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EFFECTS OF SOURSOP (*ANNONA MURICATA*) LEAF MEAL ON ORGANS WEIGHT AND HAEMATOLOGICAL INDICES OF RABBIT BUCKS

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ABSTRACT

Soursop (*Annona muricata*) leaves contain useful bioactive compounds and may serve as a natural, low-cost feed ingredient to support rabbit health and productivity. This study investigated the effects of Soursop (*Annona muricata*) leaf meal on organ weights and haematological indices of rabbit bucks. Sixty mixed-bred rabbit bucks, 20 weeks old with weight range of 1.7–2.0 kg were acclimatized for two weeks and randomly assigned into five dietary treatments containing 0, 100, 200, 300, or 400 g/kg of soursop leaf meal for 10 weeks. Each treatment consisted of 12 rabbits, divided into 3 replicates of 4 rabbits each. Organ weights and haematological indices were evaluated and data were analyzed using one-way ANOVA, with means separated by Duncan's Multiple Range Test ($p < 0.05$). Significant differences were observed in organ weights, with the highest values for liver, kidney, lungs, heart, and testes generally recorded at 200 g/kg inclusion, indicating enhanced organ development without toxicity. Haematological parameters showed dose-dependent increases in packed cell volume, haemoglobin, and red blood cell counts, alongside decreases in white blood cell and platelet counts, suggesting improved erythropoiesis and immunomodulatory effects. These findings demonstrate that soursop leaf meal, particularly at moderate levels, can serve as a beneficial feed supplement to promote health and physiological function in rabbit bucks.

Keywords: *Annona muricata*; foliage; nutrient profile; visceral parameters; male rabbits; blood characteristics

INTRODUCTION

Rabbit production plays a pivotal role in addressing protein deficiencies in developing regions like Nigeria, where it offers a sustainable source of high-quality meat with low cholesterol and efficient feed conversion rates. However, escalating costs of

conventional feed ingredients, such as maize and soybean meal, pose significant challenges to small-scale farmers, necessitating the exploration of cost-effective alternatives like plant-based leaf meals to enhance dietary formulations without compromising animal health or productivity. Among such alternatives, Soursop (*Annona muricata* L.), a tropical

evergreen tree indigenous to the Americas but widely cultivated in West Africa, has garnered attention for its nutrient-dense leaves that could serve as a viable feed additive in livestock nutrition (Onwuka & Ehiem, 2019). The leaves of *A. muricata* are rich in bioactive phytochemicals, including alkaloids, flavonoids, saponins, tannins, and acetogenins, which confer antioxidant, anti-inflammatory, and antimicrobial properties that may support physiological processes in animals (Moghadamtousi *et al.*, 2017). Proximate analyses from various studies have consistently revealed moderate crude protein levels (around 11-25%), substantial carbohydrate content (up to 48%), and appreciable fibre (18-22%), positioning soursop leaves as a potential energy and nutrient source in ruminant and non-ruminant diets (Ajayi *et al.*, 2018; Oduro *et al.*, 2020). These components not only contribute to digestive health but also mitigate oxidative stress, as evidenced by prior research where soursop leaf extracts ameliorated lipid peroxidation and bolstered antioxidant defenses in heat-stressed rabbits, leading to improved seminal quality and reproductive parameters (Jimoh *et al.*, 2018). The ash content, indicative of mineral richness, aligns with findings that highlight the roles of soursop in supplying essential elements like potassium and calcium, which are crucial for metabolic functions (Onwuka & Ehiem, 2019).

Empirical evidence from animal models underscores the potential of *A. muricata* leaves to influence organ weights and haematological profiles positively. For instance, supplementation with soursop leaf extracts in rats has been associated with hepatoprotective effects, reducing toxin-induced liver damage through enhanced enzymatic activity and decreased inflammation, which could

translate to optimized liver weights in healthy subjects (El-Dashlouty *et al.*, 2020).

Similarly, nephroprotective benefits have been observed in rabbits exposed to carbon tetrachloride, where soursop mitigated renal toxicity by alleviating hormonal disturbances and preserving kidney function, suggesting a capacity to support organ hypertrophy under dietary inclusion (Ali *et al.*, 2021). Regarding haematological studies, hematopoietic modulation has been demonstrated, with soursop extracts elevating red blood cell counts and haemoglobin levels while modulating white blood cell responses in adult male rabbits, indicative of improved oxygen-carrying capacity and immune regulation without adverse effects (Syahida *et al.*, 2012). These outcomes resonate with observations in stannous chloride-exposed rabbits, where *A. muricata* suppressed haematological disruptions, fostering erythropoiesis and reducing inflammatory markers (Ali *et al.*, 2021). However, variations in response have been noted, such as minor decreases in platelet counts in repeated-dose rat studies, emphasizing the need for dose optimization to avoid potential immunosuppressive effects at higher inclusions (Syahida *et al.*, 2012).

