# Effect of Feed Withdrawal on the Performance and Physiological Response of Broiler Chickens

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***ABSTRACT***

*A research was carried out on the effect of feed withdrawal in the fourth and fifth week on the performance and physiological response of broilers chickens. A total of forty eight (48) unsexed broiler chickens were divided into two treatments each of which was replicated three times with eight birds per replicate in a completely randomized design. Experimental treatments were designated as: skip a day and ad libitum feeding. Results showed that birds fed ad libitum had the highest weight (2690.73g ± 103.51). However, this variation was not significantly higher ($p>0.05$) than the skip a day group (2529.33g ± 138.15). Significant higher value ($p<0.05$) for feed intake was obtained in the ad libitum fed birds (5682.07g ± 184.09g). Significant ($p<0.05$) value was obtained for the birds on restricted feeding (3.09 ± 0.17) for feed conversion ratio. Result for the physiological response showed significantly lower ($p<0.05$) values both for cloaca temperature ($37.03^0C$ ± 1.14) and respiration rate (41.74 ± 1.88) for the restricted birds during the restricted period of the experiment. It was concluded that for better physiological performance feed should be restricted to skip a day technique during the fourth and fifth weeks in broiler production*

**Key Words:** feed, chickens, performance, withdrawal, physiology, respiration

## INTRODUCTION

Poultry production has important economic, social and cultural benefits and plays a significant role in family nutrition in the developing countries. It remains one of the veritable ways of achieving sustainable and rapid production of high quality protein to meet the increasing demand of the Nigerian teeming populace (Apata and Ojo, 2000). In animal agriculture, feed accounts for a major proportion of the entire cost of production (Omo-Akeju, 2010). Availability of quality feed at a reasonable cost is therefore the key to successful poultry production. Poultry are excellent feed converters and do not suffer social infringement or consumer acceptability issues like other livestock species such as pig (Dipeolu, 2004). The foregoing has triggered the rising demand for poultry products like eggs and meat, given their palatability and high nutritional value. These attributes amongst others, make the poultry industry stand tall amidst rival livestock producing ventures. However, the ever-increasing cost of producing products such as meat and egg makes it imperative to explore the use of alternative cheaper methods for production like diet

manipulation, feed restriction and the use of alternative feed ingredients that are cheaper, locally available and of low human preference in poultry ration formulation. One of the possible nutritional strategies of reducing feed cost is to restrict feed intake of the birds (Novel *et al*., 2009; Okpe, 2017). Oyedeji and Atteh, (2005)' report on feed restriction during the growing period in broilers indicate that restricting feed intake lowers body weight and carcass fat, retards growth and improves feed efficiency.

Feed restriction in terms of quantity and quality are procedures that can be applied to manipulate the feeding regime in poultry and thereby decreasing growth and metabolic rate to some extent in order to alleviate the incidence of some metabolic diseases as well as improving feed conversion and reducing feed cost through compensatory feeding (Govaerts *et al*., 2000). Birds selected for early-life fast growth (commercial broilers) suffer from leg disorders, organ failure and heart disease. At six weeks of age, broiler chickens have much difficulty supporting their abnormality heavy bodies as that they spend 76 to 86% of their time laying down (Lee and Lesson. 2001). They may suffer from respiratory diseases, big liver and spleen disease, sudden death syndrome and ascites (Lippens *et al*., 2000; Onderka and Hanson 2003).

The benefits in reducing metabolic disorder and leg problems associated excessive growth in the starter phase through early age feed restriction in the modern meat type chickens has been established (Dozier *et al*., 2002). Feed restriction depending on its severity could also predispose broilers to stress and reduce productive performance (Dozier *et al* 2002; Oyedeji, and Atteh, 2005). This necessitates the need to conduct careful studies to determine adequate feed restriction level that will not be of adverse effect on the health status and of effective nutrient utilization of broilers.

With a feed restriction period of sufficient length and severity, several workers have demonstrated improved general performance and productivity in poultry. Currently there is interest in the use of feed restriction programmes to modify bird growth patterns and decrease their maintenance requirements which seem to signify improvement in their overall performance. Presently there are scientific information known to exist on the physiological responses and performance of broilers raised under restricted feeding conditions in the humid tropical environment of Nigeria. There is need therefore, for a reliable feed intake restriction study under the Nigerian climatic condition to build up a data base for broiler chickens particularly in the humid tropical environment of the country. The objective of this study therefore is to determine the effect of feed withdrawal on the performance and physiological response of broiler chickens.

