# GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHER BROILER CHICKENS FED DIETARY SUPPLEMENTATION OF ACETYLSALICYLIC ACID DURING DRY SEASON

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***Received*** *January 15, 2024;* ***Revised*** *March 02, 2024;* ***Accepted*** *March 05, 2024*

## ABSTRACT

***Heat stress has been recognized as a great challenge in the poultry industry, and its effects are mostly felt in tropical countries, hence, the need to alleviate heat stress problems in poultry production. This experiment was therefore carried out to assess the effect of acetylsalicylic acid (ASA) on growth performance and carcass characteristics of finisher broiler chickens during the transition from dry to rainy season (January – March). One hundred and ninety-two (192) three-week-old broiler chicks (ANAK) were used for this experiment. The birds were randomly divided into four dietary treatments, each treatment comprising 48 birds, which was replicated 4 times containing 12 birds per replicate. Diet 1 (T1) which is the control had no inclusion of acetylsalicylic acid (ASA), Diet 2 (T2) contained 0.025% inclusion of ASA, Diet 3 (T3) contained 0.050% inclusion of ASA, and Diet 4 (T4) had 0.075% of ASA. The result of the growth performance of finisher broilers showed that finisher broilers fed 0.075% ASA had the significantly highest (p>0.05) total feed intake value of 4766.60 ± 43.86 g. The percentage of mortality decreased as the level of ASA supplementation increased. Significant treatment effect was also observed in all the carcass parameters investigated; broilers fed 0.025% were observed to have the highest breast weight value (561.75 ± 68.89 g). while broilers fed 0.075% had the highest (p<0.05) thigh value of 262.00 ± 7.03g, the highest (p<0.05) drumstick value was recorded in broilers fed 0.050% ASA with value of 238.90 ± 6.87 g. It was concluded that ASA supplementation improved the growth performance and reduced mortality in broiler chickens.***

**Keywords:** Acetylsalicylic acid, Broiler, Carcass, Growth, Performance

## INTRODUCTION

High environmental temperature has been reported as one of the major militating factors against broiler production, due to their fast growth rate, feather cover, and lack of sudoriferous glands, which make them highly sensitive to heat stress (Piestun *et al*., 2013; Aro *et al.,* 2017). Many researchers have revealed the adverse effects of heat stress on the efficiency of broiler production (Sohail *et al*., 2012; Imik *et al.,* 2012). Sohail *et al.* (2012) subjected broilers to chronic heat stress, the result revealed significantly lower feed intake of 16.4%, reduced body weight of 32.6%, and higher feed conversion ratio of 25.6% at 42 days of age. Sahin *et al.* (2003) also revealed significantly lower body weight in heat-stressed broilers than in birds administered with antioxidant vitamins A and E. In another study by Deng *et al.* (2012), there was a reduction in daily feed intake by 28.58 g/bird, which resulted in a 28.8% decrease in egg production in a 12-day heat stress period research. Star *et al.* (2009a) reported a reduction of 31.6% in feed conversion, 36.4% in egg production, and 3.41% in egg weight in laying hens subjected to heat stress. In another study (Lin *et al.,* 2004), heat stress caused a reduction in production performance, as well as reduced eggshell thickness, and increased egg breakage. Furthermore, studies demonstrated that heat stress was associated with depression of meat chemical composition and quality in broilers (Dai *et al.*, 2012; Imik *et al.,* 2012).

Several nutritional strategies have been suggested to alleviate the negative effect of heat stress in the poultry industry, including; fat supplementation and low protein contents (Fisinin and Kavtarashvili, 2015; Kumari and Nath*,* 2018), feed restriction (Fisinin and Kavtarashvili, 2015), supplementation with vitamins (Khan *et al.*, 2012), use of additives; ascorbic acid (Anwar *et al.*, 2004), sodium chloride (Smith, 1994), sodium bicarbonate, carbonated drinking water (Koelkebeck *et al.,*1992) and acetylsalicylic acid (Aro *et al.,* 2020; Awoneye and Olorunfemi, 2021).