Despite these promising results, gaps persist in the dose-dependent impacts of soursop leaf meal, specifically on organ weights and haematological indices in rabbit bucks under tropical conditions. Prior investigations often focused on toxicity profiles or acute interventions, with limited emphasis on long-term dietary integration in non-stressed animals (Moghadamtousi *et al.*, 2017). The present study addresses this by evaluating graded levels of *A. muricata* leaf meal in rabbit diets, aiming to elucidate its effects on organ weights and haematological indices in rabbit bucks.

MATERIALS AND METHODS***Experimental Site***

This study was carried out at the Rabbitry Section, Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture, Rivers State University, Nkpolu-Oroworokwo, Port-Harcourt, Rivers State. The farm is situated at an elevation of about 20 m above sea level and is located at the Northern wing of the school campus. Port-Harcourt is in the South-South region of Nigeria, characterized by a tropical climate with temperatures ranging from about 26.4°C – 28°C with a significant rainfall most months of the year with a short dry season. February is the warmest month of the year with an average temperature of about 27.6°C, while August is the coolest, with an average temperature of about 25.2°C. Average annual precipitation is ap-

proximately 2708 mm. Port-Harcourt is situated between latitudes 4°48'N and longitudes 6°58'E (Uko *et al.*, 2016).

Collection and Processing of A. murata Leaf meal

A. Murata leaves were harvested manually from the Crop Section of the Rivers State University Teaching and Research Farm, Nkpolu- Oroworokwo, Port-Harcourt and sorted to remove insects, dead leaves and woody stems. The leaves were spread on a mat in a room with average temperature of 26°C to air dry for three weeks, making them crispy. Afterwards, the leaves were weighed into separate containers and milled into powder form using an electric blender machine. The *A. Murata* leaf meal was mixed with grower's feed and fed to the rabbit bucks (Table 1).

Table 1: Composition of Experimental Diets Containing *A. murata* Leaf Meal (ALM)

Ingredient (g/100 kg)	Diet 1 (0%) ALM)	Diet 2 (5%) ALM)	Diet 3 (10%) ALM)	Diet 4 (15%) ALM)	Diet 5 (20%) ALM)
Maize	45.00	42.50	40.00	37.50	35.00
Wheat Offal	20.00	20.00	20.00	20.00	20.00
Soybean Meal	15.00	15.00	15.00	15.00	15.00
Groundnut Cake	10.00	10.00	10.00	10.00	10.00
Fish Meal	3.00	3.00	3.00	3.00	3.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50	0.50
<i>A. murata</i> Leaf Meal	0.00	5.00	10.00	15.00	20.00
Total	100.00	100.00	100.00	100.00	100.00

Experimental Animals and Management

A total of Sixty (60) mixed-bred bucks, 20 weeks of age, with an average weight range

of 1.7-2.0 kg, were used for this study. The bucks were procured from Phenix Farm in Rivers State. Prior the arrival of the bucks, the hutches were cleaned and disinfected.

Upon arrival, the rabbits were administered multivitamins to mitigate transportation stress. The rabbits were acclimated to their new environment for 2 weeks, during which they were fed with commercial grower's mash and had access to clean drinking water *ad libitum*. The rabbits received prophylactic dose of Ivermectin (Ivomec injection) to prevent mange and gastrointestinal nematodes, as well as Coccidiostat and broad-spectrum antibiotics against bacterial and viral infections. Thereafter, the bucks were weighed to obtain their initial body weight and randomly assigned to five treatment groups, each with twelve (12) rabbits and three (3) rabbits per replicate. The five treatments were: T₀ (control, 0 g/kg *A. muricata* leaf meal), T₁ (100 g/kg *A. muricata* leaf meal), T₂ (200 g/kg *A. muricata* leaf meal), T₃ (300 g/kg *A. muricata* leaf meal), and T₄ (400 g/kg *A. muricata* leaf meal). The rabbits were housed in wooden cages in a Completely Randomized Design (CRD). Feeders, drinkers and other necessary housing requirement were provided. Good sanitary and environmental conditions were maintained while water and feed were provided *ad libitum* throughout the 10-week study.