## MATERIALS AND METHODS

### Location of the Experiment

The experiment was conducted at Inachalo along Odolu road behind NTA Idah. Idah lies between a longitude of $5^0$45'E and latitude$7^0$5N, 420 m above sea level. The zone is characterized by 6 to 7 months of rainfall ranging from 1400 to 1500 mm and daily temperature of 27 to 35 $^0$C with the highest temperature been June to July (Tokula, 2019).

### Experimental Animals and Management

A total number of 48 day-old broiler chicks were used in the experiment to determine the effect of feed withdrawal on the growth performance and physiological response of broilers. The birds were fed commercial diet all through the experiment. The chicks were raised in a brooding room for three weeks. The brooding room was prepared prior to the arrival of the chicks at a temperature between 37 $^o$C to 39 $^o$C using the 100 watt electric bulb and the floor was of deep litter system. The birds were given anti- stress medication immediately on arrival. A commercial broiler starter diet was given to the birds *ad libitum* for 21 days. On the 22$^{nd}$day the chicks were randomly assigned to two treatment groups. Each treatment had 3 replicates and 8 birds per replicate. The feed restriction phase started from the 22$^{nd}$ day and lasted till the 35$^{th}$ day. The birds were offered feed *ad libitum* from the 36$^{th}$ day to the 56$^{nd}$ day of the experiment. The treatments were labelled, $T_1$ (*ad libitum*- fed birds) and $T_2$ (birds on skip a day feeding). Water was given *ad libitum* to the birds throughout the experiment.

### Vaccination schedule

The birds were vaccinated against Newcastle disease using Newcastle disease vaccine B1 strain (1/0) when the birds were within the first week of their age and LaSota at the 3$^{rd}$ week in their drinking water. While Gumboro vaccine was also administered to the birds in their drinking water at the 2$^{nd}$ and 4$^{th}$ weeks of ages. Coccidiostat as well was given to the birds to prevent an outbreak of coccidiosis in the flock during the course of the research. Other management practices and routine vaccinations were strictly adhered to.

### Data Collection

At the beginning of the experiment the broiler chicks were weighed before being assigned to the diet and subsequently on weekly basis. Feed offered to the birds were weighed on a daily basis and the left overs were also weighed to determine the feed intake of the birds. The birds and feed were weighed using a digital weighing scale. Weighing of birds took place in the morning hour (7:00 – 9:00 am) prior to feeding each week.

**Performance Parameters**

Data were collected on the following performance parameters:

1. Weight gain: the weights gained by the birds were measured using a weighing balance. Initial live weight was subtracted from the mean final weight.
2. Body weight during the period of the experiment
3. Feed intake: known quantity of feed was weighed and offered to the birds daily and the left over was weighed and recorded. The feed intake was determined by obtaining the difference between the quantity of feed offered and the left over the next morning.
4. Feed conversion ratio: This was computed by dividing the weekly feed intake by the weekly weight gain.

**Physiological Parameters**

1. Breath/min (respiration rate) was measured by counting the flank movements of the birds per minute using a stop watch
2. Cloaca Temperature: was obtained by introducing a digital thermometer into the cloaca of the bird for a period of one minute with the aid of a stopwatch

**Statistical Analysis**

All the Data collected were subjected to an independent sample T–test using Statistical soft package (SPSS software) and differences between treatments mean were separated using the Least Significant Difference (LSD).

## RESULTS

The performance of broiler chickens subjected to restricted feeding is presented in Table 1 Result shows significant difference ($p<0.05$) for body weight of birds during the restricted period ($21^{st}$ to $35^{th}$ day) and during the period of realimentation ($36^{th}$ – $56^{th}$ day), feed consumption during restricted period ($21^{st}$ - $35^{th}$ day) and total feed consumption ($21^{st}$ – $56^{th}$ day), feed conversion ratio during the restricted period ($21^{st}$ – $35^{th}$ day), total feed conversion ratio ($21^{st}$ – $56^{th}$ day) and breath per minute during the restriction period. Significantly higher ($p<0.05$) body weight was obtained for the non-restricted bird (1569.93g) during the period of restriction. Value obtained were 1150.23 g and 1569.92 g for the skip –a-day and the non-restricted birds respectively. Body weight gain showed significant higher value ($p<0.05$) for the non-restricted birds (854.19 g) during the restricted period (21-35day) while 464.23 g was obtained for the skip-a-day birds.