Aspirin or acetylsalicylic acid (ASA) is a derivative of salicylate and is generally used as an analgesic, antipyretic, and also as an anti-inflammatory drug. Its effects have been reported such as enhancing growth performance (Aro *et al.,* 2020;), feed utilization, nutrient digestion, and absorption, and egg production (Mohammed, 2010; Awoneye *et al.*, 2021a). Aro *et al.* (2020) revealed that dietary supplementation of acetylsalicylic acid improved growth, livability, and egg production performance. Awoneye *et al.* (2021b) also investigated the effect of acetylsalicylic acid supplementation at 0, 0.025, 0.050, and 0.075% inclusion levels on follicular development, gonadal morphometry, and hormonal profile of Isa Brown and Haro Black breeds of the layer. The result revealed that layers fed 0.075% ASA had the highest ($p<0.05$) number of follicles, weight of the entire reproductive tract, length of magnum, length of isthmus, and length of shell gland, the hormonal assay showed layers fed 0.050% ASA were observed to have the highest progesterone and estradiol value.

Poultry birds are among the most vulnerable livestock species when it comes to exposure to heat stress. This is even more so with broilers when raised during the dry season of the year in the tropics, most especially in Nigeria, hence, it becomes a necessity to investigate the effect of ASA during the hot season of the year (January - March) on growth performance and carcass characteristics of broiler chickens.

## MATERIALS AND METHODS

**Experimental Site:** The experiment was carried out at the Teaching and Research Farm (Poultry Unit) of the Rufus Giwa Polytechnic Owo (RUGIPO) Nigeria. The farm is located in the equatorial climatic zone of Western Nigeria, characterized by two rainfall peaks, high temperature, and high humidity, especially during the rainy season. The mean annual rainfall is about 1500 ± 250 mm and last for 9 months usually from March to November every year. It also has a mean annual temperature of about $27^oC \pm 1^0C$ and a relative humidity of over 75%.

**Procurement of Dietary Supplement:** Aspirin (Acetylsalicylic acid) was purchased from was purchased from Bayer Pharmaceutical Company, Berlin, Germany.

**Experimental Animals and Feeding:** One hundred and ninety-two (192) three-week-old broiler chicks (ANAK) were purchased from Chi Farm Limited, Ibadan. The birds were given 7 days of physiological adjustment to the feed and environment before data collection. The birds were raised in a deep litter system using a 2.5 x 2.5 $m^2$ pen. Feed and water were supplied *ad libitum* throughout the period of the feeding trial. Four treatment diets were formulated. During the four-week feeding trial, the birds were fed ad libitum with a finisher diet in a mash form, water was equally supplied *ad libitum*, all medication and vaccination schedules such as Newcastle Disease (Lasota) and Gomborro Vaccine were strictly adhered to, and good hygienic condition was maintained throughout the period of feeding trial. Other management practices carried out include; daily washing of drinkers, administration of antihelmintics, and packing of litter. All dietary ingredients and the formulated diets were subjected to proximate composition analyses (AOAC, 2000). The experimental diets were formulated to meet the nutrient requirements of the birds. Diet 1 (T1) which is the control had no inclusion of acetylsalicylic acid (ASA), Diet 2 (T2) contained 0.025% inclusion of ASA, Diet 3 (T3) contained 0.050% inclusion of ASA, and Diet 4 (T4) had 0.075% of ASA (Table 1). Formulated broiler finisher diets were given from the 4$^{th}$ week to the 8$^{th}$ week of the feeding trial.

**Experimental Layout and Feeding Trial:** The birds were randomly divided into four dietary treatments, each treatment comprising 48 birds, which was replicated 4 times containing 12 birds per replicate.

**Slaughtering of the Experimental Birds:** At the end of the 4-week feeding trial, the final weight was taken; three birds per replicate were randomly selected and humanely slaughtered.

