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# EFFECT OF VARYING LEVELS OF BLACK SEED (*Nigella sativa)* POWDER SUPPLEMENTATION ON PERFORMANCE & THERMOREGULATORY PERFORMANCE AT FINISHER PHASE DURING HOT SEASON

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## ABSTRACT

This study was conducted to evaluate the effect of supplementation of different levels of black seed (*Nigella sativa*) powder on the performance, rectal temperature and respiratory rate of broiler chicks during hot season. A total of 180 four weeks old broilers were used for this study, the chicks were randomly allocated into four experimental treatments with three replicates having 15 birds per replicate in a complete randomized design (CRD). Diets were formulated to meet the standard requirement and were supplemented with black seed powder at $0gKg^{-1}$, $10gKg^{-1}$, $20gKg^{-1}$ and $30gKg^{-1}$. Water and diets were offered to the chicks *ad libitum*. Result showed that black seed powder significantly ($p<0.05$) increased final body weight, weight gain and daily weight gain compared to the control. Rectal temperature and respiratory rate decreases significantly ($p> 0.05$) among the groups with black seed supplementation. It is concluded that black seed powder can be supplemented to improve performance of broiler chickens and also reduced the effect of heat. as shown in the decreased in both rectal temperature and respiratory rate during hot season best at $20gKg^{-1}$at finisher phase.

**Key words**: Black seed, Growth performance, Rectal temperature, Respiratory rate, Broiler

## INTRODUCTION

Black seed *(Nigella sativa* L.), belonging to the family *Ranunculaceae*, is an arumal spicy herb native to the Mediterranean regions and is now cultivated in other parts of the world including Middle East, North Africa and Asia (Durani *et al.*, 2007). The Black seed is a crop of great medical importance, particularly in Unani (Greek) and Ayurveda system of medicines (El-Abhar, 2003). Radwan *et al*, (2003) reported *Nigella sativa* as a natural feed additive (medicinal plant) that have some properties such as growth enhancers to improve birds productive performance under normal or heat stress conditions, the composition and properties of Black seed have been found to be a good source of protein, crude fat, crude fiber and major minerals. It has however been found recently that natural feed additives like herbs and edible plants have some properties as growth enhancers, instead of using synthetic drugs which may have adverse effects on human health (Fluck *et al*., (1971). This apparently lead to the increase in the demand for using natural feed additives to overcome the adverse impact of heat stress on broiler performance in Northern Nigeria. It is also reported by Mills *et al*, (1999) that high environmental temperatures have deleterious effect on poultry, reducing rate of growth, feed intake, live weight gain, feed efficiency, digestibility of nutrients, egg production, as well as egg weight, mortality and

depression of immunity (Naseem *et al.*, 2005). Also the physiological functions of broiler chickens are affected by heat stress as mentioned by Hassan, (2004). The author reported that, a high environmental temperature ($32^oC$) decreased concentration of some minerals resulting in abnormal physiological process.

## MATERIALS AND METHOD

The experiment was conducted at the Poultry Unit of the Teaching and Research farm of the College of Agriculture and Animal Science, Ahmadu Bello University, Mando Road Kaduna located at ($10^0$ 20'N $07^0$ 45'E) in the Northern Guinea Savannah. GPS A total of 180 four weeks old broilers were used for this study. The chicks were randomly allocated into four experimental treatments with three replicates having 15 birds per replicate in a complete randomized design. The birds were reared in a deep litter system and managed with all necessary routine management practice with feed and water given *ad libitum* with no synthetic drugs administration. A diet was formulated to meet the (NRC, 1994) requirement for the finisher feed and then supplemented with the black seed powder at different levels of 0, 10, 20 and 30g/kg of diet to T1, T2, T3 and T4 respectively.

**Table 1: Composition of Broiler Finisher Diet Fed to the Birds (5-8 weeks)**

| **Feed ingredients** | **Composition(Kg)** |
|---|---|
| Maize | 57.00 |
| Maize offal | 8.00 |
| Ground nut cake | 20.00 |
| Soya bean cake | 9.00 |
| Fish meal | 2.00 |
| Bone meal | 2.00 |
| Limestone | 1.00 |
| Salt | 0.30 |
| Premix | 0.25 |
| Lysine | 0.20 |
| Methionine | 0.25 |
| **Total** | **100** |
| **Calculated analysis:** | |
| ME(kcal/kg) | 2924.00 |
| Crude protein (%) | 19.90 |
| Ether Extract (%) | 4.44 |
| Crude fibre (%) | 4.07 |
| Calcium (%) | 1.05 |
| Available phos (%) | 0.44 |
| Lysine (%) | 1.02 |
| Methionine(%) | 0.84 |

