RELATIVE ORGAN WEIGHT AND HEART FUNCTION PARAMETERS OF BROILER CHICKENS ADMINISTERED LIFE PLANT (*Bryophyllum pinnatum*) AQUEOUS EXTRACT

***OWEN, O. J & JOEL, E. I.**

Department of Animal Science, Rivers State University, Nkpolu-Oroworukwo
Port Harcourt, Rivers State, Nigeria
*Corresponding Author: congomfx@yahoo.com, +2348033309939

ABSTRACT

The aim of this study was to determine the relative organ weight and heart function of broiler chickens administered *Bryophyllum pinnatum* (life plant) aqueous extract. Plant samples used were cleaned, washed and then 400 g of crushed samples was soaked in 4 litres of distilled water for 24 hours at room temperature. The extract was filtered using a muslin cloth, placed in airtight containers and refrigerated at 4°C prior to usage. Using a completely randomized design, 120 Ross 308 broiler chickens were randomly allotted to four treatment groups: T1, T2, T3 and T4 containing 0 ml, 10 ml, 20 ml and 30 ml/litre of water respectively, each replicated thrice containing ten (10) birds. At the end of the experiment, organ and blood samples were collected from 1 bird randomly selected from each replicate to determine the organ weight and proportion. Biochemical tests were carried out to evaluate the impact of *Bryophyllum pinnatum* on the functionality of the heart of broiler chickens. Dressed weight and weight of organs determined across the experimental groups showed no significance ($P>0.05$) except kidney which was significantly different ($P<0.05$) across treatments. Heart function biomarkers showed that total cholesterol, total glyceride, high-density lipoprotein and very low-density lipoprotein were significantly different ($P<0.05$) across treatment groups while low-density lipoprotein was not significantly different across treatment groups ($P>0.05$). It can be concluded that among the different inclusion levels administered, *Bryophyllum pinnatum* aqueous extract is best at 30 ml/l as it exhibits hypolipidaemic properties which is beneficial to the broiler chickens.

Keyword: Aqueous Extract, Broiler, *Bryophyllum pinnatum*, Heart function, Organ Weight

DESCRIPTION OF PROBLEM

Poultry is one of the most consumed food items in the world and are considered a rapidly available source of animal protein in most developing countries [1]. To achieve greater productivity of poultry, increased palatability of feed, nutrient utilization, and appetite stimulation, natural additives have been utilized as substitute for antibiotic growth promoters [2]. To prevent the spread and destroy bacteria, antibiotics are utilized either natural or synthetic. They have been used in animals and humans for decades to treat and prevent infections and have since then played a contributory role to the economic feasibility of poultry production [3].

The overuse of synthetic antibiotics in domesticated animals has created a high risk for the rise of antibiotic-resistant bacteria which puts both animal health and welfare at risk [4]. This reduces the effect of the antibiotic drugs and increases the risk of transfer from animals to humans through the food chain. Identifying effective alternatives is crucial to ensuring sustainable livestock production [5], and this has led to an intensified interest in phytobiotics. Phytobiotics are natural bioactive compounds such as essential oils, saponins, tannins, flavonoids, alkaloids, etc., derived from plants and used to improve livestock performance and health, due to their antimicrobial, antioxidant and growth-promoting characteristics [6].

Many medicinal plants have been researched and discovered by scholars as potential substitutes for conventional antibiotics particularly in poultry production. These plants provide possible solutions to antibiotic resistance while enhancing animal well-being and production [7]. Many plant extracts show enhanced performance of poultry in terms of production and health as supported by various organ biomarkers, biochemical indices and anatomical features [8]. Among numerous medicinal plants that have been identified as alternatives by researchers is (Life Plant)

Bryophyllum pinnatum. Hence, this study is aimed to determine its effect on relative organ weight and heart function of broiler chickens.

