
WEEKLY SEMEN PRODUCTION OF MARSHALL BROILER BREEDER COCKS FED DIETARY SALT INCLUSIONS AND SUPPLEMENTAL ACETYLSALICYLIC ACID

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ABSTRACT

The aim of this study is to investigate the weekly semen production of Marshall Broiler breeder cocks fed supplemental acetylsalicylic acid (ASA) and dietary salt (NaCl) inclusion. The experiment was conducted at the Poultry Unit of the Livestock Section of the Teaching and Research Farm, and Diagnostic Laboratory of the Department of Animal Production and Health, Federal University of Technology, Akure between November 2021 and March 2022. Semen collection, through the abdominal massage method commenced at the 30th to 35th week of age and was carried out once weekly between 6.00 hours and 8.00 hours. A six-week data on total ejaculate volume (TEV), seminal plasma (SP), spermatocrit (ST), sperm motility (MT), dead sperm cells (DSC), abnormal sperm cells (ASC) and sperm concentration (SC) were collected and subjected to Microsoft excel using scatter with smooth lines and markers chart. Diet T₃ showed increase in total ejaculate volume from 30 to 35 weeks of age with peak at 33 weeks of age (0.6ml), highest in sperm motility between the ranges of (98-100%), lowest in abnormal sperm cells (12-17%) and DSC (20-23%) while other treatment diets were lower. Diet T₄ was lowest in Seminal plasma which ranged from 87-90%, highest in spermatocrit (11- 13.67%) and SC ($1.40 \times 10^9 \text{ mL}^{-1}$ - $2.27 \times 10^9 \text{ mL}^{-1}$) were lowest in the same treatment throughout the six-week study. In conclusion, 0.750% NaCl worked synergistically with 0.050% ASA to improve the ejaculate characteristics of this particular breeder cocks from 30 to 35 weeks of age.

Keywords: Acetylsalicylic acid; salt, Marshall Breeder cock, semen, sperm cell.

INTRODUCTION

Chicken sperm are produced in the intra-abdominal testes at a core body temperature (40–41°C) for 14 days and then are transported through the epididymis to the vas deferens, where they are stored for 2–3 days and undergo some natural degeneration before being exported at ejaculation (Williams and de Riviers, 1981). In light of this physiological evidence, it is reasonable to collect semen at a consistent frequency to maintain optimal sperm quality during fertility. In turkeys, more than three rounds of collections per week in decreased the semen volume (Noirault and Brillards, 1999). Acetylsalicylic acid (ASA) or aspirin is well known as an antipyretic drug (Aro *et al.*, 2015). This drug has been shown to improve egg production and livability in laying hen and prevent wet litter in poultry houses (Aro *et al.*, 2018). Since dietary sodium chloride (NaCl) has been reported to enhance egg production (Aro *et al.*, 2015) and boost the immune-competence of farm animals (Aro *et al.*, 2015), it seems a worthwhile intervention strategy to experiment with these attributes of NaCl to improve semen production. There is, however, a paucity of data on the effects of aspirin and NaCl combination in the diet on the reproductive performance of broiler breeders, particularly males. The broiler breeder stock's infertility issues are inclined toward males (Silveira *et al.*, 2014). This infertility problem is exacerbated further, particularly in the tropics, by perennial heat stress (Abioja, 2010), which has been linked to decreased spermatogenesis. (Shadmehr *et al.*, 2018). The use of ASA and NaCl in combination in the poultry diet has been shown to reduce wet litter. (Aro *et al.*, 2018) and lessen heat stress (Aro *et al.*, 2017). The optimal combination of ASA and NaCl in poultry diets, particularly in Marshall Breeder broiler stock, has yet to be determined. Thus, the purpose of this study is to determine the best combination of ASA and NaCl in Marshall Broiler breeder cocks to reduce heat stress while improving the semen production of this particular breed of domestic chicken.

