

CARCASS TRAITS AND RELATIVE ORGAN WEIGHTS OF BROILER FINISHER CHICKEN FED COMMERCIAL FEED SUPPLEMENTED WITH VARYING LEVELS OF BLACK SEED (*Nigella sativa* L.) CAKE

Olayeni, T.B., Adedaja, M.A. and Salaudeen, M.

Department of Animal Production and Health, Ladoko Akintola University of Technology,
Ogbomoso, Nigeria. P.M.B. 4000

E-mail: tbolayeni@lautech.edu.ng (*Corresponding author*)

Abstract: A study was conducted to evaluate the carcass characteristics and relative organ weights of broiler finisher chickens fed commercial feed (vital feed) supplemented with varying levels of black seed (*Nigella sativa* L.) cake. Two hundred unsexed day-old broiler chicks (Arbor Acres strain) were purchased from a reputable hatchery and randomly allocated to five dietary treatments of 20 birds per treatment in a completely randomized design experiment and the birds were sub-divided into four replicates each. Five diets were formulated such that diet 1,2,3,4 and 5 were supplemented with black seed cake at 0,1,2,3 and 4g/kg levels respectively. At the end of the experiment two birds were randomly selected, tagged and starved. The birds were slaughtered and data were collected on their carcasses and organs. The result of carcass traits showed that Final live weight, Bled weight, Defeathered weight, Eviscerated weight, Carcass weight and Dressing percentage were not significantly ($P>0.05$) affected. The relative carcass cuts such as Neck, Wings, Breast, Thigh, Shanks, and Fat and back were not significantly ($P>0.05$) affected by the dietary treatment except the drumstick which showed significant ($P<0.05$) difference. Significant ($P>0.05$) difference was not indicated in the relative organs weight of the birds across the treatments except that of kidney which was significantly ($P<0.05$) affected by the dietary treatment. It can be concluded that Black seed cake (BSC) supplementation in diets of broiler chickens at 2g/kg level had no negative effects on the carcass and no deleterious effect was observed on their organs.

Keywords: Carcass and Organs, Broiler, Commercial Feed, Black Seed Cake, Additive.

INTRODUCTION

In poultry, feed cost accounts for up to 80% of the total cost of production and is a very important component in determining the extent of poultry survival and profitability (Olugbemi *et al.*, 2010). Success on rearing broiler for maximum weight gain is not only dependent upon the strain of the birds and management but also on high quality feed (Nazeer *et al.*, 2002). Feed additives are assuming a position of prime importance in poultry nutrition. The use of phytochemicals as feed additives such as local plant materials in recent time is often aimed at improving animal performance by increasing their growth rate, improving feed efficiency and reducing the incidence of diseases (Zomrawi *et al.*, 2013) and serve as

alternative for growth promoting antibiotics which has been banned by European union due to their resistance against bacteria which are pathogenic to humans (Majeed *et al.*, 2010; Nasir and Grashorn 2010). Removal of antibiotics from the poultry diets may negatively affect profitability of the animals.

One of the alternatives used as feed additives is black seed. Black seed (*Nigella sativa* L.) is also known as Black cumin and grows in Asian and Mediterranean countries. The seed has been experimented with laboratory rodents and reported to have many biological properties including antibacterial activity (El-Kamali *et al.*, 1998), antiviral activity (Salem and Hossain, 2010), antiparasitic (Mahmuod *et al.*, 2002). A few studies with broiler chickens showed that black seed has significant effect on carcass and organ of the broiler chickens.

Guler *et al.*, (2006) and Toghyani *et al.*, (2010) reported an increased carcass yield, liver, abdominal fat, breast, thigh, wings and neck weights in broilers by feeding diet having 1% black cumin. However, non-significant values were obtained regarding heart weight. Controversial results were documented by AL-Beitawi *et al.*, (2009) who found no improvement in carcass characteristics by feeding different levels of crushed as well as uncrushed *Nigella sativa* seed in broilers, however, Nasir and Grashorn, (2010) reported an increased in breast percentage. Therefore, there is need to conduct studies on the potential use of black seed cake in the broiler diets. The objective of the study is to evaluate the black seed cake supplementation on the carcass traits and relative organs weight of broiler chickens.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of Ladoko Akintola University of Technology, Ogbomosho, Oyo State in the derived savanna zone of Nigeria.

Collection of Test Ingredient and preparation of experimental Diets

Black seed cake (BSC) was purchased from a local market in Saki, Oyo State and supplemented in the diets directly without any further processing. Five Experimental diets were formulated using commercial feed concentrate (Vital feed ®), maize and wheat offal. The diets were supplemented with black seed cake (BSC) such that diets 2, 3, 4 and 5 were supplemented 1, 2, 3 and 4g/kg BSC respectively. Diet 1 served as the control diet with no BSC supplementation.

