasir *et al.*, 2005). Therefore, it contains antibacterial (Nickavar *et al.*, 2003), defense regulator, antimicrobial (Harzallah *et al.*, 2011) natural antioxidant (Abdel-Zaher *et al.*, 2011) and liver protector properties with no side effects (Kanter *et al.*, 2003; Qusti and El-Sawi, 2007; Cetin *et al.*, 2008). Furthermore, the previous studies in this regard had in one assent reported that Black cumin seed contain a mixture of essential fatty acids partially, linoleic, linolenic and oleic

acids which cannot be synthesized in the body (Harzallah *et al.*, 2011; Guler *et al.*, 2006). As a consequence of this condition, black seed plant (*Nigella sativa*) appear to be potential multipurpose feed growth promoter and may be promising in improving broiler performance, particularly feed efficiency weight gain and immune system (Al-Beitawi and El-Ghousein, 2008; Khalaji *et al.*, 2011; Cetin *et al.*, 2008; Abu-Dieyeh and Abu-Darwish, 2008).

This study was mainly designed in order to evaluate the effect of the inclusion of different levels of *Nigella sativa* rations on body weight, feed consumption, feed conversion ratio and carcass characteristics of broiler chicks.

MATERIALS AND METHODS

About 120 days old broiler chicks (Ross 308) were divided into 4 equal treatment groups, each with 3 replications (cages) of 10 chicks per cage. The experiment lasted 7 weeks. An adjustment period of 1st week was provided and the treatments were practiced for a period of 6 weeks. A basal diet (starter and grower) of corn, wheat, soybean and sunflower meal containing adequate nutrients was formulated. The diets were prepared for izonitrogenic and izocaloric. Before inclusion in feed, NS seeds were grounded to powder form. Birds in control groups (C) were fed basal diets and received water without any supplementation (Group IV). The treatment

Groups I, II and III received basal diet + 3, 5 and 7% Black cumin seed, respectively. Supplemented black seed was kept at room temperature. A continuous 24 h lighting program was applied; environmental temperature was decreased from 33°C on day 1-24°C (±1) on day 21st and maintained thereafter till slaughter. The diets and water were supplied *ad libitum* during the entire 7 weeks experimental period. Weights of the dead and culled birds were used for calculation of corrected feed conversion ratio (FCR-kg feed consumed per kg of live weight gain). Live Weight (LW) and Feed Consumption (FC) of broilers were recorded weekly till the end of the experiment. The live weights of the birds were measured individually and feed intakes per pen were recorded. At 42 days, 10 birds (5 male birds + 5 female birds) were selected from each treatment group, weighed and slaughtered to determine carcass characteristics. Right and left ventricular of the hearts were weighed to indicate the presence of ascites.

All data were analyzed using the General Linear Models procedures of SAS (1998). Duncan's multiple range test was used to test mean differences at (p<0.05).

RESULTS

Growth performance and mortality: Table 1 shows the mean body weight (LW) of broiler chicks fed different levels of supplemented Black cumin seed (*Nigella sativa*) rations through 42 days. There isn't any statistical difference observed among the experiment groups in the 1st 2 weeks. The effects of supplemented black seed observed at 3rd week of trail. In the 4th week, the highest live weight was in the II group (792.85 g) which

was 5% Experiment group. The positive effect of supplemented Black cumin seed on body weight continued in the 5th week. In the 6th week, the highest live weight was observed in the 3% supplemented black seed Experiment group. The differences between first and other groups were significant (p<0.05). However, no significant differences were observed among 2nd, 3rd and 4th groups. The mortalities of birds in this study were 2.5, 3.5, 3 and 5% for groups 1st, 2nd, 3rd and 4th, respectively.

Feed consumption: Table 2 shows the mean daily feed consumption of supplemented Black cumin seed rations through 42 days. When daily feed consumption of Black cumin seed were compared as weekly basis, though some differences were observed, generally there was not any linear positive effect substantially between the averages of Black cumin seed of experiment groups and the feed consumption of control groups. The highest daily feed consumption was observed in the 2nd group then control, 1st and 3rd groups.

Carcass characteristics: Table 3 shows the mean of carcass characteristics. Table 4 shows the mean of the weight of heart ventricular that indicate Ascites Syndrome. There was not any significant effect of supplemented Black cumin seed on the carcass parts. But the difference in terms of abdominal fat averages was observed as significant (p<0.05). The abdominal fat weights were confirmed as 27.50 g in the control group as highest.

