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Review Article

Beyond the Beverage: The Versatility and Health Benefits of Coconut Water

Ragini Bose [a]*, Shubham Ghosh [a], Moutoshi Singh [b], Sarthak Singh [a]

[a] School of Pharmacy, Arka Jain University, Mohanpur, Gamharia, Saraikela Kharsawan, Jharkhand- 832108

[b] Bharat Pharmaceutical Technology, Amtali, Agartala, Tripura 799130

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For Correspondence:

Ragini Bose, School of Pharmacy, Arka Jain University, Mohanpur, Gamharia, Saraikela Kharsawan, Jharkhand- 832108

Abstract

Young coconuts contain a clear liquid called coconut water, which has attracted a lot of interest due to its inherent qualities and potential health benefits. Coconut water, which has long been used as a hydration beverage, is now valued for its diverse nutritional composition, which includes vital sugars, proteins, amino acids, vitamins, minerals, and other substances that promote growth. This review provides an overview of recent studies on the physicochemical traits, medicinal qualities, and practical uses of coconut water. Research has emphasized its cardioprotective, anti-inflammatory, and antioxidant properties as well as its possible application in the treatment of kidney disease, diabetes, and hypertension. The review also looks at how coconut water has been used historically and traditionally in medicine across cultures as a natural cure for a range of illnesses. In addition to its nutritional and therapeutic value, coconut water is being investigated for use in pharmaceutical and cosmetic formulations, as well as for food preservation and biotechnological applications. The results highlight that coconut water is a multipurpose biofluid with potential uses in the health and wellness sectors, making it more than just a cool beverage. Its therapeutic potential could be further established and its commercial use expanded with further research into its bioactive compounds and mechanisms of action. To sum up, coconut water is a naturally occurring, sustainable, and biologically active resource with a variety of advantages that warrant further research and incorporation into contemporary medical procedures.

Keywords: Coconut water, Hydration, Therapeutic potential, Biofluid, Cardioprotective, Anti-inflammatory, Anti-oxidant.

Introduction

Coconut water, a clear liquid found inside young coconuts, has gained widespread recognition for its natural composition and therapeutic properties. Throughout many regions of the world, it has been traditionally utilized for the treatment of ailments such as cholera, intestinal flu, and pediatric diseases, with notable success.[1] This tropical beverage holds immense popularity in regions where it is readily available, as it is a perishable liquid that quickly deteriorates when exposed to sunlight.[2] Recognized for its delicate flavor, refreshing taste, and nutritional benefits, coconut water has emerged as a natural contender in the sports drink sector, boasting functional properties that are highly sought after (Food and Agricultural Organization [FAO]). Although predominantly consumed in tropical coastal areas due to its limited shelf life, large-scale and intensive coconut cultivation is practiced in states like Tamil Nadu, Kerala, and Karnataka. Other states across India, including Andhra Pradesh, Maharashtra, Orissa, West Bengal, Gujarat, Assam, Pondicherry, and Goa, as well as the island nations of Lakshadweep and Andaman & Nicobar, also contribute to coconut production.[3,4]

Considering the growing popularity and diverse uses of coconut water, this review article aims to provide a comprehensive understanding of its nutritional composition, health benefits, and potential applications. It will explore the variations in nutrient content based on factors such as coconut maturity and geographic location. Furthermore, the potential health advantages associated with consuming coconut water, including its role in hydration, electrolyte replenishment, sports performance, and cardiovascular health, will be examined.[5] Additionally, this article will delve into the various applications of coconut water beyond its role as a refreshing beverage, exploring its inclusion in functional foods, natural sports drinks, nutraceutical products, and culinary creations. Moreover, the current state of research on coconut water, encompassing its nutritional value, bioactive compounds, and health benefits, will be discussed, with a focus on identifying gaps in knowledge and potential areas for future exploration. By delving into the diverse facets of coconut water, this review aims to shed light on its multifaceted nature and its potential for further research and utilization in various fields. [6,7]

Taxonomy of a coconut [8]

Kingdom	Plantae
PHYLUM	*Streptophyta*
SUBPHYLUM	*Euphyllophyta*
CLASS	*Liliopsida*
SUBCLASS	*Commelinids*
ORDER	*Arecales*
FAMILY	*Arecaceae*
SUBFAMILY	*Arecoideae*
TRIBE	*Cocoseae*
SUBTRIBE	*Attaleinae*
GENUS	*Cocos*
SPECIES	*Cocos nucifera*