MATERIALS AND METHODS

Experimental Location

This Experiment was carried out at the Poultry Unit, Teaching and Research Farm, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria. The experimental site is situated in Nigeria's tropical rainforest region. The area has an average monthly rainfall, temperature and relative humidity readings of 200.45 mm, 22.54-31.03°C, and 69.08-112.47%, respectively [9].

Identification and Processing of *Bryophyllum pinnatum*

Bryophyllum pinnatum samples used for this study were gotten from Elioparanwo axis, Port Harcourt, Rivers State The samples were cleaned of unwanted materials, washed and then crushed. Four hundred grams (400 g) of crushed sample was soaked per 4 litres of distilled water and extracted by maceration at room temperature for 24 hours. The extract was filtered using a muslin cloth and then placed in airtight containers and refrigerated at 4ºC to avoid spoilage prior to usage. This was done according to the procedure described by Uhegbu *et al.* (2017).

Experimental Birds and Management

One hundred and fifty (150) Ross 308 day-old chicks were acquired from Agrited, Nigeria Ltd, Ibadan, Oyo State, Nigeria. Prior to the arrival of the chicks, all necessary sanitary measures were carried out. The chicks were brooded for two (2) weeks using adequate source of heat with the sides of the brooding pen properly covered with tarpaulins to retain the heat. Feeding was divided into two phases (broiler starter and finisher diet).

Experimental Design and Treatment

One hundred and twenty (120) broiler chickens were randomly allotted to four treatment groups (T1 – 0 ml/litre of water, T2 – 10 ml/litre of water, T3 – 20 ml/litre of water and T4 – 30 ml/litre of water) using a Completely Randomized Design, each replicated in triplicates containing ten (10) birds. The experimental treatment began after the brooding period and lasted for six (6) weeks. At the end of the experiment, one bird per replicate was randomly selected and starved for a period of twelve hours, euthanized and blood samples collected for laboratory tests as indicated by Bakoshi *et al.* (2022).

Determination of Dressed Weight and Relative Organ Weights

At the end of the experiment, organ samples were collected from one (1) bird randomly selected from each replicate per treatment to determine the organ weight and proportion in relation to the live weight. Dressed weight was also recorded as proportion of the live weight. The organs collected include liver, heart, gizzard, kidney, gall bladder.

Heart Function Biomarkers

Biochemical tests were carried out to evaluate impact of *Bryophyllum pinnatum* on the functionality of vital organs such as the liver, heart and kidney of broiler chickens. At the end of the experiment, 5 mls of blood was collected from one (1) bird per replicate after severing the jugular vein. Blood samples were collected into sterilized plain bottles free of Ethylene diamine tetra acetic acid. Samples were taken to the laboratory for determination of cardiac biomarkers (total cholesterol, total triglyceride, high-density lipoprotein, low-density lipoprotein, and very-low-density lipoprotein). Blood samples for heart function tests were allowed to clot, centrifuged and serum were then separated and stored at -20ºC for serum analysis carried which was carried out as described in Chauhan *et al.* (2021 and Makama *et al.* (2022).

Statistical Analysis

The data generated from the experiment was subjected to a one-way analysis of variance and significant differences were separated using Duncan's Multiple Range Test. The statistical analysis was done using computer software IBM SPSS Statistic version 25 [14].

RESULTS AND DISCUSSION

Dressed Weight and Relative Organ Weight of Broiler Chickens

This current study determined the weights of some organs (gall bladder, liver, heart, gizzard and kidney) and dressed weight across the experimental groups among which only kidney

was significantly different (P<0.05) across treatment groups. Control group had higher mean value compared to the treatment groups containing *B. pinnatum* aqueous extract (T2 – T4) but significantly similar to T2 and T4 which were in turn significantly similar with T3. This indicates that *B. pinnatum* extract does not have any negative impact on kidney weight as they did not undergo hypertrophy due to detoxification. This is in agreement with the findings of Essien (2021).