Biomix broiler finisher premix include per kg diet: vit A,10,000 I.U; Vit D3,2000 IU; Vit E,23mg; Vit K,2mg; Vit B1, 1.80mg; Vit B2, 5.5mg; Niacin, 27.5mg; pantothenic acid, 0,5mg Vit B6 0.30mg; Vit B12, 0.15mg; Folic acid, 0.75mg; biotin, 0.6mg; chlorine chloride, 300mg; Iodine, 1mg; Iron, 20mg; Manganese, 40mg; selenium, 0.2mg; 30mg; Antioxidant, 1.25mg. ME= Metabolizable Energy.

Initial weight, final weigh, average weight gain, were measured using a table scale in grams and mortality were recorded, also average weight of the liver, empty Gizzard, and Immune organs (spleen and thymus gland), thymus gland found at the neck of the bird while the spleen in the abdomen between the liver and the stomach were also recorded after evisceration of the bird. Rectal temperature was measured using a digital thermometer inserted 2-3cm into the cloaca at the 28 days of age at (7:30-9:00am) while the Respiratory rate was measured by counting the movement of the body surface of a quite bird for one minute using a stop watch. Data collected from the experiment were subjected to analysis of variance, using the General Linear Model procedure of statistical analysis (SAS, 2001) and means were separated using Duncan's multiple range test. The model used for the experiment was:

$Y_{ij} = \mu + t_i + e_{ij}$

Where $Y_{ij}$ = individual observation

$\mu$ = Overall mean.

$t_i$ = Fixed effect of treatment at varying level of supplementation.

$e_{ij}$ = Experimental Error

## RESULTS

As shown in Table 2, the performance of broiler finisher chickens supplemented with different levels of black seed powder during the hot season indicating significant differences at ($P<0.05$) in the final weight of the other treatments compaired with the contol with a highest value in the group with $20gkg^{-1}$, followed by the group with $30gkg^{-1}$ and $10gkg^{-1}$, respectively. Also Mean liver wieght, gizzard, Proventriclus and kidney differs significantly at ($p<0.05$) in the same pattern with the result of the final body wight compaired to the control. The result showed that mortality rate decreases as the supplementation of black seed increases with the highst in the control ($0gkg^{-1}$).

**Table 2: Effect of Varying Levels of Black seed supplementation on the performance and weight of Some Internal Organs of Broilers at the Finisher phase during hot season**

| | Levels of Black seed ($gkg^{-1}$) | | | | | |
|---|---|---|---|---|---|---|
| **Parameters** | **0** | **10** | **20** | **30** | **SEM** | **LOS** |
| Initial body weight(g) | 702.83 | 700.53 | 701.15 | 700.00 | 0.69 | NS |
| Final body weight (g) | $1935.00^{d}$ | $2005.63^{c}$ | $2080.70^{a}$ | $2016.67^{b}$ | 3.08 | * |
| Total weight gain (g) | $1232.17^{d}$ | $1305.10^{c}$ | $1379.55^{a}$ | $1316.67^{b}$ | 0.05 | * |
| Av daily weight gain (g) | $44.00^{d}$ | $46.61^{c}$ | $49.27^{a}$ | $47.02^{b}$ | 0.05 | * |
| Liver weight (g) | $31.87^{c}$ | $44.00^{ab}$ | $44.64^{a}$ | $42.85^{b}$ | 0.66 | * |
| Gizzard (g) | $31.53^{b}$ | $40.09^{a}$ | $39.83^{a}$ | $32.62^{b}$ | 0.82 | * |
| Proventriclus (g) | $9.71^{b}$ | $10.57^{ab}$ | $12.40^{a}$ | $8.95^{b}$ | 0.58 | * |
| Spleen (g) | $1.48^{c}$ | $2.55^{b}$ | $3.09^{a}$ | $2.51^{b}$ | 0.29 | * |
| Kidney (g) | $6.82^{d}$ | $9.72^{c}$ | $11.98^{a}$ | $10.93^{b}$ | 0.24 | * |
| Thymus (g) | $1.99^{b}$ | $2.23^{b}$ | $3.01^{a}$ | $2.03^{b}$ | 0.25 | * |
| Mortality (%) | 15.55 | 6.66 | 2.22 | 2.22 | 0.46 | * |