Nutritional composition of coconut water

Coconut water is a nutrient-dense drink that provides valuable macronutrients. It supplies carbohydrates, such as glucose, fructose, and sucrose, which serve as a source of energy. Although it has lower protein and fat content compared to other foods, it does contain small amounts of amino acids and fatty acids. Furthermore, coconut water is rich in essential micronutrients.[9] It contains minerals like potassium, magnesium, calcium, phosphorus, and sodium, which are crucial for maintaining electrolyte balance, supporting muscle function, and facilitating proper nerve transmission. It also contains vitamins, including vitamin C, vitamin B-complex, vitamin A, and vitamin E, although these are present in moderate quantities. The nutrient composition of coconut water can vary depending on the maturity of the coconut and its geographic location.[10]

As coconuts mature, there is a change in sugar content, with a decrease in glucose levels and an increase in sucrose levels. The mineral content, especially potassium, and sodium, may also vary based on coconut maturity. Additionally, geographical factors such as soil composition and environmental conditions can influence the nutrient profile of coconut water. Coconut water is a healthy, fat-free beverage that is low in sugars and calories while being rich in nutrition. However, it is important to consume coconut water promptly after opening as the water gradually loses its nutrients and flavors over time. [1,11] This is partly due to the presence of enzymes in coconut water, such as peroxidase (POD) and polyphenol (PPO), which react with oxygen and lead to nutritional and flavor degradation. Young coconut water generally contains more sugar and total phenolic compounds compared to mature coconut water. Coconut water is considered sterile within its protective husk and contains both organic and inorganic compounds that support the body's antioxidant system.[12]

Table 1: Composition and Concentration of Tender Coconut Water [13]

Composition	Concentration
Total solids (%)	6.5
Reducing sugars (%)	4.4
Minerals (%)	0.6
Protein (%)	0.01
Fat (%)	0.01
pH	4.6
Potassium (mg%)	290.0
Sodium (mg%)	42.0
Calcium (mg%)	44.0
Magnesium (mg%)	10.0
Iron (mg%)	106.0
Copper (mg%)	26.0
Phosphorous (mg%)	9.2

Chemical Components

Phosphate: Coconut water contains phosphoric acid, which is crucial for the health of your bones, teeth, kidneys, muscles, heartbeat, and nervous system.

Sulfate: Sulfites in coconut water function as antioxidants and preservatives, inhibiting microbial growth and oxidation, which can result in off-flavors and colors.

Nitrate: Coconut water contains nitrates, which can be converted to nitric oxide to widen blood vessels, reduce blood pressure, and possibly improve physical performance.

Potassium: Potassium, a mineral abundant in coconut water, is important for maintaining fluid and electrolyte balance, especially when exercising, and it also lowers blood pressure.

Calcium: Calcium, which is found in coconut water and promotes healthy teeth, bones, and muscles, may also help prevent cancer, diabetes, and high blood pressure, among other diseases.

Sodium: Coconut water contains a little quantity of sodium, which facilitates the transmission of nerve signals, controls muscle contractions and preserves the equilibrium of minerals and water.

Zinc: Zinc is a mineral found in coconut water that is necessary for healthy skin, immune system function, cell growth, and defense against acne and inflammation.[14]

Magnesium: Magnesium in coconut water is good for regulating blood sugar, producing energy, and maintaining organ health.

Fats: Even though coconut water normally contains very little fat, a tiny quantity is necessary for the body to

absorb fat-soluble vitamins and serve as a source of energy.

Protein: Protein, which is essential for cell growth, repair, and development as well as the maintenance of general health, is found in modest amounts in coconut water. [15]

Versatile uses of coconut water

Natural Beverage:

Hydration: Due to its high-water content and electrolyte makeup, coconut water is a fantastic natural hydrating beverage. Electrolytes and fluids lost during exercise or hot conditions can be successfully replaced.[16]

Refreshing Drink: Coconut water is a cool, refreshing beverage that satisfies thirst. It's a tasty replacement for sugary beverages or artificial sports drinks because of the natural sweetness and nutty flavor. [17]

Nutrient-rich: Vitamin C, B-complex vitamins, and minerals like potassium, magnesium, iron, and calcium are just a few of the critical components that coconut water is rich in. These nutrients assist a variety of biological processes and are beneficial to general well-being. [18]

Post-Workout Recovery: Due to its electrolyte content, coconut water might aid in recovery following physical activity. The potassium and magnesium it help to restore are crucial for boosting muscle repair and preventing cramping.[19]