The kidney weight across all experimental groups in this study is below the range (0.19% to 0.37%) stated by Omoikhoje *et al.* (2019) for broiler chickens administered varying levels of coffee weed leaf ethanolic extract. However, T1 (0.15%) is within the range (0.13% to 0.18%) reported by Essien (2021) for broiler chickens administered varying levels of *Centrosema pubescens* leaf extract. All other organs were not significantly different across treatment groups (P>0.05). Hence, it can generally be inferred from this study that *B. pinnatum* did not exhibit any negative effect on the organ weight of broiler chickens.

Table 1: Effect of aqueous extract of *Bryophyllum pinnatum* on Dressed Weight and Relative Organ Weight of Broiler Chickens

Parameters	Treatments			
	T1 (0 ml/l)	T2 (10 ml/l)	T3 (20 ml/l)	T4 (30 ml/l)
Live Weight (Kg)	2.82±0.42	2.58±0.29	2.58±0.25	2.47±0.31
Dressed Weight (%)	74.08±1.20	79.46±10.10	69.44±8.40	72.69±3.56
Gall Bladder (%)	0.19±0.10	0.16±0.04	0.13±0.02	0.29±0.23
Liver (%)	2.02±0.22	2.32±0.50	2.13±0.24	2.10±0.65
Heart (%)	0.44±0.04	0.44±0.06	0.42±0.05	0.65±0.23
Gizzard (%)	1.44±0.12	1.56±0.23	1.29±0.33	1.44±0.21
Kidney (%)	0.15 ± 0.03^{a}	0.10 ± 0.04^{ab}	0.09 ± 0.02^{b}	0.10 ± 0.03^{ab}

^{ab} means across treatments having different superscripts are significantly different (P<0.05), Mean ± Standard Deviation

Heart Function of Broiler Chickens

The result on the effect of *Bryophyllum pinnatum* aqueous extract on heart function of broiler chickens is shown in Table 2. The result shows that total cholesterol, total glyceride, high-density lipoprotein and very low-density lipoprotein were significantly different (P<0.05) across treatment groups while low-density lipoprotein was not significantly different across treatment groups (P>0.05). It can be seen from the result that mean values of all parameters was higher in T3 (20 ml/l) when compared to means values of the control group for all parameters. Total cholesterol value in T3 (4.87 mmol/l) was slightly above the upper range of 4.1 mmol/l for broilers. while high-density lipoprotein (1.91 mmol/l) was below the findings of Alagbe (2020). In relation to the relative weight of the heart, which is lowest in T3 (0.42%) and highest in T4 (0.65%), broiler heart weight is affected mostly by haemodynamic and oxygen demand than by serum lipids as a result, lipid changes do not importantly affect the relative weight of the heart [17, 18].

The lipid profile in T3 shows no adverse effect as higher high-density lipoprotein with moderate Total glyceride levels were recorded. Very low-density lipoprotein values in this study (0.62–0.76 mmol/l) are consistent with reported values of very low-density lipoprotein [19]. There is no evidence that the extract adversely affected heart weight. The slight increase of total cholesterol in T3 occurs with higher high-density lipoprotein and the lowest values of relative heart weight, which does not indicate any sign of disease in broilers. However, T2 (10 ml/l) and T4 (30 ml/l) produced similar mean values with that of the control group. This suggests that only T3 exhibited hyperlipidaemic properties which can negatively affect the health status of the birds.

This significantly high levels particularly that of low-density lipoprotein can cause sudden

death as it can lead to atherosclerosis; form plaques which accumulates and block blood vessels such as arteries thereby preventing the normal blood circulation. This is in alignment with Das *et al.* (1997) and Johnson *et al.* (2023). However, the similar effect of T2 and T4 denotes the hypolipidaemic property of the synergistic effect of interaction among the phytoconstituents of *B. pinnatum* leading to improvement of the overall health of poultry. This can be supported by Igiebor *et al.* (2024). It can hence be stated that the treatment containing 30 ml/l of *Bryophyllum pinnatum* aqueous extract had a better effect of the heart function when compared to other treatment levels.

