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The Hypolipidemic Potential of *Anacardium occidentale*, A Comparative Study of Sprout and Mature Leaves on Lipid Profiles of Albino Rats

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Abstract:

Hyperlipidemia is a major risk factor for cardiovascular diseases, necessitating safe and effective Extracts from Sprout and Mature Leaves on the Lipid Profile of Albino Rats. *Anacardium occidentale* (cashew) is traditionally used for various ailments, but the comparative efficacy of extracts from different leaf developmental stages remains underexplored. This study comparatively evaluated the hypolipidemic potential of ethanolic extracts from sprout and mature leaves of A. occidentale on the lipid profile of albino rats. Methods: Forty-eight rats were divided into 7 groups (n=4). Group I (normal control) received standard diet. Groups II-VII were rendered hyperlipidemic via a high-fat diet. Group II served as the negative control. Groups IV and V received 250mg/kg bd wt of sprout and mature leaf extract, respectively. Groups VI and VII received 500 mg/kg of Sprout and mature leaf extract, respectively. Group III received the standard drug (Chemiron, 1.5mg/kg). Treatments were done orally for 28 days. Serum lipid profiles (TC, TG, LDL-C, HDL-C) were analyzed. Both extracts significantly ($p<0.05$) reduced TC, TG, and LDL-C while elevating HDL-C in a dose-dependent manner compared to the negative control. The mature leaf extract demonstrated superior efficacy at both doses, with the 500 mg/kg dose showing effects comparable to Chemiron. Histopathological examination revealed amelioration of hepatic steatosis, more pronounced with the matuee extract. Ethanolic extracts of A. occidentale leaves possess significant hypolipidemic activity, with the matuee leaf extract exhibiting greater potency than the sprout leaf extract. This suggests that the phytochemical composition varies with developmental stage, offering a potential natural alternative for managing dyslipidemia.

Keywords: *Anacardium occidentale*, sprout leaves, mature leaves, hypolipidemic, lipid profile, albino rats.

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1. Introduction

Cardiovascular diseases (CVDs) remain the foremost cause of mortality and morbidity globally, accounting for an estimated 17.9 million deaths annually, a figure that represents approximately 32% of all global deaths (World Health Organization [WHO], 2021). This staggering statistic underscores a critical public health challenge that transcends geographical and socioeconomic boundaries. A primary, modifiable risk factor for the development and progression of CVDs is dyslipidaemia, a pathological condition characterized by an abnormal concentration of lipids (Pi llo *et al*., 2021ri). Metabolic aberration typically manifests as elevated levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglycerides (TG), alongside reduced levels of high-density lipoprotein cholesterol (HDL-C) (Grundy *et al*., 2019). The clinical significance of dyslipidemia lies in its direct contribution to atherogenesis, the insidious process of plaque formation within arterial walls, which can culminate in life-threatening events such as myocardial infarction, stroke, and peripheral artery disease (Libby *et al*., 2019).

The contemporary management of dyslipidemia relies heavily on pharmacological interventions, most notably the statin class of drugs, which function as HMG-CoA reductase inhibitors to reduce endogenous cholesterol synthesis (Chou *et al.,* 2022). While highly effective, these synthetic agents are not without limitations. A significant number of patients experience adverse effects, ranging from mild myalgia to more severe conditions like rhabdomyolysis and hepatotoxicity (Ward et *al*., 2019). Furthermore, a proportion of individuals exhibit statin intolerance or fail to achieve desired lipid targets despite maximal therapy (Pinal-Fernandez & Mammen, 2019). This therapeutic gap, coupled with the high cost of some patented drugs and the growing preference for natural health solutions, has catalyzed a global resurgence of interest in the exploration of plant-based medicinal agents as alternative or adjunctive therapies (Ekor, 2014; Newman & Cragg, 2020). Ethnopharmacology, the scientific study of traditional plant-based remedies, offers a promising avenue for discovering novel, safer, and more cost-effective hypolipidemic agents (Gurib-Fakim, 2006; Heinrich *et al*., 2020).

Among the vast repository of medicinal plants, Anacardium occidentale, commonly known as the cashew tree, stands out as a species of significant ethnobotanical and pharmacological interest. Native to North-eastern Brazil, this evergreen tree has been widely naturalized across tropical and subtropical regions of the world, including parts of Africa, Asia, and Latin America, primarily for its economically valuable cashew nut and the pseudo-fruit, the cashew apple (Aliyu, 2021; Johnson, 2023). However, beyond its commercial value, the various parts of the cashew tree—including the bark, leaves, and nuts—have a long-standing history of use in traditional medicine systems. For instance, the bark is employed in folk remedies for its anti-diarrheal and anti-inflammatory properties, while the nut oil is used topically

to treat dermatological conditions and warts (Ogunwande *et al*., 2021). The leaves, in particular, are widely utilized in various African and Asian traditional medical practices for the management of a diverse array of ailments, including diabetes, hypertension, malaria, and inflammatory disorders (Gbolade *et al.,* 2022; Konan *et al.,* 2021).