Table 1: The effect of dietary Black cumin seed on the average live weight of broilers

Traits (weeks)	Groups			
	I	II	III	IV
Live weight (g)				
1	108.95±3.300 ^a	109.55±3.480 ^a	109.83±3.230 ^a	108.92±3.410 ^a
2	223.38±4.370 ^a	223.93±4.610 ^a	234.00±4.280 ^a	218.78±4.510 ^a
3	426.79±5.240 ^a	389.13±5.510 ^b	406.91±5.180 ^{ab}	431.17±5.430 ^a
4	722.24±9.580 ^a	792.85±10.25 ^b	730.52±9.390 ^a	741.23±9.860 ^a
5	1090.36±12.60 ^a	1172.79±13.26 ^b	1222.42±12.33 ^{bc}	1225.88±12.99 ^{bc}
6	1732.96±15.72 ^a	1658.32±16.14 ^b	1663.37±15.62 ^b	1639.48±15.50 ^b

Table 2: The effect of dietary Black cumin seed on feed consumption of broilers

Traits (weeks)	Groups			
	I	II	III	IV
Feed consumption (g/bird/day)				
1	20.57±0.79 ^a	26.75±0.79 ^{ab}	20.76±0.79 ^a	26.50±0.79 ^{ab}
2	39.82±0.80 ^a	47.58±0.80 ^b	36.07±0.80 ^a	39.13±0.80 ^a
3	68.56±1.75 ^a	76.28±1.75 ^a	60.11±1.75 ^{ab}	67.41±1.75 ^{ab}
4	97.46±1.77 ^a	127.14±1.77 ^b	109.82±1.77 ^{ab}	113.29±1.77 ^{ab}
5	125.73±2.42 ^a	156.40±2.42 ^b	120.00±2.42 ^a	139.83±2.42 ^{ab}
6	147.60±2.49 ^a	186.47±2.49 ^b	147.62±2.49 ^a	174.53±2.49 ^{bc}
Total	499.74	620.62	494.38	554.69

I: 3%, II: 5%, III: 7% powdered Black cumin seed, IV: Control group. ^{a-c}Means within the same row with no common superscript differ (p<0.05)

Table 3: The effect of dietary Black cumin seed on carcass characteristics of broilers

Traits	Groups			
	I	II	III	IV
Carcass characteristics (g)				
Thigh	447.21±21.94 ^a	482.78±21.94 ^a	438.16±23.63 ^a	478.83±23.63 ^a
Breast	565.03±40.82 ^a	617.81±40.82 ^a	596.50±43.97 ^a	588.16±43.97 ^a
Ridge	321.10±20.81 ^a	362.90±20.81 ^a	340.50±22.42 ^a	336.16±22.42 ^a
Wing	174.84±8.880 ^a	195.87±8.880 ^a	192.16±9.570 ^a	194.66±9.570 ^a
Neck	99.43±6.370 ^a	108.99±6.370 ^a	95.66±6.860 ^a	100.83±6.860 ^a
Gizzard	35.54±2.200 ^a	31.99±2.200 ^a	37.51±2.370 ^a	34.11±2.370 ^a
Abdominal fat	9.96±3.680 ^a	10.03±3.680 ^a	12.16±3.970 ^a	27.50±3.970 ^b

I: 3%, II: 5%, III: 7% powdered Black cumin seed, IV: Control group. ^{a,b}Means within the same row with no common superscript differ (p<0.05)

Table 4: The effect of dietary Black cumin seed on Ascites Syndrome of broilers

Traits	Groups			
	I	II	III	IV
Heart (g) (Right ventricular)				
F	25.67±2.38	26.58±2.92	26.59±2.38	25.42±1.98
M	24.81±2.44	26.40±2.04	25.04±2.44	26.47±2.63
F+M	25.27±1.68	26.52±1.69	25.89±1.68	25.68±1.57
Left ventricular				
F	67.14±1.89	66.60±2.31	66.43±1.89	67.53±1.57
M	67.73±1.89	66.82±1.58	67.93±1.89	66.71±2.04
F+M	67.42±1.32	66.69±1.32	67.04±1.23	67.33±1.23

I: 3%, II: 5%, III: 7% powdered Black cumin seed, IV: Control group

The average abdominal fat weights in the 1st, 2nd and 3rd groups were determined as 9.96, 10.03 and 12.16 g, respectively. There was not any significant effect of Black cumin seed determined on the Ascites Syndrome.