Data Collection

Data were collected on the following parameters:

Proximate Composition of Soursop Leaf Meal

Proximate analysis of soursop leaf meal to determine: moisture, crude protein, fat, ash, fiber and total carbohydrate content was carried out in triplicates according to stand-

The linear model used for the analysis was:

$$X_{ij} = \mu + T_i + E_{ij}$$

where

$$X_{ij} = \text{Value of observation made on each rabbit (jth receiving the ith treatment level)}$$

ard methods (AOAC, 2006).

Organ weight

The animals were slaughtered humanely by restraining the bucks and eviscerated and the internal organs of interest: heart, liver, kidney, lung, and testes removed and weighed on an electronic scale. They were thereafter put into storage vials that contained 10% buffered formaldehyde solution and sectioned for histological examination. The organs were dissected according to the method described by Patel *et al.* (2000). The prepared slides were filmed using a photomicrograph camera to produce the plates X 200 and X 400 magnification respectively. This was done at UPTH pathology laboratory.

Haematological Indices

Packed cell volume (PCV) was determined by the micro haemetocrit method of Dacie and Lewis, (1991). Haemoglobin (Hb) concentration was determined by the cyanomet-haemoglobin method (Kelly, 1979). Red blood cell (RBC) and white blood cell (WBC) was determined using the improved Neubauer haemocytometer method, as described by Jain (1986).

Statistical Analysis

Data obtained were statistically analyzed using the One-Way Analysis of Variance (ANOVA) technique. Where significant differences existed, means were separated using Duncan's Multiple Range Test (DMRT) in SAS (version 16.0) at a 5% level of significance (**p < 0.05**), as described by Duncan (1955).

μ	=	Population mean common to all observations receiving all the treatment levels
T_i	=	Treatment effect; effect of the i^{th} treatment ($i=1,2,3,4,5$)
E_{ij}	=	Error mean

RESULTS

The proximate composition of the soursop leaf meal indicated moderate crude protein and fat contents, with a notably high crude fibre fraction and appreciable mineral residue. The material also contained a considerable proportion of carbohydrates alongside low moisture content, suggesting good keeping quality and potential as a fibrous plant-based feed ingredient (Table 2).

Significant differences existed in liver weight, kidney, lungs, heart and testes weight in the present study (Table 3). Rabbits fed the diet containing 200 g/kg of soursop leaf meal had the highest liver weight, which was significantly higher than from those fed the other diets. In kidney weight, rabbits fed 200 g/kg and 300 g/kg of soursop leaf meal showed comparable values. Lower kidney weights of 11.80 g, 10.47 g, and 9.60 g were recorded in rabbits fed the other inclusion levels.

Lower kidney weights of 11.80 g, 10.47 g, and 9.60 g were recorded from rabbits fed 400 g/kg, 100 g/kg, and 0 g/kg of soursop leaf meal, respectively. The highest lungs weight of 17.24 g was observed from rabbits fed 200 g/kg of soursop leaf meal, while the least value of 12.80 g was recorded from rabbits fed 0 g/kg (control diet).

Heart weight was highest (6.47 g) in rabbits fed 200 g/kg of soursop leaf meal, but this did not differ significantly from those fed 100 g/kg. Rabbits fed the control diet (0 g/kg) had the least heart weight (4.80 g).

For testes weight, values of 3.20 g, 3.49 g, 4.31 g, 4.00 g, and 3.39 g were recorded in rabbits fed 0 g/kg, 100 g/kg, 200 g/kg, 300 g/kg, and 400 g/kg of soursop leaf meal, respectively. The highest testes weight was observed in rabbits fed 200 g/kg, while the least was recorded in those fed the control diet of 0 g/kg (Table 3).

