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HAEMATOLOGICAL INDICES OF BROILER CHICKENS FED DIFFERENT LEVELS OF HOG PLUM (*SPONDIAS MOMBIN*)

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ABSTRACT

As the poultry industry continues to grow, there is a need to incorporate sustainable feed ingredients to improve the health status of birds and enhance food security, especially in developing countries. This study investigated the impacts of different levels of *Spondias mombin* in the diet of broiler chickens had on their haematological parameters. Four dietary groups were formulated with inclusion of *Spondias mombin* leaf meal 50mg, 75mg, 100mg, and 0mg respectively representing treatments (T) 1, 2,3 and 4. Ninety-six (96 chicks, aged three (3) weeks were purchased and used for this study. The birds were allotted into the four treatment groups containing 24 birds. Each treatment group was subdivided into three replicates, with 8 birds per replicate for three (3) weeks. At the end of three weeks, three (3) broilers per replicate were randomly selected for haematological analysis at a reputable laboratory. The results obtained were subjected to one-way analysis of variance. The outcome of this study showed significant differences ($P<0.05$) in red blood cell (RBC), lymphocytes and heterophils. T4 recorded significantly ($p<0.05$) lowest values of RBC (2.60) and Lymphocytes (56.67 %) compared to T1 and T3 which had significantly highest value of RBC and Lymphocyte. However, T4 (35.67) recorded significantly ($p<0.05$) highest value of heterophils than theT1 (29.67%) and T3 (27.67%). The study concluded that the inclusion of *Spondias mombin* to finisher diet enhanced the haematological indices of broilers thereby improving the health status of the birds.

Key words: Blood, broilers, health, hog plum and sustainability.



INTRODUCTION

One of the most popular forms of animal protein is broiler chickens, which contribute significantly to the world's food supply (Mottet & Tempio, 2017). The need for effective and sustainable broiler production systems that can satisfy the rising demand while upholding strict standards of environmental sustainability and animal welfare is expanding as the demand for chicken products keeps rising.

Conventional feed ingredients such as corn, soybean meal, and artificial additives have historically played a significant role in broiler diets. However, there is an increasing interest in investigating alternative feed sources, especially those made from plants that may boost health status. A potential way to lower the high cost of animal feed while improving animal health is through medicinal plants, which contain high phytochemicals like antioxidants. The hog plum (*Spondias mombin*), a tropical fruit with significant nutritional and therapeutic qualities, is one such substance that is gaining acceptance (Chadare *et al.*, 2009). Farmers may be able to provide their broilers with healthier and more affordable diets by adding hog plum to animal feed.

Hog plums (*Spondias mombin*) are found in Africa, Asia, and the Americas and have a long history of use as food, medicine, and lumber (Ayoka *et al.*, 2008; Etong *et al.*, 2019). Its potential as a beneficial component of animal nutrition, especially for ruminant and monogastric species, has been brought to light by recent research, creating new opportunities for its use in livestock feed (Okonkwo *et al.* 2018).

The addition of hog plum to broiler diets shows promise due to its distinct nutritional profile and bioactive components. Hog plum, which is high in vitamins C and A, minerals like potassium and magnesium, and antioxidants like carotenoids and phenolic compounds, may improve broiler hens' overall health and well-being, feed efficiency, and growth performance (Chadare *et al.*, 2009; Etong *et al.*, 2019). Furthermore, there may be financial and environmental advantages to using hog plum as a feed element or supplement. In many tropical and subtropical areas, hog plum is a resource that is

easily accessible and renewable (Ayoka *et al.*, 2008; Etong *et al.*, 2019). As such, it has the potential to support more varied and sustainable broiler production methods. Farmers may be able to lessen their need on traditional feed ingredients and develop more robust and ecologically friendly production methods by adding hog plum to broiler diets.

Haematological parameters are important markers of chicken health because they provide information about the general physiological condition and immunological response of the birds. Haematological measures like haemoglobin concentration, packed cell volume (PCV), and red blood cell (RBC) count may improve when hog plum is added to broiler diets (Akinmoladun *et al.*, 2019). Increased disease resistance and better immune function are frequently linked to elevated haematological indices. By reducing oxidative stress, hog plum's antioxidant qualities may assist broiler blood profiles become healthier. Hog plum supplementation may contribute to the general health and wellbeing of broiler chickens by encouraging improved haematological parameters (Ogunlade *et al.*, 2020).

This study fills a knowledge gap in the literature by examining the impact of supplementing broiler chickens with hog plum (*Spondias mombin*) on their haematological markers during the finisher stage. This study aims to provide important insights into the possible advantages of using hog plum as a nutritional supplement in chicken production by assessing its effect on broiler haematology.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Training and Research Unit of the Agricultural Technology Department, The Federal Polytechnic, Ilaro. It is situated in Ogun State, Nigeria's Yewa South Local Government area. According to Weather Spark (2017), its coordinates are as follows: Latitudes 6°37'46"N and 6°55'42"N; Longitudes 2°47'24"E and 3°6'48"E.

Processing of Experimental Materials

Fresh hog plum leaves (*Spondias mombin*) were collected in Ilaro community, then allowed to dry



at room temperature, blended into a powder and finally kept in an airtight container.

Experimental design

Experimental Diets

The experiment involved four dietary treatments formulated with varying inclusion levels of *Spondias mombin* leaf meal into commercial broiler finisher feed. The diets were designated as follows:

- **T1:** 50 mg of hog plum powder / 25 kg of feed.
- **T2:** 75mg of hog plum powder / 25 kg of feed.
- **T3:** 100mg of hog plum powder /25kg of feed
- **T4:** 0mg of hog plum powder/ 25kg of feed (control)

The treatments were thoroughly mixed to ensure homogeneity, and the feed was fed to the broilers throughout the experimental period.