DISCUSSION

In this study, it was observed that the Black seed has no positive or negative effect on growth, feed consumption and carcass characteristics. In agreement with the present study Cetin *et al.* (2008) and Toghyani *et al.* (2010) reported that body weight, feed consumption and carcass characteristics were not significantly affected from dietary Black cumin seed extract. The results of Abu-Dieyeh and Abu-Darwish (2008) experiment illustrate clearly positive effects of feeding powdered Black cumin (*Nigella sativa* L.) seeds on growth rate, feed intake, feed to gain ratio and mortality rate of broiler birds. Similarly, These results were in agreement of the results obtained by Guler *et al.* (2006), Al-Beitawi and El-Ghousein (2008), Al-Beitawi *et al.* (2009), Halle *et al.* (2004) and Khalaji *et al.* (2011) in broiler and Yalcin *et al.* (2010) in layers. Besides, in an experiment, no significant effect of 1% supplemented *Nigella sativa* on BWG and FCR was observed, however, combined application of NS and EP has shown a positive effect in terms of better (nearly significant) LBW on 35th day, total WG and ADWG. The researchers interpreted that obviously, there is a potential of synergism in enhancing broiler performance (Nasir and

Grashorn, 2010). Observing lack of the supplements on BW might relate to the managerial and feeding conditions and composition of basal diets. The diets were freshly prepared and did not have high amount of feed ingredients, so that the growth of mildew like aflatoxin and some pathogenic bacteria in intestine may have been limited. Lee *et al.* (2003) reported that usually it may be expected, that growth promoting effects of feed additives (antibiotic as well as non-antibiotic) become more apparent when birds receive less digestible diets and/or are kept in a less clean environment. It is also known that well-nourished healthy chickens don't respond to antibiotic supplements provided they are housed under clean and disinfected conditions. In present experiment, there was no or little room to prevent their growth performance. Observing reduced mortalities in supplemented powdered Black cumin seed treated groups as compared to control may indicate that powdered Black cumin supplementation has potential to improve health and immunity of the birds and reducing mortality and morbidity. In the first part of this experiment, supplementing 3, 5 and 5% Black cumin in broiler diets has been reported to strengthen immune system by preventing lipid peroxidation and liver damage (Sogut *et al.*, 2008). In present experiment, reduction in mortality might show that NS seeds possess potential to improve immunity alone.

In this experiment the weights of thigh, breast, ridge, wing and neck from carcass characteristics, the weights of gizzard and heart from edible internal organs and abdominal fat weights are examined. The weight of heart ventricular is examined in order to determine whether the black seed has an effect on the Ascites which is a serious problem on broiler raised in high altitude. There was no significant difference observed. Generally, except the abdominal fat weights, the black seed had no significant effect on carcass characteristics. Similarly, Al-Beitawi and El-Ghousein (2008), Halle *et al.* (2004) and Toghyani *et al.* (2010) reported that supplementation with Black cumin seed did not have significantly affect carcass

characteristics. On the contrary, Guler *et al.* (2006) reported that Black cumin seed extract significantly affected carcass characteristics.

CONCLUSION

This study shows that from the viewpoint of broiler body weight, feed consumption and carcass characteristics, there is a lack of information in the literature about these parameters. The difference between the literature statements and the study is thought to be based on the different dosages and forms of the black seed (extract, essential oil, crushed-uncrushed and seed, powder). However, it can be concluded that feeding low levels of Black cumin seed (*Nigella sativa*) tend to improve performance characteristics in terms of body weight, feed consumption and carcass characteristics. The application of *Nigella sativa* has shown some numerically beneficial effects on health and performance of birds. The Black cumin seed may reduces lipoidosis in the broilers. More studies required on this field to confirm the present results.