Experimental animal, Design and management

One hundred (200) unsexed day-old broiler chicks (Arbor acres strain) were purchased from reputable hatchery (AMO farm) in Oyo State. The chicks were weighed individually and randomly allocated to five dietary treatments in a Completely Randomized Design Experiment (CRD). Each treatment was replicated four times with ten birds per replicate. Feed and water were given *ad libitum*. Other management practices and vaccination programs were strictly adhered to.

Data collection

Carcass and Organs Evaluation

The carcass and organs were determined at the end of 6 weeks by selecting randomly, four birds from each replicate in each treatment. The selected birds were tagged and starved overnight. Before slaughtering, the individual weight of the birds was recorded and slaughtered by severing the jugular vein around the neck. The bled weight of an individual bird was recorded. The carcasses were defeathered, eviscerate, and the weights were measured immediately and the weights of the carcass were also recorded. The visceral organs such as liver, pancreas, spleen, kidney, proventriculus, and heart were removed and weighed and expressed in percentage relatives to the carcass weight. The carcasses were cut into various parts (head, neck, back, thigh, breast, shank, drumsticks and wings) and their weights were expressed in percentage relative to the carcass weight. In addition, the dressing percentage was calculated using the formula below.

$$\text{Dressing percentage (DP)} = \frac{\text{Carcass weight}}{\text{Final live weight}} \times 100$$

$$\text{Relative cut parts weight} = \frac{\text{Weight of the cuts}}{\text{Carcass weight}} \times 100$$

$$\text{Relative organ weight} = \frac{\text{Weight of organs}}{\text{Carcass weight}} \times 100$$

Data Analysis

Data generated from the experiment were subjected to one way analysis of variance (ANOVA) using the general linear model of (SAS, 2007) while the significant means among the treatments were separated using Duncan Multiple Range Test of the same statistical package at 5% significant level.

Table 1: Gross composition of experimental diets

Ingredients (Kg)	Black seed cake supplementation level (g/kg)				
	T1 (0g)	T2 (1g)	T3 (2g)	T4 (3g)	T5 (4g)
Maize	50	50	50	50	50
Concentrate	30	30	30	30	30
Wheat offals	20	20	20	20	20
Black seed cake	-	+	+	+	+
Total	100	100	100	100	100
Calculated analysis					
Metabolizable energy (kcalME/kg)	2901	2901	2901	2901	2901
Crude protein (%)	19.4	19.4	19.4	19.4	19.4
Crude fibre (%)	4.5	4.5	4.5	4.5	4.5
Ether extract (%)	5.1	5.1	5.1	5.1	5.1
Calcium (%)	1.0	1.0	1.0	1.0	1.0

Broiler finisher Concentrate used contains: Fat Max: 8.0%, Calcium: 3.0%, Protein Min: 36.0%, Metabolisable Energy- 2700Kcal/kg.

RESULTS AND DISCUSSION

Results

Results of the carcass traits of broiler finisher chickens fed commercial feed supplemented with varying levels of Black seed cake (BSC) is shown in Table 2. It was observed that Final live weight, Bled weight, Defeathered weight, Eviscerated weight, Carcass weight and Dressing percentage were not significantly ($P>0.05$) affected by the dietary treatments. Despite this, the birds fed diet supplemented with black seed cake at 2g/kg had numerical higher value when compared with other treatment groups. Relative carcass cuts e.g Neck, Wings, Breast, Thigh, Shanks, Fat and back were not significantly ($P>0.05$) affected by the dietary treatment except the drumstick which showed significant ($P<0.05$) difference. Birds fed diets supplemented with black seed cake at 2, 3, and 4g/kg levels respectively compared with the control. Their values were significantly ($P<0.05$) higher than those on 1g/kg black seed cake level.

The results of relative organ weights of broiler finisher chickens fed commercial feed supplemented with varying levels of Black seed cake (BSC) is shown in Table 3. It was

observed that there were not significant ($P>0.05$) differences in all parameters measured across the treatments except the relative weight of kidney which was significantly ($P<0.05$) affected by the dietary treatments. Relative weights of proventriculus of the birds fed diets 3, 4 and 5 were similar ($P<0.05$) and their values fall between 0.61 to 0.71%. Birds fed diet 5 had the highest value of spleen while the birds fed diet 2 had the lowest value. Relative weight of pancreas ranged from 0.44 to 0.54% and the birds fed diet 2 had lowest numerical value (0.44%).