The pharmacological basis for the traditional uses of A. occidentale leaves is being increasingly validated through modern scientific inquiry. Phytochemical analyses have revealed that the leaves are a rich repository of secondary metabolites, including a complex array of polyphenols, flavonoids, tannins, saponins, and alkaloids (Al-Fadhli et al., 2022; Kossouoh *et al*., 2021; Jere and Danjuma, 2026). The antioxidant, anti-inflammatory, and antimicrobial properties in natural plants extracts have been well-documented in various in vitro and in vivo studies (Olajide *et al*., 2020; Aourabi *et al*., 2021; Akinpelu *et al*., 2022; Ouahabi *et al*., 2023). Notably, recent research has begun to focus on the potential hypolipidemic properties of A. *occidentale* leaf extracts, suggesting a promising role in the management of hyperlipidemia. For example, studies have demonstrated that aqueous and ethanolic extracts of the leaves can significantly reduce serum TC, TG, and LDL-C levels while increasing HDL-C in experimental animal models of dyslipidemia (Akintunde *et al*., 2023; Omodamiro & Nwankwo, 2021*)*. The proposed mechanisms for these effects include the inhibition of key enzymes involved in lipid biosynthesis, such as HMG-CoA reductase, enhanced fecal excretion of bile acids and cholesterol, and the upregulation of LDL receptor activity, thereby promoting the clearance of circulating LDL-C (Ajiboye *et al*., 2022; Ekundayo *et al*., 2021).

A critical, yet often overlooked, aspect of plant-based drug discovery is the impact of the plant's phenological stage on its phytochemical composition and consequent pharmacological activity. The age of a plant, the developmental stage of its leaves, and the prevailing environmental conditions can profoundly influence the qualitative and quantitative profile of bioactive compounds (Gobbo-Neto & Lopes, 2007; Li *et al*., 2022*)*. In general, young, sprouting leaves are often associated with high concentrations of primary metabolites (e.g., proteins, nucleic acids) and specific phytohormones that drive rapid growth, whereas mature, fully expanded leaves are typically characterized by the accumulation of a broader and more diverse array of secondary metabolites, synthesized as a result of a plant's defense mechanisms against herbivores, pathogens, and abiotic stress *(*Boege & Marquis, 2005; Miranda *et al*., 2018). This developmental shift in secondary metabolism can lead to significant differences in the bioactivity of leaf extracts from the same plant. For instance, the concentration of certain flavonoids and phenolic acids, which are often the primary drivers of antioxidant and hypolipidemic activity, may vary considerably between young and mature leaves (DellaGreca et al., 2022; Zhao *et al*., 2023). While the mature leaves of A. *occidentale* have been the primary focus of most phytochemical and pharmacological investigations, comprehensive studies comparing the lipid-

modulating potential of its sprout leaves versus its mature leaves are scarce. This represents a significant gap in the literature that warrants thorough investigation.

The extraction solvent is another pivotal factor that dictates the efficacy of a plant extract, as it determines the solubility and thus the yield of different classes of bioactive compounds. Among the various solvents used in phytochemical extraction, ethanol is considered one of the most effective for recovering a broad spectrum of polar to moderately polar phytochemicals, including flavonoids, phenolic acids, and alkaloids, which are often responsible for pharmacological activities (Do *et al*., 2021; Sulaiman *et al*., 2022). The choice of an ethanolic extract is strategic, as it provides a more comprehensive phytochemical profile than water or hexane alone, potentially enhancing the resultant biological effects (Yao *et al*., 2020). Therefore, utilizing an ethanolic extraction method is appropriate for a comparative study aimed at maximizing the recovery and subsequent bioactivity of the active constituents from both leaf stages.

The large-scale studies on *A. occidentale* prompted a bibliometric analysis using both Scopus and VOSviewer. VOSviewer is a software tool for creating, viewing, and exploring bibliometric maps and network visualizations (Van Eck and Waltman, 2010). It processes scientific data from databases such as Scopus and Web of Science to show relationships like citations, keyword co-occurrences, and author connections (Bukar *et al*., 2023; Mouloudi *et al*., 2023; Byiringiro *et al*., 2025; Hammouti *et al*., 2025; Igwe *et al*., 2025).

In light of the foregoing, this research is designed to bridge the identified gap in the scientific literature by systematically evaluating and comparing the effects of ethanolic extracts of Anacardium occidentale sprout and mature leaves on the lipid profile of albino rats. The central hypothesis of this study is that both extracts will exhibit significant hypolipidemic activity, but the magnitude of this effect will differ due to variance in their phytochemical compositions, which are influenced by the phenological stage of the leaves. The use of albino rats as an experimental model is well-established in preclinical research due to their genetic and physiological similarities to humans, particularly concerning metabolic pathways, and their ease of handling and cost-effectiveness (Flores *et al*., 2022; Nehru & Ganesan, 2021). This study will provide empirical data to deepen understanding of the therapeutic potential of different parts of the cashew tree. Furthermore, it will provide a scientific rationale for the stage-specific collection and use of *A. occidentale* leaves in traditional medicine, potentially guiding the development of more effective and standardized phytomedicines to manage hyperlipidemia and mitigate cardiovascular disease risk. The findings could have significant implications for public health, especially in developing countries where access to conventional lipid-lowering drugs is limited, by promoting the use of a widely available and cost-effective natural resource.