**Data Collection:** Initial weight, weekly weight gain, and feed consumption were determined, more so, the feed conversion ratio was calculated. The initial weight of the broiler in each replicate was subtracted from the final weight at the end of each week to obtain the weekly weight gain. The feed consumption was the difference between the feed left over and feed given daily, and the feed conversion ratio was calculated as the ratio of feed consumed to the total weight gain of birds. The mean weight of the carcass parts: the primal cuts (breast, back, wing, thigh, and drum stick), and external offals (head, neck, and shank) were determined.

**Statistical Analysis:** All data were subjected to a one-way analysis of variance (ANOVA) using the SAS (2008) statistical package. Duncan's multiple range test of the same statistical package was used to separate significant means.

## RESULTS AND DISCUSSION

The growth performance of broiler finisher chickens fed dietary supplementation of acetylsalicylic acid during the transition from dry to rainy season (January – March) is presented in Table 2. Statistical variations were observed in all the parameters investigated with broilers fed 0.050% ASA having the highest ($p<0.05$) final weight and total weight gain value of 2475.00 ± 43.30 g and 1864.67 ± 54.92 g respectively, which was not significantly different ($p>0.05$) from values obtained in broilers fed 0.075% ASA. The highest total feed intake value was recorded in broilers fed 0.075% ASA with a value of 4766.60 ± 43.86 g. Broilers fed 0.050% were observed to have the lowest feed conversion ratio of 2.52 ± 0.10. The result also revealed that the percentage of mortality decreased as the level of ASA supplementation increased. The high final weight, weight gain, and significantly low feed conversion rate observed in broilers fed 0.050% and 0.075% ASA signifies better digestibility and performance and this could be attributed to the growth enhancement ability of ASA (Mohammed, 2010; Aro *et al*., 2017). This result was in agreement with the report of Al-Obaidi and Al-Shadeedi (2010) who reported that feeding of 0.2% ASA to broilers increased live body weight. The significantly low mortality recorded in ASA supplemental diets may be attributed to the effect of ASA on enhancing the immune competence of the birds through its tolerogenic activities on the lymphocytes and the immunoglobins (Dujić *et al*., 2008; Lajoie *et al*., 2021).

The carcass characteristics of finisher broilers chicken fed dietary supplementation of acetylsalicylic acid at the transition from dry to rainy season (January – March) indicated that significant treatment effects ($p<0.05$) were observed in all the carcass parameters investigated (Table 3). Broiler-fed 0.050% ASA had the highest live weight value of 2475.00 ± 59.51 g, while those fed 0.075% ASA had the highest eviscerated weight of 2150.00 ± 0.00 g respectively. Broilers fed 0.075% was observed to have the highest ($p<0.05$) thigh value of 262.00 ± 7.03 g, while the highest ($p<0.05$) drumstick value was recorded in broilers fed 0.050% ASA with value of 238.90 ± 6.87 g, which was not significantly different ($p>0.05$) from the value (234.17 ± 5.00 g) obtained in broilers fed 0.075% ASA.

**Table 1: Composition (g/100g) of broiler finisher's diets during the transition from dry to rainy season (January – March)**

| Ingredients | Composition (g/100g) | | | |
|---|---|---|---|---|
| | $T_1$ (0.00%) | $T_2$ (0.025%) | $T_3$ (0.050%) | $T_4$ (0.075%) |
| **Maize** | 62.00 | 62.00 | 62.00 | 62.00 |
| **Wheat Offal** | 4.70 | 4.70 | 4.70 | 4.70 |
| **Groundnut Cake** | 17.20 | 17.20 | 17.20 | 17.20 |
| **Soya Bean Meal** | 11.00 | 11.00 | 11.00 | 11.00 |
| **Fish Meal** | 1.00 | 1.00 | 1.00 | 1.00 |
| **Bone meal** | 1.50 | 1.50 | 1.50 | 1.50 |
| **Limestone** | 1.00 | 1.00 | 1.00 | 1.00 |
| **Lysine** | 0.20 | 0.20 | 0.20 | 0.20 |
| **Methionine** | 0.40 | 0.40 | 0.40 | 0.40 |
| **Salt** | 0.50 | 0.50 | 0.50 | 0.50 |
| **Premix** | 0.50 | 0.50 | 0.50 | 0.50 |
| **Total** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Acetylsalicylic acid (ASA)** | 0/00 | 0.025 | 0.050 | 0.075 |
| **Calculated Analysis** | | | | |
| **Crude Protein (%)** | 19.60 | 19.60 | 19.60 | 19.60 |
| **Metabolizable Energy (MJ/Kg)** | 12.21 | 12.21 | 12.21 | 12.21 |
| **Ether Extract (%)** | 4.76 | 4.76 | 4.76 | 4.76 |
| **Crude Fibre (%)** | 3.53 | 3.53 | 3.53 | 3.53 |
| **Phosphorus (%)** | 0.68 | 0.68 | 0.68 | 0.68 |
| **Calcium (%)** | 1.00 | 1.00 | 1.00 | 1.00 |
| **Lysine (%)** | 1.03 | 1.03 | 1.03 | 1.03 |
| **Methionine (%)** | 0.70 | 0.70 | 0.70 | 0.70 |