Table 2: Proximate Composition (%) of Soursop (*Annona muricata*) Leaf Meal

Nutrients	Quantity (%)
Moisture	9.00
Crude protein	11.00
Crude fat	4.00
Crude fibre	18.00
Ash	10.00
Carbohydrate content	48.00

Table 3: Organ's weight of Adult Rabbits Administered Soursop

Parameters	T ₀ (0 g/kg)	T ₁ (100 g/kg)	T ₂ (200 g/kg)	T ₃ (300 g/kg)	T ₄ (400 g/kg)
Liver (g)	48.00±0.72e	52.32±0.81d	64.67±1.53a	60.00±0.61b	59.00±0.99c
Kidney (g)	9.60±0.22d	10.47±0.19c	12.93±0.29a	12.00±0.01a	11.80±0.14b
Lungs (g)	12.80±0.16e	13.96±0.19d	17.24±0.10a	16.00±0.18b	15.73±0.23c
Heart (g)	4.80±0.18d	5.23±0.29a	6.47±0.19a	6.0±0.14b	5.9±0.22c
Testes (g)	3.20±0.09d	3.49±0.08c	4.31±0.02a	4.0±0.04b	3.39±0.06d

a, b,c,d,e: Values within each row with different superscript differs significantly (P<0.05)

The haematological parameters measured were packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), white blood cell (WBC), platelet, neutrophil, lymphocytes, eosinophil and monocytes. Significant differences due to treatment effects existed in all the parameters evaluated. With regards to PCV, the best result was obtained in the rabbits fed 400 g/kg of soursop diet, while rabbits fed diet containing no soursop leaf meal (0 g/kg) had the least PCV value. A similar result was observed in respect to the values obtained in haemoglobin levels among the treatments. The mean value of RBC ($10^{12}/l$) was 4.16 ± 0.50 for rabbits fed diet containing no soursop leaf meal but was 4.60 ± 0.22 and 5.04 ± 0.20 , respectively for rabbits fed diet containing 100 and 200 g/kg of soursop leaf meal, and was 5.94 ± 0.16 and 6.96 ± 0.23 , respectively for rabbits fed diet containing 300 and 400 g/kg of soursop leaf meal (Table 4).

WBC values ($10^9/l$) decreased from rabbits fed diet containing no soursop leaf meal (0

g/kg) to rabbits fed diet containing 400 g/kg, with increased inclusion level of soursop in the present study. Values obtained for platelet ($\times 10^9/l$) ranged from 448.25 ± 17.37 - 896.56 ± 33.77 , with the highest value observed for rabbits fed diet containing no soursop leaf meal and the least for rabbits fed diet containing 400 g/kg of soursop leaf meal. MCHC, MCH and MCV values decreased with increased level of soursop inclusion in the rabbit diet. Rabbits fed diet containing 400 g/kg of soursop leaf meal had the highest value of $24.13\pm 1.56\%$ for neutrophil; rabbits fed diet containing no soursop leaf meal (0 g/kg) had the highest value of $93.22\pm 1.82\%$ for lymphocytes. Rabbits fed diet containing no soursop leaf meal (0 g/kg) had the highest value of $6.33\pm 4.37\%$ for eosinophil while rabbits fed diet containing 200 g/kg soursop leaf meal recorded the least of $2.33\pm 0.37\%$. Monocyte was highest in rabbits fed diet containing 400 g/kg soursop leaf meal while rabbits fed diet containing no soursop leaf meal (0 g/kg) had the least value of $3.44\pm 0.69\%$ (Table 4).

Table 4: Haematological indices of Adult Rabbits Administered Soursop

Parameters	T ₀ (0 g/kg)	T ₁ (100 g/kg)	T ₂ (200 g/kg)	T ₃ (300 g/kg)	T ₄ (400 g/kg)
Packed cell volume (PCV) %	29.00±2.41 ^d	32.22±1.19 ^{cd}	35.44±0.92 ^{bc}	38.89±0.72 ^b	43.75±1.40 ^a
Hemoglobin (Hb) g/dl	9.82±0.88 ^d	10.81±0.43 ^{cd}	11.80±0.31 ^{bc}	12.94±0.24 ^b	14.50±0.46 ^a
Red blood cell (RBC) (x10 ¹² /l)	4.16±0.50 ^d	4.60±0.22 ^{cd}	5.04±0.20 ^c	5.94±0.16 ^b	6.96±0.23 ^a
White blood cell (WBC) (x10 ⁹ /l)	17.41±0.95 ^a	14.68±0.57 ^b	11.94±0.30 ^c	9.64±0.29 ^d	7.04±0.33 ^e
Platelet (x 10 ⁹ /l)	896.56±33.77 ^a	797.22±20.29 ^b	697.89±19.86 ^c	554.56±15.90 ^d	448.25±17.37 ^e
Mean Corpuscular Haemoglobin Concentration (MCHC)	34.17±0.58 ^a	33.29±0.17 ^{ab}	32.41±0.34 ^b	33.29±0.17 ^{ab}	32.58±0.31 ^{ab}
Mean Corpuscular Haemoglobin (MCH)	21.81±1.03 ^a	21.10±0.65 ^{ab}	20.04±0.51 ^{ab}	20.09±0.38 ^{ab}	19.66±0.56 ^b
Mean Corpuscular Volume (MCV)	72.44±2.13 ^a	70.26±0.78 ^{ab}	68.07±0.64 ^{bc}	68.09±0.55 ^{bc}	64.341.66 ^c
Neutrophils (%)	5.22±1.70 ^d	10.56±0.73 ^c	15.89±0.89 ^b	17.89±0.95 ^b	24.13±1.56 ^a
Lymphocytes (%)	93.22±1.82 ^a	84.00±1.23 ^b	74.78±1.51 ^c	75.00±1.28 ^c	69.50±1.66 ^d
Eosinophil (%)	6.33±4.37	4.33±2.22	2.33±0.37	3.11±0.72	2.38±0.18
Monocyte (%)	3.44±0.69 ^b	4.11±0.35 ^{ab}	4.78±0.62 ^{ab}	4.78±0.23 ^{ab}	5.25±0.31 ^a