$^{abc;}$ Means with different superscripts along same rows shows significant differences ($p>0.05$), SEM: Standard Error of means, LOS=level of significance, NS=Non significant difference at ($p>0.05$)* = significant difference at ($p>0.05$)

Figure 1, showed the results of Rectal temperature of broiler chickens during hot season significantly ($p<0.05$) variability was observed among the groups with black seed supplementation with the lowest value in the group with ($30gkg^{-1}$) and the highst value in the control ($0gkg^{-1}$). Similarly, figure 2, showed the result of the respiratory rate of broiler finisher chickens during hot season which indicated significant ($p<0.05$) decrease in the groups with black seed supplementation compaired to the control. The lowest value in the group with ($30gkg^{-1}$) and the highst value in the control ($0gkg^{-1}$).

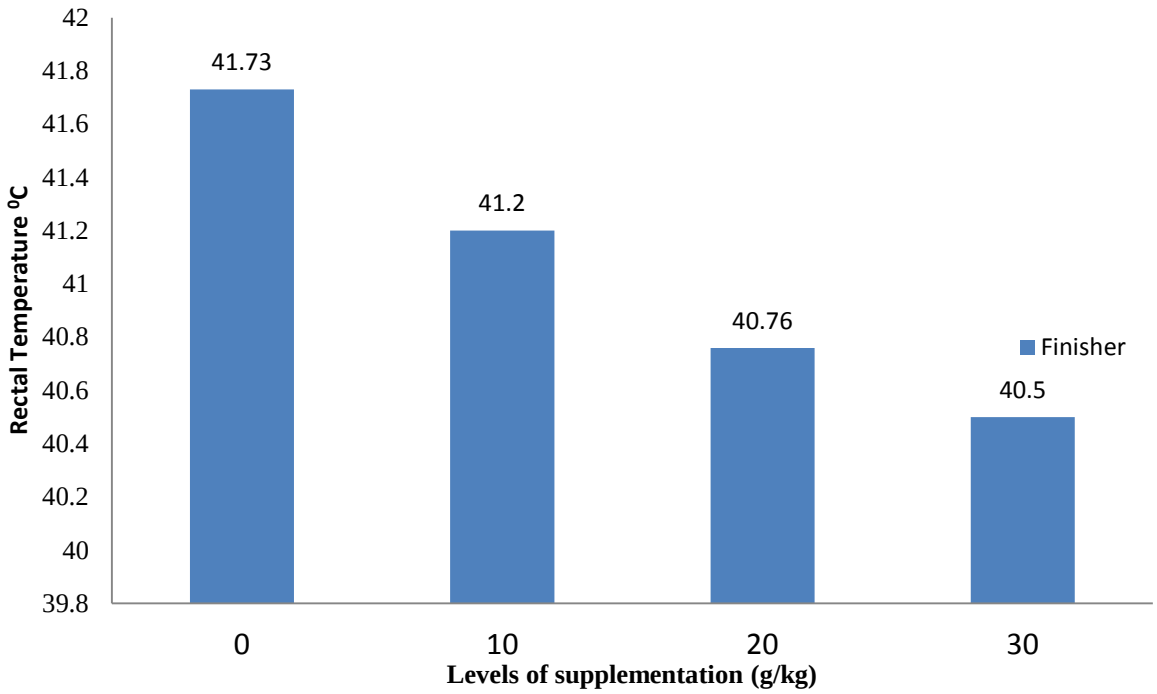



***Figure 1:*** *The Effect of Varying Levels of Black seed supplementation on the Rectal Temperature of Broiler Finisher Chickens During Hot Season.*