*T1 = Diet with 0.00% ASA; T2 = Diet with 0.025% ASA; T3 = Diet with 0.050% ASA; T4 = Diet with 0.075% ASA*

**Table 2: Growth performance of broiler finisher chickens fed dietary supplementation of acetylsalicylic acid at the transition from dry to rainy season (January – March)**

| Parameters | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| **Initial Weight (g)** | $635.51 \pm 17.43^{c}$ | $575.30 \pm 26.11^{a}$ | $610.33 \pm 18.48^{b}$ | $618.96 \pm 9.59^{c}$ |
| **Final Weight(g)** | $2337.50 \pm 3146^{b}$ | $2337.50 \pm 31.46^{b}$ | $2475.00 \pm 43.30^{c}$ | $2462.50 \pm 23.94^{c}$ |
| **Total Weight Gain (g)** | $1701.99 \pm 37.14^{b}$ | $1762.21 \pm 48.18^{bc}$ | $1864.67 \pm 54.92^{c}$ | $1843.54 \pm 28.57^{c}$ |
| **Daily Weight Gain (g)** | $60.79 \pm 1.33^{b}$ | $62.94 \pm 1.72^{bc}$ | $66.59 \pm 1.96^{c}$ | $65.99 \pm 1.04^{c}$ |
| **Total Feed Intake (g)** | $4651.39 \pm 82.72^{a}$ | $4720.48 \pm 62.05^{b}$ | $4683.02 \pm 779.70^{a}$ | $4766.60 \pm 43.86^{c}$ |
| **Daily Feed Intake (g)** | $166.12 \pm 2.96^{a}$ | $168.59 \pm 2.22^{b}$ | $167.25 \pm 2.64^{b}$ | $170.24 \pm 1.57^{c}$ |
| **Feed Conversion Ratio** | $2.74 \pm 0.08^{c}$ | $2.68 \pm 0.10^{bc}$ | $2.52 \pm 0.10^{a}$ | $2.58 \pm 0.07^{b}$ |
| **% Mortality** | $2.75 \pm 0.01^{c}$ | $0.50 \pm 0.00^{b}$ | $0.50 \pm 0.00^{b}$ | $0.00 \pm 0.00^{a}$ |

*a, ab, b, c = Means on the same rows but with different superscripts are statistically (p<0.05) significant. T1 = Diet with 0.00% ASA; T2 = Diet with 0.025% ASA; T3 = Diet with 0.050% ASA; T4 = Diet with 0.075% ASA*

Broilers fed 0.025% were observed to have the highest breast weight value (561.75 ± 68.89 g) which was statistically not different (p>0.05) from 549.70 ± 14.89 g obtained in broilers fed the control diet. The higher live weight and better carcass cut parts observed in the ASA-supplemented diets agreed with the studies of Sahin *et al.* (2003) and Lohakare *et al.* (2005) who reported that dietary ASA supplementation improved carcass trait. Le Bihan-Duval *et al.* (1998) revealed that there is a positive correlation between body weight and carcass yields and this could be attributed to the ability of ASA to enhance feed intake, digestibility, and feed utilization (Star *et al.*, 2009b), which invariably lead to high final weight recorded.