2. Materials and methods

2.1 Collection and identification of plant samples

Fresh leaves of Anacardium occidentale, including both sprout and mature leaves, were collected from healthy trees within the Bingham University, Karu, Nasarawa State, Nigeria. The harvest was carried out in the early morning to minimize moisture loss and preserve the stability of bioactive compounds. Only healthy, disease-free, and undamaged leaves were selected to ensure the quality and reliability of the experimental material, following standard procedures for medicinal plant collection and pharmacognostic studies (Heinrich, M. *et al*., 2018). The collected plant samples were authenticated by Mr. Akeem A. Lateef, a botanist at the National Institute for Pharmaceutical Research and Development (NIPRD) Herbarium, Idu, Abuja, FCT, with voucher specimen number NIPRD/H/7561, who confirmed their taxonomic identity. Voucher specimens were prepared and deposited in the herbarium for future reference

2.2 Sample preparation

The samples used in this study included sprout and mature leaves of Anacardium occidentale, which were collected from healthy, disease-free plants. The plant samples were washed thoroughly with clean water, air-dried at room temperature, ground into fine powder using a mechanical grinder, and stored in airtight polyethylene bags after weighing. These procedures were carried out to minimize contamination and preserve the stability of bioactive constituents prior to analysis (Fonmboh et *al*., 2020; Sultana *et al*., 2023). The solvents used for phytochemical extraction included ethanol and distilled water, while standard analytical reagents were used to determine protein, carbohydrate, iron, and other nutritional parameters. Standard hematological reagents, including anticoagulants and hematinic preparations, were also used in accordance with established laboratory protocols.

Laboratory equipment comprised an analytical balance for accurate weighing of samples, centrifuge for blood sample preparation, spectrophotometer for biochemical analyses, and microscope for hematological examinations. Standard laboratory glassware and plasticware, including beakers, test tubes, pipettes, measuring cylinders, and Petri dishes, were used throughout the study following standard laboratory procedures. The harvested cashew leaves were washed thoroughly under running tap water to remove dirt and other contaminants. Excess water was drained, and the samples were spread on clean trays and air-dried at ambient room temperature (25–30 °C) for fourteen (14) days in the Biochemistry Laboratory of Bingham University. Air-drying at room temperature is widely recommended because it minimizes the degradation of heat-sensitive phytochemicals and preserves the chemical integrity of plant materials (Fonmboh *et al*., 2020; Sultana *et al*., 2023). After drying, the leaves were pulverized into fine powder using a mechanical grinder. The powdered samples were weighed and stored in airtight, labeled

containers at room temperature away from direct sunlight and moisture until further analysis. Appropriate storage conditions are essential for maintaining the stability of phytochemicals and preventing degradation during the experimental period (Anibogwu *et al*., 2021).

2.3 Extraction preparation procedure

Six hundred grams (600 g) each of the sprout and mature leaves of Anacardium occidentale were separately soaked in 1000 mL of ethanol in 2.5 L reagent bottles. The mixtures were kept at room temperature for six (6) days with intermittent shaking to enhance extraction of bioactive constituents. The extracts were filtered separately using Whatman No. 1 filter paper into clean conical flasks. The filtrates were concentrated to dryness using a laboratory water bath at a controlled temperature to obtain crude extracts. The concentrated extracts appeared as dark-green semi-solid pastes and were transferred into sterile airtight containers, appropriately labelled, and stored in a refrigerator until further analysis (Azwanida, 2022; Sultana *et al*., 2023).

2.4 Research design

This study employed a laboratory-based experimental research design to investigate the effects of the nutritional composition, phytochemical properties, biochemical parameters, and haematological indices in phenylhydrazine-induced anaemic albino rats treated with sprout leaf extract (SLE) and mature leaf extract (MLE) of Anacardium occidentale. Experimental animal studies are appropriate for evaluating the efficacy and safety of plant-derived therapeutic agents under controlled conditions (National Research Council, 2020; ARRIVE Guidelines Working Group, 2020).

2.5 Animal care

A total of twenty-eight (28) albino rats of both sexes, weighing 150–200 g, were obtained from the National Veterinary Research Institute (NVRI), Vom, Plateau State, Nigeria. The animals were housed in standard polypropylene cages containing clean, sterilized wood shavings as bedding. They were acclimatized for fourteen (14) days under standard laboratory conditions, with a temperature of 22–25 °C, relative humidity of 50–60%, and a 12-hour light/dark cycle. Standard commercial rat feed and clean drinking water were provided ad libitum throughout the acclimatization period. The animals were monitored daily to ensure good health before commencement of the experiment, following internationally accepted guidelines for the care and use of laboratory animals (National Research Council, 2020; ARRIVE Guidelines Working Group, 2020).

2.6 Ethical Considerations

All experimental procedures involving animals were conducted in strict accordance with internationally accepted guidelines for the care and use of laboratory animals. Ethical approval was obtained from the

Institutional Animal Care and Use Committee (IACUC) of Bingham University, Jos, Plateau state with reference number NHREC/21/05/2005/01786, before the commencement of the study. Efforts were made to minimize animal suffering, including providing appropriate housing, nutrition, and handling techniques. The number of animals used were kept to the minimum necessary to achieve statistical significance, following the principles of Replacement, Reduction, and Refinement. All procedures, including blood sampling and administration of plant extracts, were performed under strict supervision to ensure animal welfare.