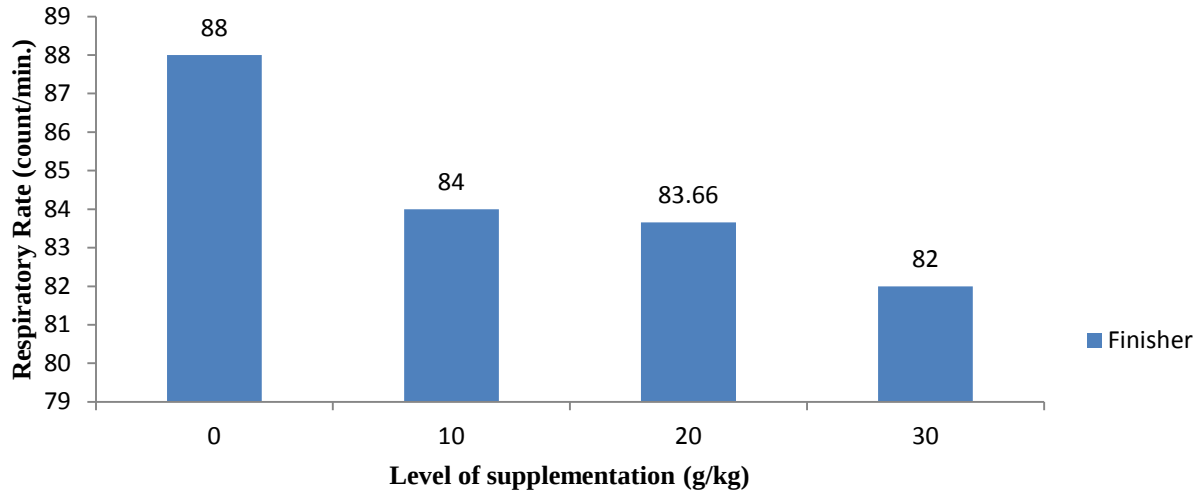



***Figure 2:*** *The Effect of Varying Levels of Supplementation of Black seed powder on Respiratory Rate of Broiler Finisher Chickens During Hot Season. SEM = 0.23*

## DISCUSSION

The results of total weight gain and average daily weight gain increases compaired with the control, this is in agreement with the findings reported by Tolba *et al*. (2003) who found a significant increase in final body weight of broiler chickens fed diet supplemented with different levels of Black seed. This may be due to the enhancement of metabolism as the supplement might have increased the thyroid hormone concentrations which could lead to an increase in the metabolic rate of the chickens which can lead to enhanced amino acid utilization as reported by Mandour *et al.* (1998). The increase in the weight of the gizzard, proventriculus and kidney disagrees with the result of Hermes *et al.* (2010) who found no increase in the relative weight of internal organs, the study shows an increase in the weight of the lymphoid organs (thymus, spleen and liver). Osman and El-barody (1999), Elkhaiaty *et al.*(2002) and Radwan (2003) reported that the increase in the weight of thymus, spleen and liver may be as a result of the effective substance Nigellon which activates lymphoid organs for better immune response.

As observed in this study (Figure 1 and 2), rectal temperature and respiratory rate of heat stressed broiler at the end of 8$^{th}$ weeks of age were significantly ($P<0.05$) decreased by feeding experimental treatments compared with the control. Bell and Freeman (1971) reported that young chickens switch from poikilothermic to homeothermic status at the age of four weeks, when they are able to maintain their body temperature by means of their own metabolic processes. At this developmental stage, chickens begin to accumulate enormous amounts of muscle. This was why their records were taken at the age of the 8$^{th}$ weeks which is the end of the fattening period. It is well known that high temperature conditions resulted in physiological changes and reactions of the bird such as the increase of body temperature, respiration rate and heart rate, as the birds consume more energy and accordingly the remaining net energy for growth is decreased Hermes *et al*. (2011). It is well known that birds in general adjust their feeding as the ambient temperature rises which leads to the rise in the internal body temperature, the reduction in the rectal temperature with 3% and the respiratory rate with 7.37% in the finisher phase of the chickens compared to the control may be the

reason for better weight gain in the supplemented groups, as a result of better feed intake by the chickens. Naqvi *et al*. (1995) reported that environmental temperatures above 28ºC causes heat- induced physiological stress, which leads to increase in respiration rate and rectal temperature. The reductions in thermoregulatory parameters corroborated with the findings of Herms *et al*. (2010) who reported a decrease in both respiratory rate and rectal temperature of broiler chickens fed with different forms and levels of black seed, Tollba and Hassan (2003) found adding 1% Black seed as natural feed additives to diets of heat stressed broiler significantly decreased their Respiration rate and body temperature compared with the control.

## CONCLUSION AND RECOMMENDATION

It can be concluded that the supplementation of black seed during hot season can reduce the effect of heat stress and improve the growth performance, physiological responses and the immunity of broiler chicks.

In view of this it can be recommended that Black seed can be supplemented during hot season in broiler chickens for better performance best at $20gkg^{-1}$ at the finisher phase and that black seed can also be used as broad spectrum antibiotic and feed additive to reduce the effect of synthetic drug's residual effect to the consumers.

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