**Table 3: Carcass characteristics of broiler finisher chicken fed dietary supplementation of acetylsalicylic acid at the transition from dry to rainy season (January – March)**

| Parameters | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Live Weight(g) | 2325.00 ± 52.04$^{a}$ | 2325.00 ± 52.04$^{a}$ | 2475.00 ± 59.51$^{b}$ | 2473.00 ± 43.30$^{b}$ |
| Feather Weight (g) | 185.50 ± 0.12$^{a}$ | 190.50 ± 0.06$^{a}$ | 200.25 ± 0.16$^{b}$ | 190.00 ± 0.08$^{a}$ |
| Dressed Weight(g) | 2139.50 ± 20.25$^{a}$ | 2134.50 ± 18.90$^{a}$ | 2274.50 ± 25.6$^{b}$ | 2285.00 ± 10.96$^{b}$ |
| % Dressed Weight | 92.02 ± 2.45$^{b}$ | 91.81 ± 5.00$^{a}$ | 91.90 ± 5.25$^{a}$ | 92.32 ± 6.00$^{b}$ |
| Eviscerated Weight(g) | 1915.00 ± 36.17$^{a}$ | 1925.00 ± 32.28$^{a}$ | 2062.50 ± 62.50$^{b}$ | 2150.00 ± 0.00$^{b}$ |
| % Eviscerated weight | 82.37 ± 1.09$^{a}$ | 82.80 ± 2.00$^{a}$ | 83.33 ± 1.35$^{a}$ | 86.87 ± 2.10$^{b}$ |
| Head(g) | 56.17 ± 3.42$^{b}$ | 51.34 ± 0.98$^{a}$ | 50.83 ± 1.35$^{a}$ | 57.33 ± 2.23$^{b}$ |
| Neck(g) | 72.25 ± 21.28$^{a}$ | 83.25 ± 7.46$^{b}$ | 103.58 ± 2.91$^{c}$ | 110.00 ± 3.88$^{d}$ |
| Wing(g) | 183.25 ± 5.60$^{b}$ | 173.08 ± 5.92$^{a}$ | 167.58 ± 3.23$^{a}$ | 182.29 ± 4.17$^{b}$ |
| Shank(g) | 89.83 ± 3.57$^{bc}$ | 81.67 ± 0.53$^{a}$ | 87.58 ± 3.12$^{b}$ | 97.75 ± 1.53$^{c}$ |
| Thigh ( g) | 257.25 ± 17.39$^{c}$ | 231.25 ± 7.09$^{a}$ | 245.17 ± 9.46$^{b}$ | 262.00 ± 7.03$^{d}$ |
| Drumstick(g) | 227.08 ± 10.72$^{b}$ | 214.17 ± 5.72$^{a}$ | 238.90 ± 6.87$^{c}$ | 234.17 ± 5.00$^{bc}$ |
| Breast(g) | 549.70 ± 14.89$^{b}$ | 561.75 ± 68.89$^{b}$ | 490.08 ± 11.98$^{a}$ | 492.58 ± 22.05$^{a}$ |
| Back(g) | 414.56 ± 15.41$^{b}$ | 313.88 ± 29.62$^{a}$ | 358.30 ± 14.50$^{ba}$ | 359.48 ± 7.18$^{ba}$ |

*a, b, ab, c, = Means on the same rows but with different superscripts are statistically ($p<0.05$) significant. T1 = Diet with 0.00% ASA; T2 = Diet with 0.025% ASA; T3 = Diet with 0.050% ASA; T4 = Diet with 0.075% ASA*

**Conclusion:** It can be concluded that ASA supplementation up to 0.075% inclusion does not have any detrimental effect on broiler chickens, but rather improves the growth performance, and reduces abdominal fat content and mortality rate in broiler chickens, most especially during the hot season.

**ACKNOWLEDGEMENTS**

Special thanks to the Tertiary Education Trust Fund (TETFund) and the Management of Rufus Giwa Polytechnic Owo, for the research grant made available for this study.

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