Religious uses:

Ritual Offerings: In many religious ceremonies and rituals, coconut water is offered as a symbol of purity, devotion, and gratitude. It is commonly presented as an offering to deities, ancestors, or divine beings as a gesture of reverence and to seek blessings. [20]

Cleansing and Purification: Coconut water is believed to have purifying properties in some religious practices. It may be used to cleanse sacred spaces, statues, or ritual objects to remove negative energies and impurities, creating a spiritually conducive environment.[21,22]

Fasting and Ritual Observances: During religious fasts or observances, coconut water is sometimes consumed as a permitted liquid or considered a sacred drink that helps to sustain energy levels while adhering to dietary restrictions. [23]

Anointing and Blessings: Coconut water may be used for anointing or sprinkling during religious ceremonies, rituals, or blessings. It is believed to bestow blessings, protection, and divine grace upon individuals or objects being blessed. [24]

Symbolic Representation: The coconut itself is seen as a symbol of auspiciousness, fertility, and abundance in various cultures. Coconut water represents the life-giving fluid within the coconut, symbolizing purity, vitality, and the essence of creation.[25]

Religious Observances and Festivals: Coconut water is often included in religious festivals and celebrations. It may be used for ceremonial bathing, as a holy drink, or as an ingredient in traditional dishes prepared during festive occasions. [26]

Traditional uses:

Hydration and Replenishment: Coconut water is frequently consumed to hydrate and replenish the body, particularly in hot regions or after physical exertion. Because it contains electrolytes, it is frequently regarded as a natural sports drink substitute. [27]

Digestive Aid: Coconut water has long been used to ease stomach discomfort and aid with digestion. It is said to have a cooling impact on the digestive tract, which may help ease the signs of heartburn or indigestion. [28]

Detoxification: As a natural detoxifier, coconut water is occasionally used. It is thought to boost kidney function, encourage a healthy urinary system, and aid in the body's detoxification process. [29]

Medicinal uses:

Kidney Health: The natural diuretic properties of coconut water may support kidney function and help prevent the formation of kidney stones by promoting urine production and flushing out toxins.[30]

Blood Pressure Regulation: Coconut water is considered beneficial for maintaining healthy blood pressure levels. It is low in sodium and high in potassium, which helps balance electrolytes and regulate blood pressure. [31]

Cardiovascular Health: Regular consumption of coconut water may have a positive impact on cardiovascular health. It is believed to help reduce cholesterol levels, improve lipid profiles, and support overall heart health. [32]

Pharmacological Activities

Anti-inflammatory activity: The aqueous extract obtained from the husk of C. nucifera have anti-inflammatory activity. The formalin and subcutaneous air pouch test are conducted to prove the anti-inflammatory activity and showed that aqueous crude extracts of C. nucifera (50, or 100 mg/kg) significantly inhibited (Po0.05) the time that animals spent licking their formalin-injected paws and reduced inflammation induced by subcutaneous carrageenan injection by reducing cell migration, extravasation of protein, and TNF-a production. [33]

Anti-bacterial activity: Ethanolic dry-distilled and aqueous extracts of coconut endocarp were compared with gentamicin and ciprofloxacin for their antibacterial activities against methicillin-resistant Staphylococcus aureus (MRSA), methicillin-sensitive S. aureus, Pseudomonas aeruginosa, Escherichia coli, Klebsiella pneumonia, Acinetobacter baumannii, Citrobacter freundii, Enterococcus, Streptococcus pyrogens, Bacillus subtilis, and Micrococcus luteus using the Kirby-Bauer disc diffusion method. The endocarp extracts showed strong antimicrobial activity against B. subtilis, P. aeruginosa, S. aureus, and M. luteus but had no effect on E. coli. [34]

Antioxidant activity: Diets rich in phenolic compounds can significantly enhance human health because of the effects of phenolic antioxidants. All of the oil obtained from the coconut virgin coconut oil has a high number of phenols. The DPPH test is used to study the antioxidant activity of virgin coconut and which has higher antioxidant activity compared to refined coconut oil. The ethanolic and aqueous extract obtained from the endocarp of Coconut has anti-oxidant activity comparable with that of standard ascorbic acid. [35]