Table 2: Effect of Aqueous Extract of *Bryophyllum pinnatum* on Heart Function Parameters of Broiler Chickens

Parameters	Treatments			
	T1 (0 ml/l)	T2 (10 ml/l)	T3 (20 ml/l)	T4 (30 ml/l)
TC (mmol/l)	3.83±0.25^{b}	3.90±0.80^{b}	4.87±0.35^{a}	3.87±0.21^{b}
TG (mmol/l)	1.41±0.04^{b}	1.40±0.23^{b}	1.68±0.08^{a}	1.36±0.03^{b}
HDL (mmol/l)	1.49±0.04^{b}	1.53±0.22^{b}	1.91±0.08^{a}	1.48±0.06^{b}
LDL (mmol/l)	2.99±0.26	3.00±0.69	3.72 ±0.37	3.01±0.18
VLDL (mmol/l)	0.64±0.02^{b}	0.63±0.10^{b}	0.76±0.04^{a}	0.62±0.01^{b}

^{ab} means across treatments having different superscripts are significantly different (P<0.05), Mean ± Standard Deviation.

CONCLUSION AND APPLICATION

This study aimed to determine the effect of *Bryophyllum pinnatum* aqueous extract on the dressed weight, relative organ weight and heart function of broiler chickens. The result showed a positive effect of the *Bryophyllum pinnatum* aqueous extract on the organ weight and heart biomarkers and it can be concluded that among the different inclusion levels administered, *Bryophyllum pinnatum* aqueous extract is best at T4 (30 ml/l) as it exhibits hypolipidaemic properties which is beneficial to the health status and performance of the heart of broiler chickens.

REFERENCES

1. Gabrielli, M., Everton, V., Decian, M., Jorge, M., Farinha, U. S. & Bernado, L. V. M. (2020). Assessing the Eco-Efficiency of Different Poultry Production Systems: An Approach Using Life Cycle Assessment and Economic Value. *Sustainable Production and Consumption* 24, 181-193.
2. Owen, O. J. & Amakiri, A. O. (2012). Evaluation of Ginger (*Zingiber officinale*) as Feed Additive on the Performance Characteristics and Haematological Profiles of Broiler Birds. *Proc. 17th Annual Conf. Animal Science Association of Nigeria (ASAN), Abuja*, 9th -13th September, 434 - 437.
3. Kpun, I. P., Ebiyeibo, P. T. & Joel, E. I. (2023) Haematological Properties of Broilers Administered with Aqueous Extract of *Triumfetta cordifolia* Leaf. *Life Sciences: An International Journal (LSIJ)*. 1(1), 13-22.
4. Lee, K. H. & Lesson, S. (2001). Performance of Broilers Fed Limited Quantities of Feed or Nutrients During Seven to Fourteen Days of Age. *Poultry Science*. 80, 446-456.
5. Khameneh, B., Iranshahy, M., Soheili, V. & Bazzaz, B. S. (2019). Review on Plant Antimicrobials: A Mechanistic Viewpoint. *Antimicrobial Resistance and Infection Control*. 8(118).
6. Windisch, W., Schedle, K., Plitzner, C., & Kroismayr, A. (2008). Use of Phytogenic Products as Feed Additives for Swine and Poultry. *Journal of Animal Science*, 86(14), 140-148.
7. Ebenebe, C. I., Uchegbu, M. C., Ibe, S. N., & Ajuogu, P. K. (2015). Effect of *Moringa oleifera* Leaf Meal on Growth Performance and Health Status of Broiler Chickens. *Journal of Agricultural Science*, 7(3), 234-239.
8. Alagbe, J. O. (2020). Effect of Dietary Supplementation of *Cymbopogon citratus* Oil on the Haematology and Serum Biochemical Parameters of Broiler Chicks.