MATERIALS AND METHODS

Experimental Site

This experiment was carried out at the Poultry Section of the Livestock Unit of the Teaching and Research Farm, Federal University of Technology, Akure, Ondo State, Nigeria.

Procurement and Management of Experimental Animals

Twenty broiler breeder cocks of the Marshall Breed were purchased from Vettinson Breeders' Farms, Oyo State, Nigeria. The birds were twenty weeks of age at the time of their arrival. Sixteen birds with an average live weight of 2.3kg were randomly allotted to four dietary treatments with four replicates in each treatment. Four treatment diets were formulated in which ASA was supplemented at 0g, 250g, 500g and 750g/100kg and dietary salt inclusions at 250, 500, 750 and 1000g/100kg of the diets. The diets were labeled as T1, T2, T3 and T4 respectively in which T1 served as the control diet. Table 1 shows the gross composition of the Marshall Breeder cock's diets.

Table 1: Gross composition (kg/100kg) of the experimental diets

Ingredients	T ₁ (kg)	T ₂ (kg)	T ₃ (kg)	T ₄ (kg)
Maize	47.55	47.55	47.55	47.55
Wheat offal	16.00	16.00	16.00	16.00
Soybean meal	18.00	18.00	18.00	18.00
Rice bran	15.00	14.75	14.50	14.25
Lysine	0.20	0.20	0.20	0.20
Methionine	0.25	0.25	0.25	0.25
Dicalcium phosphate	1.30	1.30	1.30	1.30
Limestone	1.20	1.20	1.20	1.20
Breeder's premix	0.25	0.25	0.25	0.25
Table salt	0.25	0.50	0.75	1.00
Total	100.00	100.00	100.00	100.00
ASA	0.00	0.025	0.050	0.075
ME (Kcal/kg)	2700.93	2701.00	2701.07	2702.04
Crude protein (%)	16.01	16.03	16.06	16.09

T 1 = Diet with 0.25% NaCl and 0.00% ASA; T 2 = Diet with 0.50% NaCl and 0.025% ASA; T 3 = Diet with 0.75% NaCl and 0.050% ASA; T 4 = Diet with 1.00% NaCl and 0.075% ASA; ASA = Acetylsalicylic Acid; NaCl = Sodium Chloride; ME = Metabolizable Energy and Breeder premix

Determination of Qualitative Semen Analysis

Total ejaculate volume was determined as described by Rekwot (2013). Sample bottles were used for semen collection per replicate from which semen or ejaculate volume for replicate was taken and recorded. Eosin/nigrosin stains were used on smears for live/dead and abnormal/normal sperm cell counts. The smears were dried on a warm slide and observed immediately with a light microscope at high power magnification ($\times 100$) Rekwot (2013). Sperm motility was done by placing fresh semen on a cover slip and a drop of saline water was added which was then viewed under 40x magnification with a light microscope. Sperm concentration was calculated by multiplying the number of sperm cells counted by the dilution factor of the semen. The seminal volume and spermatocrit were determined by the use of a centrifuging machine and calibrated pipette, the semen was aspirated and the volume read according to Rekwot (2013).