Value of 1378.95 g was obtained for the feed restricted birds which was significantly higher ($p<0.05$) than the *ad libitum* birds (1121.61 g).

Values obtained for feed consumption showed the non-restricted birds having significantly higher ($p<0.05$) feed intake all through the experiment. Values obtained were 2700.60 g and 1980.01 g for the *ad libitum* and feed restricted birds respectively for the restriction period. Total feed consumption of 3877.33 g (non-restricted) and 3702.67 g for the feed restricted group during the alimentation period. Lowest value for the total feed consumed was obtained in restricted birds (5682.07 g) which was significantly ($p<0.05$) lower than 6578.19 g obtained for the *ad libitum* group.

Feed conversion ratio for the period of restriction show least significant value ($p<0.05$) of 3.29 for the *ad libitum* – fed birds. Realimentation period (35-56) however showed significantly lowest value ($p<0.05$) of 2.70 for the feed restricted birds. Significantly lower ($p<0.05$) cloaca temperature (37.03± 1.14) and breath rate (41.74 ± 1.88) was obtained for the restricted group of birds

**Table 1: Body Weight (BW) and Body Weight Gain (BWG) of Broiler Chickens Subjected to Feed Restriction**

| Performance | Treatment | | |
|---|---|---|---|
| | Restricted | *Ad-libitum* | LOS |
| Duration (days) | Body weight (g/chick) | Body weight (g/chick) | |
| 21 | 677.90±5.31 | 679.44±7.11 | NS |
| 22-35 | $1150.23^{b}$±52.86 | $1569.93^{a}$±112.05 | * |
| 36-56 | 2529.33±138.15 | 2690.73±103.51 | NS |
| Duration (days) | Body wt. gain (g/Chick) | Body wt. gain (g/Chick) | |
| 21 | $464.23^{b}$±43.84 | $859.19^{a}$±123.72 | * |
| 22-35 | $1378.95^{a}$±107.35 | $1121.61^{b}$±111.68 | * |
| 36-56 | 1843.38±125.29 | 2007.33±89.64 | NS |

**Table 2: Feed Consumption (FC) and Feed Conversion Ratio (FCR) of Broiler Chickens Subjected to Feed Restriction**

| Performance | Treatment | | |
|---|---|---|---|
| | Restricted | *Ad-libitum* | LOS |
| Duration (days) | Feed Consumption (g) | Feed Consumption (g) | |
| 21-35 | $1980.01^{b}\pm60.14$ | $2700.60^{a}\pm51.85$ | * |
| 35-56 | $3702.63\pm123.81$ | $3877.33\pm52.42$ | NS |
| 21-56 | $5682.07^{b}\pm184.09$ | $6578.19^{a}\pm104.42$ | * |
| Duration (days) | Feed Conversion Ratio | Feed Conversion Ratio | |
| 21-35 | $4.28^{a}\pm0.32$ | $3.29^{b}\pm0.45$ | * |
| 35-56 | $2.70^{b}\pm0.29$ | $3.49^{a}\pm0.39$ | * |
| 21-56 | $3.09^{b}\pm0.17$ | $3.39^{a}\pm0.11$ | * |

**Table 3: Physiological Response: Breath/Min (B/M) and Cloaca Temperature of Broiler Chickens Subjected to Feed Restriction**

| Physiological Parameters | Treatment | | |
|---|---|---|---|
| | Restricted | *Ad-libitum* | LOS |
| Duration (days) | Cloaca Temp ($^{o}$C) | Cloaca Temp ($^{o}$C) | |
| 21-35 | $37.03^{b}\pm1.14$ | $39.60^{a}\pm0.85$ | * |
| 35-56 | $38.41\pm0.94$ | $40.47\pm1.12$ | NS |
| Duration (days) | Breath/Min B/M$^{-1}$ | Breath/Min B/M$^{-1}$ | |
| 21-35 | $41.74^{b}\pm1.88$ | $43.65^{a}\pm2.08$ | * |
| 35-56 | $39.27\pm1.03$ | $40.94\pm0.69$ | NS |