Journal of Multidimensional Research and Review, 1(3), 15-25.
9. Uko, E. D. & Tamunobereton-Ari, I. (2013). Variability of Climatic Parameters in Port Harcourt, Nigeria. *Journal of Emerging Trends in Engineering and Applied Sciences* 4(5), 727 – 730
10. Uhegbu, F., Nwaogwugwu, C., Onwuegbuchulam, C., Oriaku, C., Atasie, O., & Akatobi, K. (2017). Renal Protective Properties of Aqueous Extract of *Bryophyllum pinnatum* (Lam.) Oken Leaf against Petrol Vapour – Induced Toxicity on Male Albino Rats. *European Journal of Medicinal Plants*, 19:1-8.
11. Bakoshi, A. M., Abdu, I. and Joseph, M. (2022) Metabolites of Broiler Chickens Fed Three Millet Varieties Based Diets as Replacement for Dietary Maize. *Global Journal of Agricultural Research*, 10(4): 16-22.
12. Chauhan, S. S., Sharma, R. K., Singh, D. V., Shukla, S. K., Palod, J. and Singh, M. K. (2021). Studies on Serum Mineral Profile and Kidney Function of Broiler Chickens Fed Diets Containing Different Supplements. *Indian Journal of Animal Research*. 55(2), 189-192.
13. Makama, R. S., David, B., Aaron, C. D., Kehinde, H. W., Yayi, J. and Bala, I. J. (2022). Haematological indices, liver function and lipid profile of broiler chickens fed graded levels of scent leaf (*Ocimum gratissimmum* L.) meal. *Nigerian Journal of Animal Production*, 49(2), 140-149.
14. IBM Corp (2017). *IBM SPSS Statistics for Windows, Version 25.0*. Armonk, NY: IBM Corp.
15. Essien C. A. (2021) Performance, Carcass and Organ Characteristics of Broiler Chicken Administered Aqueous Extract of *Centrosema pubescens*. *AKSU Journal of Agriculture and Food Sciences*, 5(3), 1-13.
16. Omoikhoje, S. O., Okooza, M. O., Okeje, R. O. and Peter-Paul, F. E (2019). Carcass traits and internal organs of broiler chickens as influenced by coffee weed (*Senna occidentalis*) leaf ethanolic extract. *Nigerian Journal of Animal Production*, 46(5), 136-142
17. Julian, R. J. (2000). Physiological, management, and environmental triggers of the ascites syndrome: A review. *Avian Pathology, 29*(6), 519–527.
18. Wideman, R. F. (2001). Pathophysiology of heart/lung disorders: Pulmonary hypertension syndrome. *Poultry Science, 80*(8), 1177–1195.
19. Okpogba, A. N., Ogbodo, E. C., Okpogba, J. C., Analike, R. A., Amah, A. K., Odeghe, B. O., Ujowundu, F. N., Oguaka, V. N., & Onyeneke C. E. (2018). Assessment of Kidney Function Status in Chickens (*Gallus gallusdomestica*) in Rural (Elele) and Urban (Nnewi) Areas. *Journal of Medical Science and Clinic Research*, 6(12), 1048-1052.
20. Das, S. Snehlata, B. L and Srivastava, L. K. (1997). Effect of Ascorbic Acid on Lipid Profile and Peroxidation in Hyper-Cholesterolemic Rabbits. *Nutr. Res*. 17(2), 231-241.
21. Johnson, N. C., Fakae, L. B., Ogbamgba, V. M & Diri, M. (2023) Lipid Profiles and Antibody Responses of Broiler Chickens Fed Graded Levels of Vitamin C. *Greener Journal of Agricultural Sciences*, 13(3), 208-212
22. Igiebor, F. A., Michael, F. C., Haruna, O., & Ikhajiagbe, B. (2024). Impact of plant-based nanoparticles synthesized from *Carica papaya* and *Bryophyllum pinnatum* against selected microorganisms. *Studia Universitatis Babeş-Bolyai Biologia*, 69(1), 87-106.