2.7 Animal grouping and diet formulation

The experimental rats were randomly assigned into seven groups, each comprising four (4) rats. Group I (IA–ID) served as the normal control and received only standard rat feed and water without anemia induction or treatment. Group II (IIA–IID) served as the negative control and consisted of phenylhydrazine-induced anaemic rats that received only standard rat feed and water. Group III (IIIA–IIID) served as the positive control and received the standard hematinic preparation (Cameron®, 1.5 mL) in addition to standard feed and water. Group IV (IVA–IVD) received sprout leaf extract of Anacardium occidentale at a dose of 500 mg/kg body weight. Group V (VA–VD) received mature leaf extract of Anacardium occidentale at a dose of 500 mg/kg body weight. Group VI (VIA–VID) received sprout leaf extract at a dose of 250mg/kg body weight, while Group VII (VIIA–VIID) received mature leaf extract at a dose of 250 mg/kg body weight. The extracts were administered orally once daily using a sterile oral gavage needle attached to a syringe. The volume administered to each rat was calculated based on its body weight to ensure accurate and uniform dosing throughout the experimental period, following standard laboratory animal procedures (Percie du Sert *et al*., 2020; National Research Council, 2020). This experimental design enabled comparison of the effects of sprout and mature leaf extracts of Anacardium occidentale on the Lipid Profiles.

2.8 Measurement of body weight

The rats were weighed on a well-calibrated digital balance ±0.1 g. The weighing was carried out at 7-day intervals. To minimize physiological variation during weighing, all the rats were weighed at the same time of day. Each rat was gently placed in a clean container to get an accurate reading. Experiments were conducted by trained personnel in accordance with standard procedures for the handling of laboratory animals to minimize stress and ensure the reliability and reproducibility of the data (Percie du Sert *et al*., 2020; National Research Council, 2020).

3. Results and discussion

3.1. Bibliometric analysis on Anacardium occidentale

More than 2940 Scopus documents are collected on *Anacardium occidentale* from 1941 to 28 July 2026.

The increase in documents is so marked in recent decades, indicating the research interest on this natural plant (**Figure 1**). The scientific production oscillates between 100 and 150 during (2006-2026) period. The most published documents are articles, conference papers, reviews or book chapters (98.9%) as shown in **Figure 2a**, and covered agricultural, biochemistry, chemistry, environmental science, medicine, pharmacology… (**Figure 2b**). In other words, **Figure 2c,** provides the generated visualization map according to the 18600 keywords or terms in the data file based on the clustering techniques available in VOSViewer (Kachbou *et al.*, 2025). Among the 1927 keywords that appeared in at least 5 articles, the largest red circle, called a node, was identified. Among the countries contributing to *A. occidentale*, Brazil is the most published, reaching almost 1000 documents, followed by India (650 articles), Nigeria (250 articles) … (**Figure 3a**). This result can be illustrated using VOSviewer, with Brazil represented by the largest red circle, followed by India (mustard-colored node) and Nigeria—also mustard-colored but smaller in diameter—indicating close collaboration between researchers from the two countries (**Figure 3b**).