## Discussion

Significant variation obtained in the body weight of the birds during the feed withdrawal period could be attributed to the level of feed available to the birds during this period. Lippens *et al*., (2002) opined that depending on the level of feed withdrawal, birds tend to survive at the expense of their body reserve. This view was also upheld by Santoso (2002). Also much energy that could be converted to body weight might have been expended in the struggle for available feed (Shariatmadari and Vaeztorshizi 2004). This variation is further reflected in the body weight gain during the period. As alimentation is restored, compensatory growth in the feed restricted birds is observed. Value of 1378.95 g, which is significantly higher ($p<0.05$) than that of the *ad libitum* fed birds is obtained for the feed restricted birds. This is in line with early report by Plavnik and Hurwitz (1991) who stated that a fast growth rate of birds following a period of feed restriction is expected provided the duration and severity of the restriction is not extreme. This view is also upheld by Lippens *et al*. (2002) and Shariatmadari and Vaeztorshizi, (2004).

Feed withdrawal significantly affected ($p<0.05$) feed intake. Analyzed result showed *ad libitum*-fed birds having significantly higher feed intake (2700.60g) as compared to the feed restricted birds. This is in agreement with Shariatmadari and Vaeztorshizi (2004) who studied the effect of three feeding levels (control, 15% and 30% below *ad libitum*) of broilers, but in contrast to report by Plavnik and Hurwitz (1989) who studied the effect of meal time feeding for 7 to 21 days of age in broilers where they observed no compensatory growth after restricted feeding was observed.

Withdrawal period showed lower significant ($p<0.05$) value for *ad libitum fed birds* (3.29) in feed conversion ratio. Low consumption and energy wastage in competition for feed could account for the higher value obtained for the withdrawn birds. However compensatory growth experienced by the feed withdrawal group significantly affected ($p<0.05$) the feed conversion ration during re-alimentation; thus affecting the overall ratio. This is in line with reports by Lippens *et al*., (2002) who reported substantial compensatory growth in broilers restricted to 80 per cent of the *ad libitum* intake.

The present findings on the physiological responses of chickens indicated that the responses are weight dependent. Results on rectal temperature on the feed withdrawn chickens were in line with the work of Eberhart and Washburn (1993) for naked neck broiler chickens. The large size to weight ratio helps to dissipate heat effectively. N'dri *et al*. (2007) observed values for cloaca temperature were within the limits of 40 $^{o}$C (105 $^{o}$F) which is similar with values obtained in this work during the feed withdrawn period. Meanwhile, the values for cloaca temperature significantly increased with the *ad libitum* fed birds which could be attributed to increase in weight and the various biochemical reaction with thermal energy release (Chen *et al*., 2004).This result for cloaca temperature agrees with the observation made by Okpe (2017) and Oso *et al*. (2013) who reported a similar range of values for local Nigerian turkeys offered dietary vitamins. Pulse rate as obtained in the present study, were in agreement with the finding of Isidahomen *et al*., (2012). Significant variation ($p<0.05$) was observed with lower value (41.74) obtained in the feed withdrawn birds as against 43.67min$^{-1}$ for the *ad libitum* fed birds. This implies a higher oxygen requirement for bioactivities and digestive process, radiation of body heat and a better thermoregulation; thereby raising the oxygen requirement (Uzma *et al*., 2008; Sayed and Scott, 2008). The non-significance ($p>0.05$) obtained in the re-alimentation period implies a synchronization of the activities of the respiratory and cardio system in the birds (Dingle 2014). The general physiological response that existed in this presented study was in accordance with the direct observation of Robert (2004), Oke (2011) and Okpe (2017).

## CONCLUSION AND RECOMMENDATION

Based on the findings of this research, it is concluded that there was significant reduction in feed intake with feed withdrawal without a corresponding reduction in weight of the birds.

There was efficiency of feed conversion and utilization during re-alimentation resulting in compensatory growth; as withdrawal of feed significantly improved the performance of the feed withdrawn birds.

Physiological response was better in the feed withdrawn birds as compared to the *ad libitum* fed birds during the feed withdrawal period with impact on the rectal temperature and respiratory rate.

Based on the finding of this research, it is recommended that the skip a day method of feed withdrawal be practiced in the raising of fast growing broilers in the fourth and fifth week as significant improvement is observed in feed conservation which could impact the economics of production (reduced cost of feeding).

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