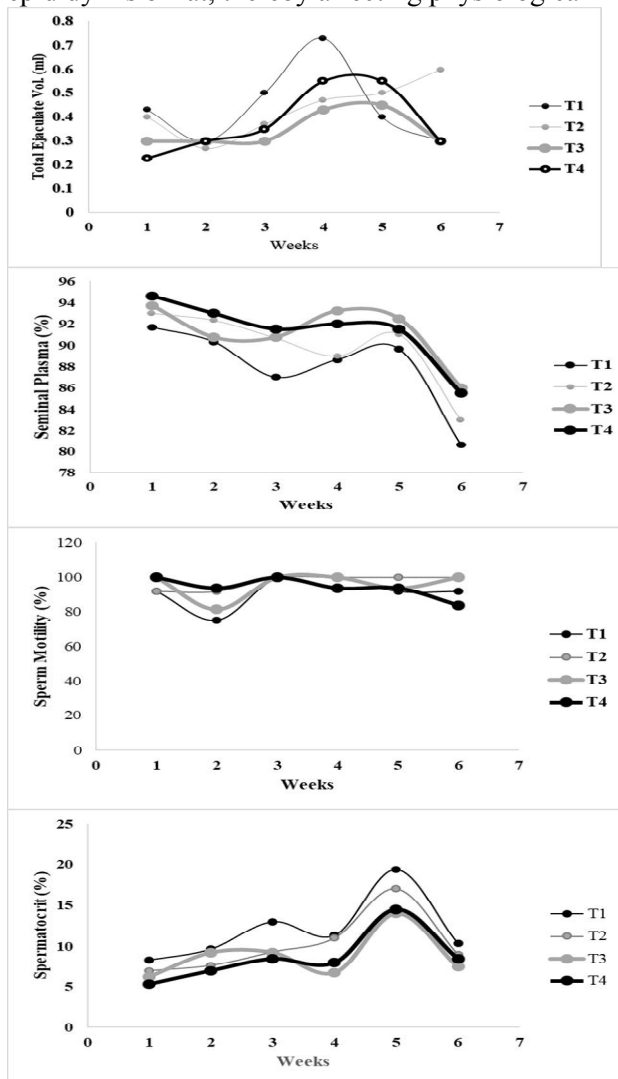
Statistical Analysis

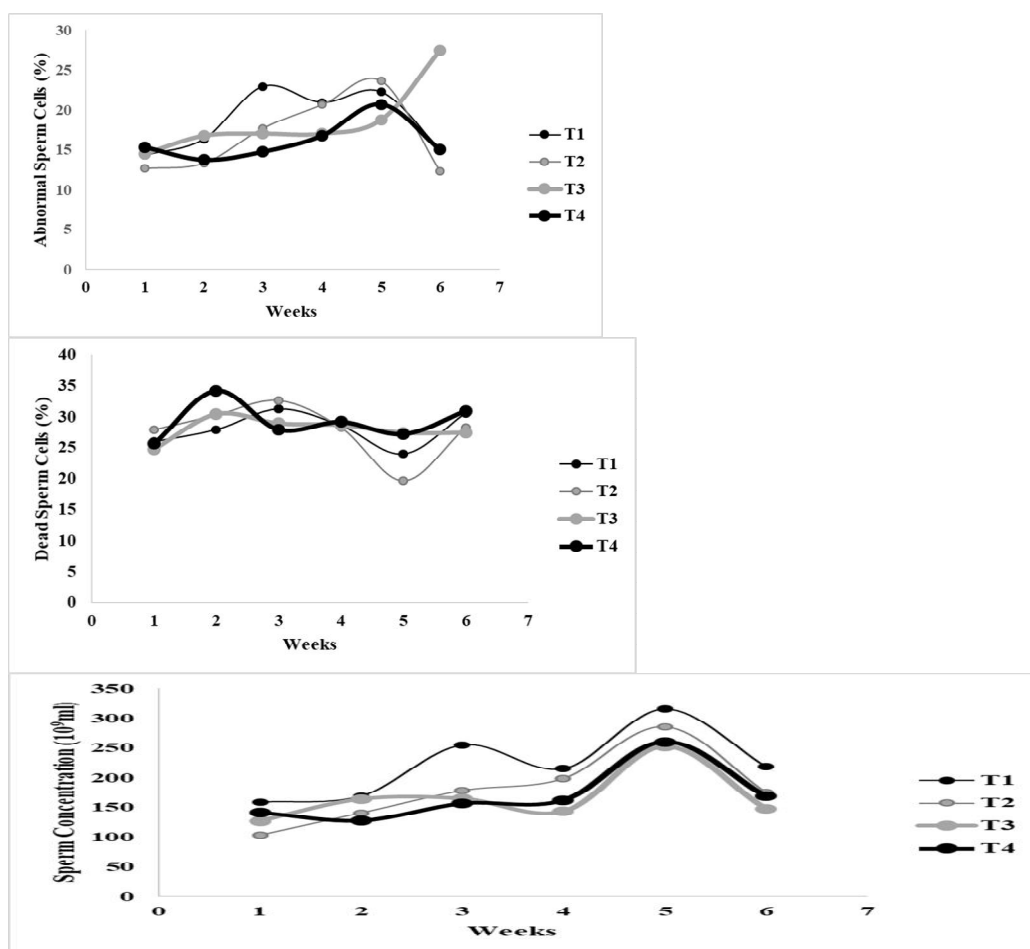
The data obtained from the experiment were subjected to Microsoft excel (2013) version using scatter with smooth lines and markers chart.