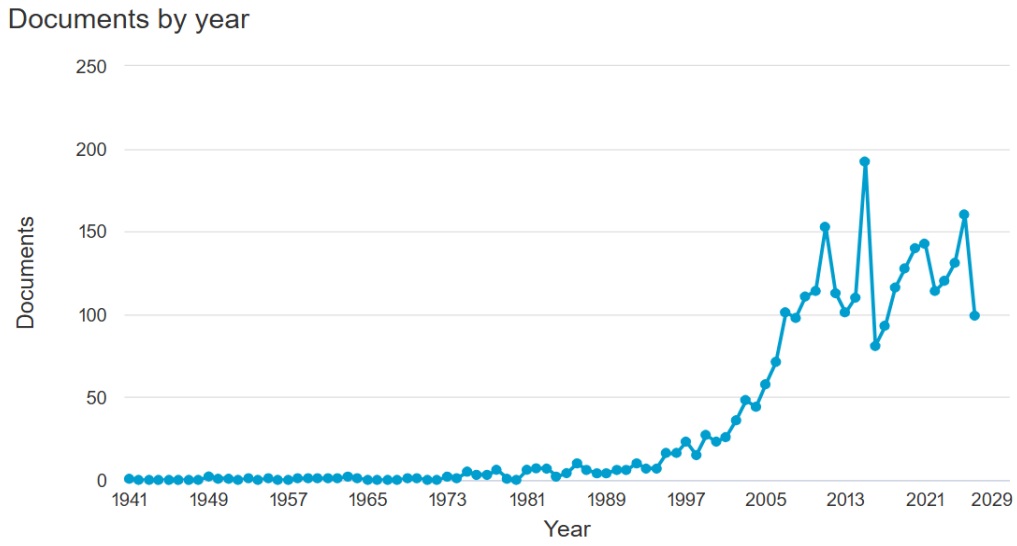

Figure 1. Progress of article number over time

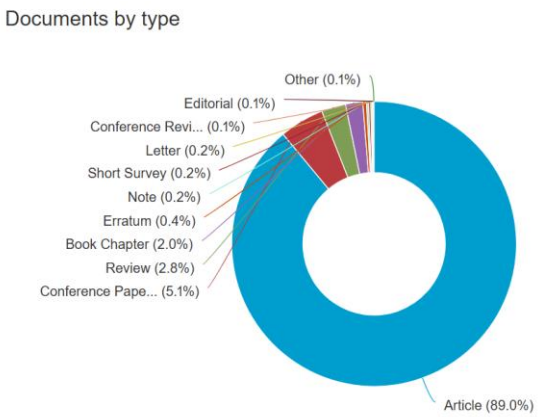

Figure 2a. Distribution of documents by type

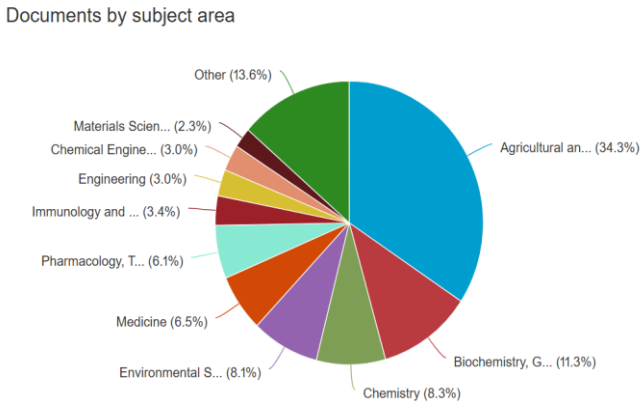

Figure 2b. Distribution of documents by area

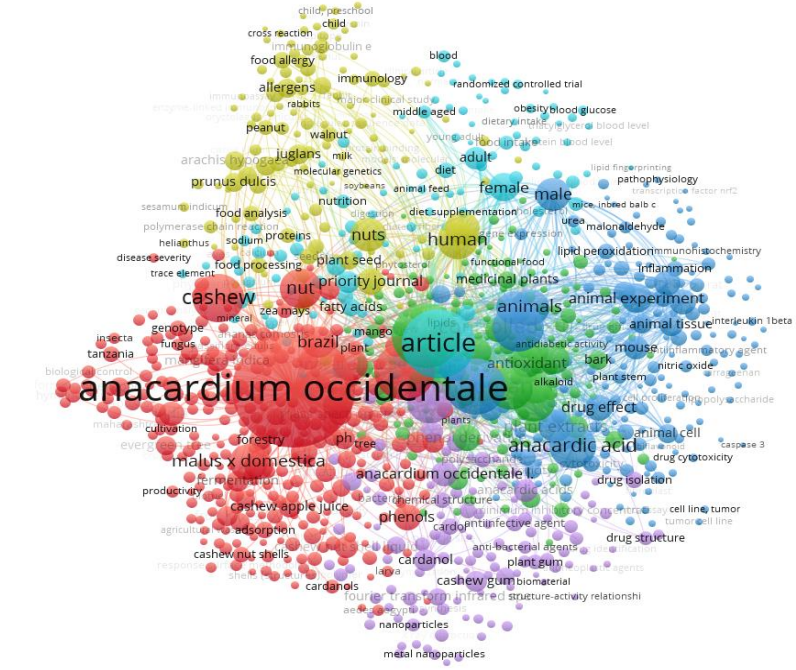

Figure 2c. Distribution of documents by keywords

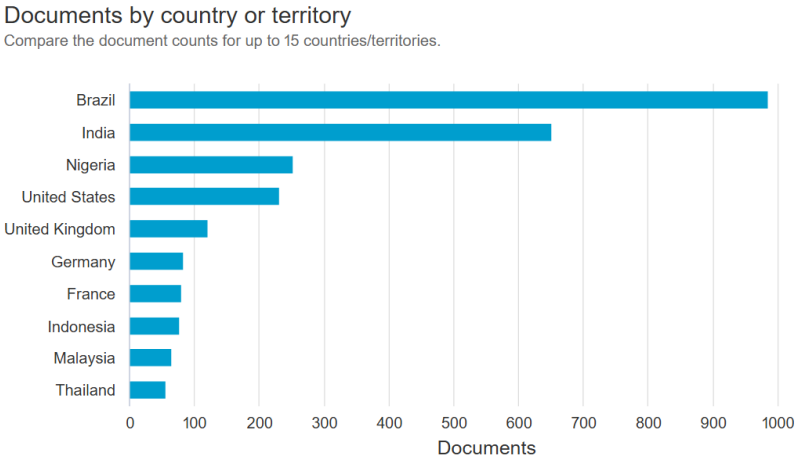

Figure 3a. Top ten most contributed countries

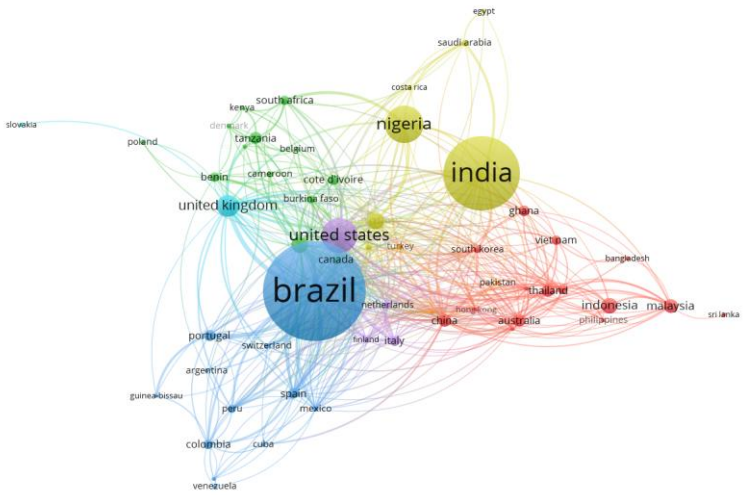

Figure 3b. VOSviewer network visualization of contributing countries

The Indian Adiga is one of the top ten published authors with 31 articles *A. occidentale*, followed by three Brazilan (Cardoso, Rodrigues, and Maia) authors, as indicated in **Figure 4a**. **Figure 4b** shows the network visualization of authors' collaboration. The node visualization indicates that 157 authors published a minimum of 5 articles among more than 11 000 authors gathered. The larger size of the red node indicates a higher volume of publications for Rodrigues, and Adiga is shown by a green node. Cardoso is shown by an orange node. This mapping can be linked to time using the overlay presentation. Yellow nodes indicate that the articles appeared recently, and those of dark blue before 2004 (**Figure 4c**). Moreover, **Figure 4d** presents a density visualization that illustrates the depth of research. The color density in the figure corresponds to the frequency of authors' occurrences, providing insight into the intensity of research focus across different areas. The density of the colors shows the high growth research.