Table 2: Carcass traits of broiler finisher chickens fed commercial feed supplemented with varying levels of Black seed cake (BSC)

Parameters (g)	Black seed cake supplementation level (g/kg)					SEM
	T1 (0g)	T2 (1g)	T3 (2g)	T4 (3g)	T5(4g)	
Final live weight	1788.50	1735.75	1845.50	1694.75	1617.75	34.06
Slaughtered weight	1722.50	1671.25	1768.25	1628.25	1553.75	71.93
Defeathered weight	1652.00	1603.00	1689.25	1558.75	1490.25	66.20
Eviscerated weight	1336.75	1345.00	1394.75	1284.25	1228.75	28.81
Carcass weight	1208.25	1225.75	1260.50	1160.25	1107.00	26.45
Dressing percentage (%)	67.54	70.53	68.65	68.43	68.46	0.58
Relative cut-parts weight (%)						
Neck	4.62	4.66	4.60	4.41	4.50	0.99
Wings	11.30	10.67	11.00	11.40	11.30	0.12
Breast	33.69	36.18	34.66	33.31	38.83	0.43
Thigh	15.56	15.57	15.64	15.36	15.62	0.75
Drumstick	14.60 ^a	13.22 ^b	14.53 ^a	14.37 ^a	14.55 ^a	0.19
Shanks	6.24	5.53	6.16	6.00	6.21	0.12
Fat	1.08	0.61	0.96	0.71	0.10	0.18
Back	18.34	17.94	19.28	19.01	18.50	0.34

^{a,b}- means in the same row bearing different superscripts differed significantly ($P<0.05$). SEM – Standard error of mean.

Table 3: Relative organs weights of broiler finisher chickens fed commercial feed supplemented with varying levels of black seed cake

Parameters	Black seed cake supplementation level (g/kg)					SEM
	T1 (0g)	T2 (1g)	T3 (2g)	T4 (3g)	T5 (4g)	
Proventriculus	0.61	0.61	0.70	0.71	0.71	0.03

Gizzard	4.42	4.14	4.15	3.94	4.32	0.13
Liver	3.26	3.05	2.82	3.11	3.07	0.08
Spleen	0.13	0.10	0.14	0.14	0.16	0.01
Kidney	0.84 ^{ab}	0.95 ^{ab}	0.75 ^b	1.02 ^{ab}	1.09 ^a	0.02
Pancreas	0.54	0.44	0.48	0.54	0.49	0.02
Heart	0.71	0.63	0.63	0.70	0.65	0.02
Lung	0.94	0.91	0.81	0.86	0.94	0.03

^{a,b}- means in the same row bearing different superscripts differed significantly ($P < 0.05$). SEM – Standard error of mean.

DISCUSSION

Results of the present study showed that supplementation of broiler finisher diets with black seed cake at 1, 2, 3 and 4g/kg levels did not significantly influenced the carcass traits. This observation support the report of AL-Beitawi *et al.*, (2009) who found no improvement in carcass characteristics by feeding different levels of crushed as well as uncrushed Black seed in broilers diets. Although, Al-Beitawi and Goushein, (2008) observed significant improvement in the final live weight of broilers fed diets supplemented with black seed at 1.5% inclusion level. Carcass weight and dressing percentage were improved in birds fed diets supplemented with 1g and 2g/kg Black seed cake respectively and this support findings of Guler *et al.*, (2006) and Toghyani *et al.*, (2010) who reported an increased carcass yield in broilers by feeding diet having 1% black seed. Improved in cut-up parts weights was observed across the treatments and significant differences was observed in drumstick. This indicated that Black seed cake might have a good effect on enhanced availability of mineral metabolism because black seed contained macro-minerals (mg/100gm) i.e Ca (572), P (540), Mg (264), Na (17.8) and K (810) (Cheikh-Rouhou *et al.*, 2007).

However, similarity observed in kidney relative weight showed that black seed cake have immune-stimulant effects thus maintain broiler chicken in good health. In particular, thymoquinone and dithymoquinone obtained from *Nigella sativa* extract showed important properties against antibacterial, antioxidant, and anti-inflammatory agent (Al-Saleh *et al.*, 2006). The disagreement of these studies may be explained in the light of different doses, species and / or age of birds. The highest percentage of supplementation in this study was quite low (0.04%) when compared with previous supplementation levels used by Al-Beitawi and Goushein, Guler *et al.*, (2006) and Toghyani *et al.*, (2010) that showed that in this study

the choice of 4g/kg could be cost effective when compared with previous studies where higher levels were used.