RESULTS AND DISCUSSION

The control diet had the highest volume of ejaculate from week 1 to 4 followed by a drastic reduction at week 6 when compared with other diets in Figure 1. Diet T₃ showed a progressive increase in the volume of the ejaculate from week 1 to 6 with highest in volume at week 5 (0.55ml) and 6 (0.53ml) throughout the six-week study. The findings in our study is in consonance with the report made by Aro, (2020) that ASA when combined with NaCl at 0.05 and 0.50% of the diet would encourage

maximum semen production of Marshal Broiler Breeder Cocks. Percentage of seminal plasma of birds fed diet T₃ decreased gradually from week 1 to 6 compared to others treatment diets, while birds fed diet T₄ had the highest while In Figure 3, the graph showed an improving trend of spermatocrit from week 1 to week 6. It shows that diet T₄ had the lowest spermatocrit value compared to other treatments. Throughout the study, the seminal plasma and spermatocrit (Figure 2 and 3) showed that diets supplemented with ASA/NaCl had its best at diet T₃ relative to the control diet. This means that the less the seminal plasma the lower the fluidity of the semen which eventually leads to increase in spermatocrit percentage (Aro, 2019). From week 3 to 6, diet T₃ showed a linear trend for sperm motility with 100% while other treatment diets were lower. The best improvement of sperm motility, dead sperm cells and abnormal sperm cells observed in diet T₃ and may be due to the Na⁺ in the salt providing the energy needed for sperm motility, as they play a role in the process of ATP synthesis, which is the primary source of energy for sperm movement (Hall and Guyton, 2006). Furthermore, Na⁺ is involved in the regulation of fluid balance within sperm cells, which is essential for maintaining structural integrity and protecting it from damage (Hall and Guyton, 2006). In addition, aspirin, known for its anti-stress and anti-inflammatory activity, could have reduced any oxidative stress within the seminal plasma, avoided inflammation, and thus contributed to the improvement of those ejaculate parameters (Fan *et al.*, 2013). It was observed that the sperm cells concentration increased from week 1 to week 5 among all the treatment diets and decreased at week 6. The reduction in the sperm concentration values of the birds fed ASA- supplemented and dietary NaCl-inclusion diets is in agreement with Vyas *et al.* (2016) who noted a reduction in sperm concentration of rats due to aspirin, causing androgen depletion in the target level, particularly in the caudal epididymis of rat, thereby affecting physiological maturation of the sperm





T₁ = Diet with 0.25% NaCl and 0.00% ASA; T₂ = Diet with 0.50% NaCl and 0.025% ASA; T₃= Diet with 0.75% NaCl and 0.050% ASA; T₄ = Diet with 1.00% NaCl and 0.075% ASA.

CONCLUSION

All of the ejaculate parameters differed in trend across treatments throughout the six-week study period. Diet T₃, had the best total ejaculate volume, sperm motility and reduced the dead /abnormal sperm cells. As a result, the usage of ASA supplementation and dietary NaCl-inclusion in this current experimental study improve the reproductive parameters of breeder cocks.

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