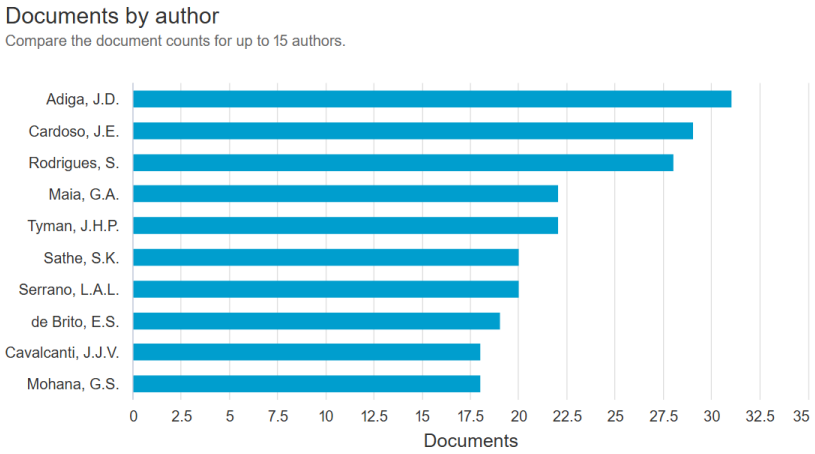

Figure 4a. Top ten most contributing authors

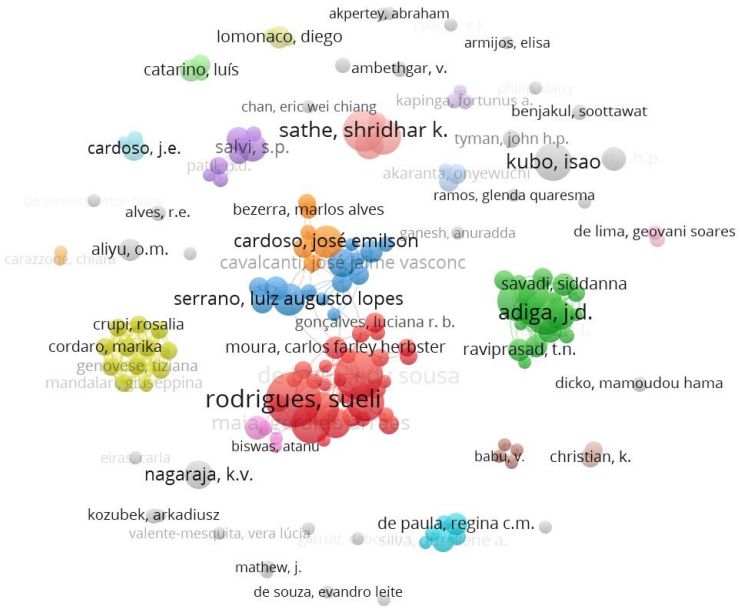

Figure 4b. VOSviewer network visualization of contributing countries

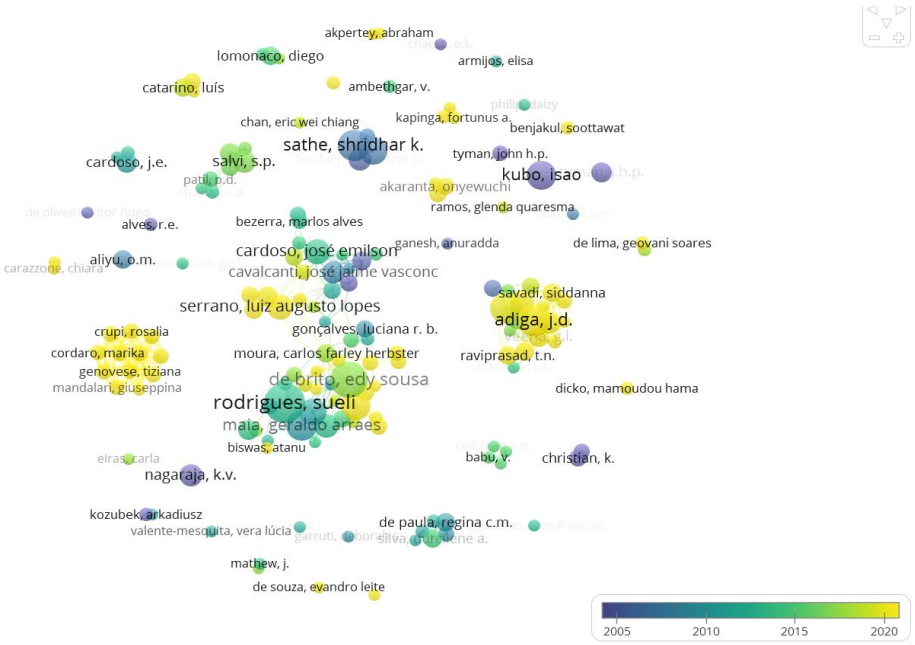

Figure 4c. VOSviewer overlay visualization of contributing countries

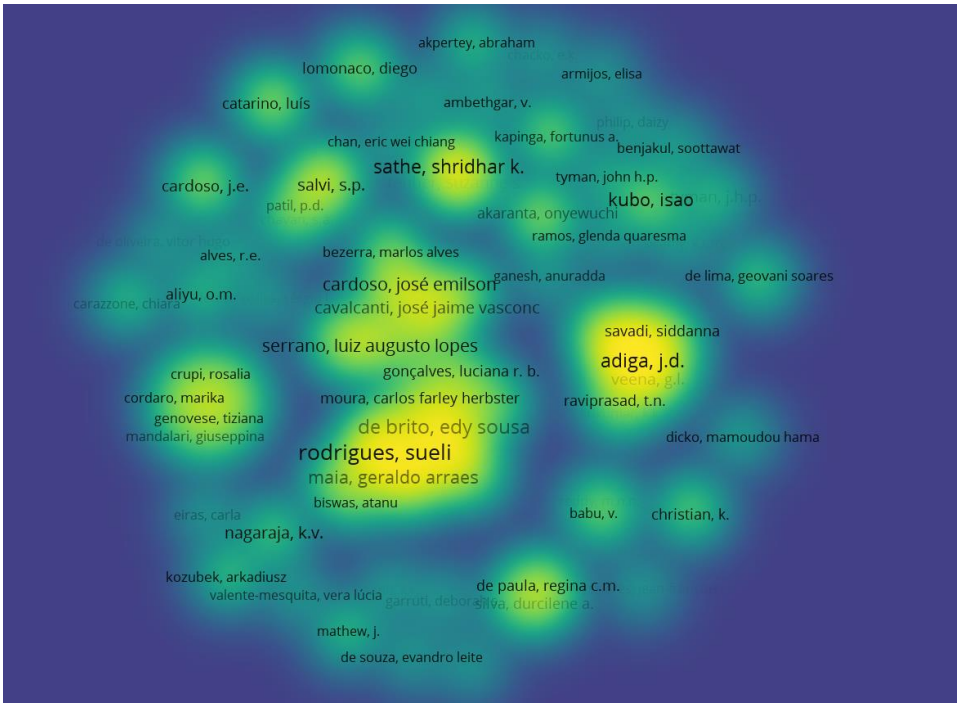

Figure 4d. VOSviewer density visualization of contributing countries

3.2. Effects of sprout shoot and masture leaves extracts of **Anacardium occidentale** *on the body weight of Phenyhydrazine-induced anemic Albino rats*

Body weight is an indicator of the overall health and nutritional status of experimental animals. Phenylhydrazine-induced anemia caused a decrease in body weight of untreated anemic rats which might have occurred due to oxidative damage of red blood cells (Bhatti *et al*., 2023). This may significantly hinder transport of oxygen to tissues (Chen *et al*., 2023), suppress feed intake and metabolism of

nutrients involved in anemia (Yaqoob *et al*., 2012). Meanwhile, treatment with the sprout and mature leaf extracts of Anacardium occidentale improved the body weight. According to the findings, the extracts contributed to the recovery of anemic