CONCLUSION

The results obtained from the study revealed that Black seed cake (BSC) supplementation in diets of broiler chicken at 4g/kg level had no deleterious effects on the carcass characteristics and indicated that their organs were in good health state.

REFERENCES

- [1] AL-Beitawi, N. and EL-Ghousein, S.S. (2008). Effect of feeding different levels of *Nigella sativa* seeds (black cumin) on performance, blood constituents and carcass characteristics of broiler chicks. *International Journal of Poultry Science*, 7:715-721.
- [2] AL-Beitawi, N.A., El-Ghousein, S.S. and Nofal, A.H. (2009). Replacing bacitracin methylene disalicylate by crushed *Nigella sativa* seeds in broiler rations and its effects on growth, blood constituents and immunity. *Livestock Science*, 125:304-307
- [3] Al-Saleh, I.A., Billedo, G., Inam I.E. (2006). Level of selenium, DL- α -tocopherol, DL- γ -tocopherol, all transretinol, thymoquinone and thymol in different brands of *Nigella sativa* seeds. *Journal of Food Composition Analytical*, 19:167-175.
- [4] Cheikh-Rouhou, S., Besbes, S., Lognay, G., Blecker, C., Deroanne, C. and Attia, H. (2007). Sterol composition of black cumin (*Nigella sativa* L.) and aleppo pine (*Pinus halpensis* Mill.) seed oils. *Journal of Food Composition Analytical*, 21: 162–168.
- [5] Duncan, D. B. (2007). Multiple range and multiple F – test. *Biometrics* 11: 1-42.
- [6] El-Kamali, H.H., Ahmed, A.H. and Mohammed, A.H., (1998). Antibacterial properties of essential oils from *Nigella sativa* seeds, *Cymbopogon citratus* leaves and *Pulicaria undulata* aerial parts. *Fitoterapia* 69, 77–78.
- [7] Guler, T., Dalkilic, B., Ertas, O.N. and Ciftci, M. (2006). The effect of dietary black cumin seeds (*Nigella sativa* L.) on the performance of broilers. *Asian-Australia Journal of Animal Sciences*; 19: 425-430.
- [8] Mahmoud, M.R., El-Ahbar, H.S. and Saleh, S., (2002). The effect of *Nigella sativa* oil against the liver damage induced by *Schistosoma Mansoni* infection in mice. *Journal of Ethnopharmacology*, 79, 1–11.
- [9] Majeed, L.H.A., Abdelati, K.A., Al Bagir, N.M., Alhaidary, A., Mohamed, H.E. and Beynen, A.C., (2010). Performance of broiler chickens Fed diets containing low inclusion levels of black cumin seed. *Journal of Animal Veterinary Advance*, 9 (21), 2725–2728

- [10] Nasir, Z. and Grashorn, M.A. (2010). Effects of *Echinacea purpurea* and *Nigella sativa* supplementation on broiler performance, carcass and meat quality. *Journal of Animal Feed Science*, 19:94–104.
- [11] Nazeer, S.M., Talat, N.P., Shahid, A. and Zulfiqar, A. (2002). Effect of yucca saponin on urease activity and development of ascites in broiler chickens. *International Journal of Poultry Science*, 1(6), 174-178.
- [12] Olugbemi, T. S., Mutayoba, S. K. and Lekule, F. P. (2010). Effect of Moringa (*Moringa oleifera*) inclusion in cassava based diets fed to broiler chickens, *International Journal of Poultry Science*, 9 (4): 363 –367.
- [13] Salem, M.L. and Hossain, M.S. (2010). Protective effect of black seed oil from *Nigella sativa* against murine cytomeglovirus infection. *International Journal of Immunopharmacology*, 22:729-740.
- [14] SAS (2007). Institute Inc. SAS Technical Report Package 234 SAS/STAT Software. The GEMOD Procedure. Release 6.09, SAS Institutes Inc. Cary, NC.USA.
- [15] Toghyani, M.A., Geisari, G., Ghalamkari, M. and Mohammadrezaei. (2010). Growth performance, serum biochemistry and blood hematology of broiler chicks fed different levels of black seed (*Nigella sativa* L.) and peppermint (*Mentha piperita*). *Livestock Science*, 129: 173-178
- [16] Zomrawi, W.B., Abdel Atti, K.A.A., Dousa, B.M. and Mahala, A.G. (2013). The effect of dietary ginger root powder (*Zingiber officinale*) on Broiler chicks performance, Carcass Characteristics and serum Constituents. *Journal of Animal Science*. 3 (2): 42-47.