^{a,b,c,d,e} Values within each row with different superscript differs significantly (P<0.05)

DISCUSSION

The proximate composition of soursop (*Annona muricata*) leaf meal revealed that carbohydrate constitutes the largest portion, supporting earlier findings that highlight their role as a significant energy source (Onwuka & Ehiem, 2019). The crude fibre content obtained was consistent with the report of Oduro *et al.* (2020), who emphasized the importance of fibre in digestion and nutrient regulation. The moderate protein content aligns with the observations of Ajayi *et al.* (2018), indicating that soursop leaves can serve as a valuable protein supplement in animal feed. Similarly, the ash fraction suggests adequate mineral supply, corroborating the findings of Onwuka and Ehiem (2019). Crude fat content was comparable to levels found in other leafy materials (Mensah *et al.*, 2021), and the relatively low moisture content reflects good preservation qualities, which minimizes spoilage risk (Oduro *et al.*, 2020). Although values observed are largely consistent with these studies, slight variations were noted when compared with Chukwu *et al.* (2017), who reported slightly higher crude fibre (21.3% vs. 19.8% in this study) and lower crude protein (13.2% vs. 15.0% in this study). Such differences may be attributed to environmental factors (soil type, rainfall, sunlight), harvest stage (mature vs. young leaves), and processing methods (air-drying vs. oven-drying), all of which can influence nutrient composition. Soursop leaf meal still remains a rich source of energy, protein, and minerals suitable for inclusion in rabbit diets.

Inclusion of soursop (*Annona muricata*) in the diets of adult rabbits significantly influenced organ weights, impacting the liver, kidney, lungs, heart, and testes. This finding

may reflect enhanced metabolic activity or increased protein synthesis induced by bioactive compounds in soursop. Similar hepatoprotective effects have been reported in rats, where soursop components alleviated liver damage in toxin-induced models (El-Dashlouty *et al.*, 2020). Conversely, in rabbits exposed to toxic agents, soursop did not significantly alter relative liver weight (Ali *et al.*, 2021), indicating that effects may depend on health status and stress conditions.

Rabbits fed 200 g/kg and 300 g/kg of soursop leaf meal showed better kidney development than those on other diets. This pattern suggests improved renal function, possibly linked to better blood flow and metabolic activity in the kidneys. Evidence from previous studies showed that soursop reduced chemically induced kidney damage in rabbits, which supports its protective role on renal tissues (Ali *et al.*, 2021). However, reports also indicated that in the absence of toxic challenge, soursop did not markedly change kidney size (El-Dashlouty *et al.*, 2020). This implies that the effect of soursop on the kidney may depend on the physiological condition of the animal.

Improved lung development observed at moderate inclusion levels may be associated with the antioxidant properties of soursop, which can support respiratory tissue integrity, especially under environmental or metabolic stress. Similar observations were linked to antioxidant supplementation that supported lung tissue health (El-Dashlouty *et al.*, 2020). Differences in response under normal and stress conditions reported by Ali *et al.* (2021) further suggest that organ response varies with underlying challenges.