rats through improved body weight gain. The infusion of the extracts might supply valuable nutrients and bioactive phytochemicals such as iron, flavonoids, phenolics, and vitamins to the anemic rats thus boosting erythropoiesis, appetite stimulation and reduced oxidative stress (Rajeshkumar *et al*., 2018). As a result, body weight was improved. Additionally, the higher dosages produced a greater weight gain, indicating a dose-dependent effect

Table 1: Effects of SLE and MLE extracts of *Anacardium occidentale* on the body weight of Phenyhydrazine-induced anemic Albino rats

Treatment	Week 1 (g)	Week 2 (g)	Week 3 (g)	Week 4 (g)
NC	167.50 ± 4.25^{a}	181.50 ± 3.20^{a}	183.25 ± 3.75^{a}	196.00 ± 4.37^{a}
NTC(Induced)	98.75 ± 8.66^{d}	84.25 ± 7.93^{d}	93.00 ± 8.83^{d}	88.75 ± 10.14^{d}
CHR(1.5ml)	166.75 ± 15.44^{a}	177.50 ± 13.23^{a}	184.25 ± 11.50^{a}	195.00 ± 8.41^{a}
MLE (250mg/kg)	142.00 ± 3.74^{b}	152.50 ± 3.87^{b}	155.00 ± 3.74^{b}	155.25 ± 3.95^{a}
MLE (500mg/kg)	179.75 ± 4.01^{a}	184.00 ± 22.08^{a}	200.75 ± 9.40^{a}	201.25 ± 7.69^{a}
SLE (250mg/kg)	104.00 ± 3.42^{c}	137.50 ± 2.92^{c}	129.50 ± 4.22^{c}	158.30 ± 6.25^{b}
SLE (500mg/kg)	130.75 ± 5.19^{b}	141.75 ± 4.57^{c}	153.00 ± 3.16^{c}	153.40 ± 3.11^{b}