Experimental Birds and Design

A total of ninety-six (96) broiler chickens that were three (3) weeks old were purchased from a credible source. The broilers were assigned randomly to four treatment groups, each of which contained 24 birds in a completely randomized design (CRD), and each treatment group was further divided into three replicates, each of which had eight (8) birds. The birds were raised in a deep litter system with compartments that were 4 meters by 4 meters to provide sufficient space for movement and reduce stress.

The birds had unlimited access to food and water throughout the three (3) weeks of the experiment. All suitable management practice was adhered to and health concerns were resolved by administering the required drugs prescribed by a poultry veterinarian.

Haematology

Three (3) broilers per treatment were randomly chosen for haematological analysis at the end of the experiment, and two milliliters (2 ml) of blood were drawn from the wing vein into the EDTA bottle and transported to the cold chain laboratory for the analysis of the haematological profile. Ovhei and Kolhatkar (2000) described the procedures for analyzing haemoglobin (Hb), packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), and differentials.

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) and the treatment means separated using Duncan’s Multiple Range Test. Statistical significance was assumed at $P < 0.05$ (IBM SPSS 26, 2022)

RESULTS AND DISCUSSION

Results

Table 1 summarizes the key haematological parameters observed across different treatment groups. There was a significant difference ($P < 0.05$) in RBC, lymphocytes and heterophils between the treatments only. While other parameters measured showed no significant ($p>0.05$) differences. Birds fed T4 recorded significantly ($p<0.05$) lowest values of RBC and Lymphocytes compared to T1 and T3 which had significantly highest value of RBC and Lymphocyte. However, birds fed T4 recorded significantly ($p<0.05$) highest value of heterophils than birds fed T1 and T3.

Table 1: Effect of varying levels of hog plum on haematological parameters of broiler finisher at finisher phase

Data Collection

Parameters	T1	T2	T3	T4	SEM	P Values
PCV (%)	29.67	30.33	30.33	26.33	0.71	0.61
Hb (g/dl)	9.53	9.77	9.90	8.87	0.20	0.22
RBC (*10 ⁶)	3.23 ^a	3.03 ^a	3.13 ^a	2.60 ^b	489.00	0.03
WBC (*10 ³ ul)	13583.33	13633.33	13966.67	17200.00	741.90	0.75
Platelet (ul)	118333.33	114666.6	124000.00	188000.00	5.00	0.33



Lymph (%)	63.00 ^a	61.33 ^{ab}	66.00 ^a	56.67 ^b	1.17	0.02
Heterophils (%)	29.67 ^b	32.00 ^{ab}	27.67 ^b	35.67 ^a	1.04	0.04
Monocytes (%)	3.00	3.00	3.30	3.67	0.20	0.83
Eosinophils (%)	4.00	3.67	2.67	4.00	0.29	0.34
Basophils (%)	0.33	0.00	0.33	0.5	0.13	0.65

^{abc}Mean on the same row having different superscripts are significantly different

DISCUSSION

Investigating the haematological characteristics of broiler finishers fed different concentrations of *Spondias mombin* offers important information on the nutritional effects and overall health of the birds. According to the study's findings, hog plum has a beneficial effect on lymphocytes and red blood cells in comparison to the control. In contrast to Okonkwo *et al.* (2018), who found that values dropped with increasing levels of hog plum (*Spondias mombin*) inclusion, the RBC exhibited a substantial ($p < 0.05$) increase in values throughout all treatments as compared to the control (T4). All the treatments' RBCs were within the ideal 2.5–3.5 $\times 10^6$ range (Bounous & Stedman, 2000).

There was statistical significance ($p < 0.05$) for the heterophils. Compared to the other treatments, the heterophil level was significantly higher at T4. The results of this investigation surpassed the 50.66% to 54.33% values published by Okonkwo *et al.* (2018). The study's lymphocyte counts are similar to the findings of Bello *et al.*, (2024) which ranged from 58.00% to 67%. However, it was above the typical range of 20% to 50% as stated in Merck's Manual (1998), it might indicate an inflammatory disease which made the immune system overactive. More research on broilers fed hog plum has reportedly showed significant improvements in a number of haematological markers. According to a study by Ochei *et al.* (2020), broilers that were given hog plum had higher levels of PCV and Hb than those in control groups. These results suggest that birds ingesting hog plum have improved oxygen-carrying capacity and general health. According to another study, broilers given *Spondias mombin* leaf extract during the starting phase showed improved haematological indices, implying that the timing and mode of administration could have an impact on results (Bello *et al.*, 2024). According to Akinmoladun *et*

al. (2018), birds who were fed hog plum containing diets showed increased lymphocyte counts, which suggested a strong immune system. The haemoglobin levels were within the usual limits of 7.0 and 13.0 g/dl (Banerjee, 2013). The findings exceeded those of Onimisi *et al.* (2016), who reported 7.40 to 8.27 g/dl. The effects of *Spondias mombin* on broiler health and performance have been the subject of several studies. Okonkwo *et al.* (2018) found that *Spondias mombin* leaf meal did not negatively impact haematological indices at inclusion levels as high as 15%, which is consistent with findings that biochemical parameters remained stable in similar conditions. The notion that *Spondias mombin* can improve feed quality while preserving healthy blood profiles was supported by Abiodun *et al.* (2020), who showed that it could be included in chicken diets without negatively affecting their health status.

CONCLUSION

The inclusion of hog plum (*Spondias mombin*) into broiler chicken diets in this study did not have an adverse effect on its haematological indices. Hog plum leaves are readily available and its nutritional benefits could play a major role in sustainable poultry production while also promoting animal health in developing countries.



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