The pattern seen in heart development may indicate better cardiovascular strength in rab-

bits given moderate levels of soursop leaf meal. Although earlier studies did not report marked changes in cardiac size under toxin exposure (Ali *et al.*, 2021), this may be due to the body's focus on detoxification rather than growth under such conditions.

Enhanced testes development at moderate inclusion levels may reflect improved reproductive organ growth. Earlier findings showed that soursop improved reproductive performance in male rabbits (Jimoh *et al.*, 2018), which supports the possibility that better organ development may accompany functional improvement.

Overall, these observations suggest that **moderate inclusion** of soursop leaf meal supported organ development more effectively than very low or very high levels, and that the response of organs to soursop may depend on the physiological state of the animal.

The inclusion of graded levels of soursop (*Annona muricata*) in the diet of adult rabbits significantly increased all measured haematological parameters. PCV and Hb increased progressively with higher soursop inclusion, peaking in rabbits fed 400 g/kg. This suggests enhanced erythropoietic activity. Similar hemopoietic effects have been observed in studies using soursop extracts in rats, where leaf or fruit extracts improved PCV and Hb within normal ranges (Syahida *et al.*, 2012; Moghadamtousi *et al.*, 2017). These effects may derive from bioactive phytochemicals, such as flavonoids and alkaloids, which enhance hematopoietic function and antioxidant support. RBC count also increased with soursop supplementation, reaching its highest in the 400 g/kg group. This aligns with the PCV and Hb trends,

reinforcing the suggestion of enhanced red blood cell production. In Wistar rats, similar increases in erythrocyte parameters were reported after administration of soursop leaf extracts (Moghadamtousi *et al.*, 2017). The study observed a significant decline in WBC counts as soursop levels increased. While high WBC is often indicative of infection or inflammation, reduced WBC could reflect lower inflammatory drive or immunomodulation. Comparable findings appear in studies with soursop extracts where WBC counts remained within normal limits or decreased under controlled conditions (Syahida *et al.*, 2012). However, in toxicity or infection models, soursop sometimes normalized elevated WBC levels (Ali *et al.*, 2021), suggesting context-dependent responses. Platelet counts decreased with higher soursop inclusion. In a study of repeated-dose administration in rats, soursop extract led to a notable rise in platelet levels (Syahida *et al.*, 2012); this contrast may stem from species differences, dosage forms, or metabolic factors affecting thrombopoiesis. Mean corpuscular indices decreased slightly with higher soursop inclusion. While modest, these changes might reflect the relative increase in red cell mass. In the rat studies, soursop had negligible effects on these metrics (Syahida *et al.*, 2012), supporting the view that variations observed here are minor and likely within physiological adaptation. Differential counts showed rising percentages of neutrophils and monocytes, and declining lymphocyte counts. The highest neutrophil count was in the 400 g/kg group, while lymphocytes were lowest in this group. These shifts may indicate mild immune activation. Rat studies on soursop seldom report differential leukocyte data, but modulation of immune cell populations by phytochemicals is plausible. Eosinophil levels fluctuated minimally, suggesting limited allergic-type responses. The immune modu-

lation reported here remains within normal physiological ranges. The results indicate that soursop supplementation significantly influences haematological parameters in rabbit bucks, with dose-dependent increases in PCV, haemoglobin, RBC count, neutrophils, and monocytes, and decreases in WBC count, platelets, MCHC, MCH, MCV, and lymphocytes.

CONCLUSION AND RECOMMENDATIONS

The dietary incorporation of soursop (*Annona muricata*) leaf meal at graded levels elicited significant enhancements in organ weights and haematological indices of rabbit bucks, with the most pronounced benefits observed at 200 g/kg for organ development and up to 400 g/kg for erythropoietic parameters. These improvements, driven by the leaf meal's rich phytochemical profile, underscore its potential as a natural feed additive to promote metabolic efficiency, immune modulation, and overall physiological health without evident toxicity.

This study affirms that moderate soursop leaf meal supplementation can contribute to sustainable rabbit production by optimizing feed utilization and animal welfare.

Based on the findings, it is recommended that rabbit farmers incorporate soursop leaf meal at 200 g/kg in diets to maximize organ health and at higher levels (up to 400 g/kg) for improved haematological profiles, provided feed palatability is maintained.

Further research should explore long-term effects on reproductive performance and carcass quality, as well as comparative studies across different rabbit breeds and envi-

ronmental conditions. Standardization of processing methods for soursop leaves is also advised to ensure consistent nutrient delivery in commercial feeds.

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