Values are Mean ± STD. Means considered significant ($p < 0.05$) are those in the same column having different letter(s). Normal control (NC), Not-treated negative control (NTNC), sprout leaves extract (SLE) and mature leaves extract (MLE)

3.3. Effects of extracts of SLE and MLE Anacardium occidentale *on lipid profile of Phenyhydrazine-induced anemic Albino rats*

Compared to normal control (NC) control group, the 'not treated' (NT) control group showed a significant increase ($p < 0.05$) in total cholesterol (TCHO), Triglycerides (TG) also increase but very little. However, in high-density lipoprotein (HDL) and very low-density lipoprotein (VLDL) there was significant decrease ($p > 0.05$) in the blood. The Chemiron (CHR, standard drug) led to significant increases ($p<0.05$) in high-density lipoprotein (HDL) and very low-density lipoprotein, and it suppress/decrease/regulate the total cholesterol (TCHO) and Triglycerides (TG) ie there is a significant decrease/suppression ($p > 0.05$). SLE at 250 mg/kg resulted in little significant decrease/suppression/ regulation in total Cholesterol (TCHO) and Triglycerides (TG) ($p < 0.05$), but there are significant increase in HDL and VLDL ($p < 0.05$). The SLE 500mg/kg treatment group of *Anacardium occidentale* also produced a significant increase in high-density lipoprotein (HDL) and very low-density lipoprotein (VLDL) ($p < 0.05$), with significant decrease/suppress/regulation in total Cholesterol (TCHO) and

Triglycerides (TG) ($p > 0.05$). The MLE 500mg/kg treatment group also caused significant increases in high-density lipoprotein (HDL) and very low-density lipoprotein (VLDL) ($p < 0.05$) with significant decrease/suppression/regulation in total Cholesterol (TCHO), Triglycerides (TG), ($p < 0.05$) when compare with the 'not treated' (TN) control group. MLE 250 mg/kg showed significant increase in high-density lipoprotein (HDL) and very low-density lipoprotein (VLDL) ($p < 0.05$) and a significant decrease/suppression/regulation in total Cholesterol (TCHO), Triglycerides (TG), ($p < 0.05$) when compare with the 'not treated' (TN) control group. Although, all treatments give positives result but MLE 500mg/kg is more effective for the therapeutic treatment.

Table 4.8: Effects of extracts of SLE and MLE *Anacardium occidentale leaves* on lipid profile of Phenyhydrazine-induced anemic Albino rats

Group	TCHO (mmol/l)	TRIG (mmol/l)	HDL (mmol/l)	VLDL(mmol/l)
NC	1.88 ± 0.17^{a}	1.35 ± 0.24^{a}	1.30 ± 0.47^{a}	0.30 ± 0.40^{a}
NTC (induced)	2.78 ± 0.22^{cd}	0.38 ± 0.13^{c}	0.20 ± 0.29^{d}	0.10 ± 0.52^{d}
CHR (1.5ml)	1.84 ± 0.04^{a}	1.34 ± 0.22^{a}	1.32 ± 0.10^{a}	0.31 ± 0.14^{a}
SLE (250mg/kg)	2.00 ± 0.10^{c}	1.10 ± 0.08^{ab}	0.84 ± 0.19^{c}	0.11 ± 0.27^{d}
SLE (500mg/kg)	1.93 ± 0.19^{b}	1.25 ± 0.13^{ab}	1.05 ± 0.37^{b}	0.14 ± 0.25^{c}
MLE (250mg/kg)	1.92 ± 0.12^{b}	1.20 ± 0.08^{ab}	0.92 ± 0.06^{b}	0.16 ± 0.16^{b}
MLE (500mg/kg)	1.86 ± 0.03^{a}	1.36 ± 0.17^{a}	1.31 ± 0.15^{a}	0.29 ± 0.14^{a}

Values are Mean ± SD. Means considered significant ($p < 0.05$) are those in the same column having different letter(s). N0rmal control (NC), Non-treatment negative control (NTNC), Sprout leave extract (SLE), Mature leave extract (MLE), Total cholesterol (TCHO), triglycerides (TRIG), high-density lipoprotein (HDL), very low-density lipoprotein (VLDL).mg (milligram), kg (kilogram)

Conclusion

Among the extract-treated groups, rats administered with the sprout shoot extract at 500 mg/kg (Group 4) showed a little molecular leakage regulation treatment, suggesting that although the extract may have provided some benefit, it did not completely reverse the Molecular leakage and the damages caused by Phenylhydrazine. Conversely, the mature shoot extract at 500 mg/kg (Group 5) demonstrated the greatest Molecular leakage regulations and treatments, indicating substantial restoration of Kidney and liver architecture and improved hepatocellular integrity compared with the untreated Induced group. The low-dose treatment groups (250 mg/kg) exhibited less favorable outcomes. The sprout shoot extract (Group 6) produced severe pathological changes. These findings suggest that the lower dose of the sprout shoot extract was ineffective.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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