REFERENCES

- Abdel-Zaher, A.O., M.S. Abdel-Rahman and F.M. Elwasei, 2011. Protective effect of *Nigella sativa* oil against tramadol-induced tolerance and dependence in mice: Role of nitric oxide and oxidative stress. *Neurotoxicology*, 32: 725-733.
- Abu-Dieyeh, Z.H.M. and M.S. Abu-Darwish, 2008. Effect of feeding powdered black cumin seeds (*Nigella sativa* L.) on growth performance of 4-8 week old broilers. *J. Anim. Vet. Adv.*, 3: 286-290.
- Al-Beitawi, N.A. and El-Ghousein, 2008. Effect of feeding different levels of *Nigella sativa* seeds (Black Cumin) on performance, blood constituents and carcass characteristics of broiler chicks. *Int. J. Poult. Sci.*, 7: 715-721.
- Al-Beitawi, N.A., S.S. El-Ghousein and A.H. Nofal, 2009. Replacing bacracin methylene disalicylate by crushed *Nigella sativa* seeds in broiler rations and its effects on growth, blood constituents and immunity. *Livest. Sci.*, 125: 304-307.
- Baserisalehi, M., N. Bahador and B.P. Kapadnis, 2007. A comparison study on antimicrobial susceptibility of *Campylobacter* spp. Isolates from faecal samples of domestic animals and poultry in India and Iran. *J. Boil. Sci.*, 7: 977-980.
- Cetin, M., S. Yurtseven, T. Sengul and B. Sogut, 2008. Effect of black seed extract (*Nigella sativa*) on growth performance, blood parameters, oxidative stress and DNA damage of partridges. *J. Appl. Anim. Res.*, 34: 121-125.
- Guler, T., B. Dalkilic, O.N. Ertas and M. Ciftci, 2006. The effect of dietary black cumin seeds (*Nigella sativa* L.) on the performance of broilers. *Asian-Aust. J. Anim. Sci.*, 19: 425-430.
- Halle, I., R. Thomann, U. Bauermann, M. Henning and P. Kohler, 2004. Effects of a graded supplementation of herbs and essential oils in broiler feed on growth and carcass traits. *Landbauforsch. Volk.*, 54: 219-229.
- Harzallah, H.J., B. Kouidhi, G. Flamini, A. Bakhrouf and T. Mahjoub, 2011. Chemical composition, antimicrobial potential against cariogenic bacteria and cytotoxic activity of Tunisian *Nigella sativa* essential oil and thymoquinone. *Food Chem.*, 129: 1469-1474.
- Jamroz, D. and C. Kamel, 2002. Plant extracts enhance broiler performance. In non ruminant nutrition: Antimicrobial agents and plant extracts on immunity, health and performance. *J. Anim. Sci.*, 80: 41-41.
- Kanter, M., I. Meral, S. Dede, M. Cemek, H. Ozbek, L. Uygan and H. Gunduz, 2003. Effects of *N. sativa* L. and *Urtica dioica* L. on lipid peroxidation, antioxidant enzyme systems and some liver enzymes in Cc 14-treated rats. *J. Vet. Med. A, Physiol. Pathol. Clin. Med.*, 50: 264-268.
- Khalaji, S., M. Zaghari, K.H. Hatami, S. Hedari-Dastjerdi, L. Lotfi and H. Nazarian, 2011. Black cumin seeds, *Artemisia sieberi* and *Camellia* L. plant extract as phyto-genic products in broiler diets and their effects on performance, blood constituents, immunity and cecal microbial population. *Poult. Sci.*, 90: 2500-2510.
- Lee, K.W., H. Everts, H.J. Kappert, M. Frehner, R. Losa and A.C. Beynen, 2003. Effects of dietary essential oil components on growth performance, digestive enzymes and lipid metabolism in female broiler chickens. *Br. Poult. Sci.*, 44: 450-457.
- Nasir, Z. and M.A. Grashorn, 2010. Effects of *Echinacea purpurea* and *Nigella sativa* supplementation on broiler performance, carcass and meat quality. *J. Anim. Feed Sci.*, 19: 94-104.
- Nasir, Z., A.R. Abid, Z. Hayat and H.I. Shakoor, 2005. Effect of Kalongi (*Nigella sativa*) seeds on egg production and quality in white Leghorn layers. *J. Anim. Plant Sci.*, 15: 22-24.
- Nickavar, B., F. Mojab, K. Javidnia and M.A.R. Amoli, 2003. Chemical composition of the fixed volatile oils of *Nigella sativa* L. from Iran. *Z. Naturforsch.*, 58: 629-631.

- Nobakht, A., N.H. Mansoub and M.A.M. Nezhady, 2012. Effect of *Melissa officinalis* L., *Tanacetum balsamita* L. and *Ziziphora clinopodioides* L. on performance, blood biochemical and immunity parameters of laying Hens. *Asian J. Anim. Vet. Adv.*, 7: 74-79.
- Qusti, S.Y. and N.M. El-Sawi, 2007. Effect of *Nigella sativa* oil on roridin E toxin administration on liver of male mice. *J. Appl. Anim. Res.*, 31: 161-164.
- SAS., 1998. Statistical Analysis System. SAS User's Guide Statistics. 6th Edn., SAS Institute Inc., Cary, NC.
- Sepahri, G. and H. Abbass-Zadeh, 2006. Prevalence of bacterial resistance to commonly used antimicrobials among *Escherichia coli* isolated from chickens in Kerman province of Iran. *J. Medical Sci.*, 6: 99-102.
- Sogut, B., I. Celik and Y. Tuluca, 2008. The effects of diet supplemented with the black cumin (*Nigella sativa* L.) upon immune potential and antioxidant marker enzymes and lipid peroxidation in broiler chicks. *J. Anim. Vet. Adv.*, 7: 1196-1199.
- Toghyani, M., M. Toghyani, A. Gheisari, G. Ghalamkari and M. Mohammadrezaei, 2010. Growth performance, serum biochemistry and blood hematology of broiler chicks fed different levels of black seed (*Nigella sativa*) and peppermint (*Mentha piperita*). *Livest. Sci.*, 129: 173-178.
- Yalcin, S., S. Yalcin, H. Erol, K.E. Bugdayci, B. Ozsoy and S. Cakir, 2010. Effects of dietary cumin seed (*Nigella sativa* L.) on performance, egg cholesterol content and egg yolk fatty acid composition in laying hens. *J. Sci. Food Agric.*, 89: 1737-1742.