Antineoplastic activity: Different molecular weight fractions of husk fiber aqueous extracts of C. nucifera were tested on human erythroid leukemia cell line K562 and Lucena 1, a multidrug-resistant (MDR) and vincristine-resistant derivative of K562. Both varieties showed cytotoxicity against K562 cells and decreased by 50% the viability and anti-MDR activity of Lucena 1cells. [36] In both varieties, the anti-tumoral activity was concentrated in fractions with molecular weights between 1 and 10 kDa. There is great potential for future research on antineoplastic activity, as only one study has been reported. Because coconut is extensively cultivated in Brazil and its fiber is often discarded, it may offer an inexpensive source for new antineoplastic drugs. [37]

Anti-parasitic activity: The ovicidal and larvicidal activity of the liquid from the coconut husk (LCCV) and butanol LCCV extract were tested against Haemonchus contortus. In egg hatching and larval development tests, 2.5 mg/mL LCCV and 10 mg/mL butanol extract showed 100% ovicidal activity. Their larvicidal effects were 81.30% and 99.80% at 65 and 80 mg/mL, respectively. These results suggest that coconut extracts can be used to control gastrointestinal nematodes and that more studies are needed to evaluate their use in humans.[38]

Anti-Leishmania activity: The leishmanicidal effects of C. nucifera on Leishmania amazonensis were evaluated in-vitro and the extract obtained from the coconut husk fiber which is rich in polyphenols completely inhibited the cellular growth of Leishmania amazonensis promastigote forms at a minimum inhibitory concentration10 mg/ml and killed 100% of both developmental stages of the parasite after 60 min at 10 and 20 mg/ml. Ethyl acetate extract (EAE) from husk fiber water was tested against L. braziliensis infected hamsters Administering EAE (0.2 mL, 300 mg/kg) for 21consecutive days did not reduce edema of infected footpad nor the weight of lymph node drainage but reduced skin lesions after 14 days. These results offer new promise for the development of drugs against leishmaniasis from coconut extracts because of their potent effects and the absence of in vivo allergic reactions or in vitro cytotoxic effects in mammalian system. [39]

Depressant and anticonvulsant activity: The methanol extract from the roots of C. nucifera at concentrations of 40, 60 and 80 mg/kg significantly increases the duration of sleep when compared with the drugs such as pentobarbital 40 mg/kg, diazepam 3 mg/kg, and meprobamate 100 mg/kg. The anticonvulsant action of ethanol extract of C. nucifera was also observed in pentylenetetrazol-induced seizure models. At 80 mg/kg, animals had seizures or died, even after 24 hrs.[40]

Antimalarial activity: The methanol extracts C. nucifera of concentrations 50, 100, 200 and 400 mg/kg was studied for antimalarial activity. The drugs of concentration 20 mg/kg of Chloroquine and 1.2 mg/kg of Pyrimethamine were used as reference drugs. And it is studied in vivo against Plasmodium berghei in mice. The methanol white flesh extract of C. nucifera produced a dose-dependent chemotherapeutic activity in all three in vivo assessment models. In the established malaria infection, the concentration of extracts 200 and 400 mg/kg shows a significant decrease when compared to the two reference drugs used for the treatment of the disease.[41,42]

Conclusion

In conclusion, the analysis of the given data strongly supports the notion that natural coconut water is a healthier choice. The absence of processing and artificial additives in natural coconut water ensures its purity and authenticity. It maintains its original composition of bioactive constituents, essential minerals, amino acids, and nutrients, including reducing sugar, protein, and carbohydrates. The shorter stability period of natural coconut water further indicates its freshness and minimal processing, reinforcing its natural state.

Considering the health and well-being aspects, natural coconut water emerges as the recommended choice for those seeking an authentic and nutrient-rich option. However, it is important to acknowledge that individual preferences and specific dietary needs may vary, and these factors should be considered when making a final decision.

In summary, based on the provided data, natural coconut water stands out as a healthier choice due to its unprocessed nature, absence of artificial chemicals and additives, and retention of essential nutrients. By opting for natural coconut water, individuals can prioritize their health and enjoy a more genuine and nourishing beverage.

Credit authorship contribution statement

Shubham Ghosh: Writing - review & editing, Writing - original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Project administration, Data curation, Conceptualization. **Ragini Bose:** Writing - review & editing, Resources, Methodology, Formal analysis, Resources, Methodology. **Moutoshi Singh:** Writing - review & editing. **Sarthak Singh-** Resources, Methodology.

Declaration of competing interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability: Data will be made available on request.

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References

1. Tuyekar SN, Tawade BS, Singh KS, Wagh VS, Vidhate PK, Yevale RP, Gaikwad S, Kale M. An overview on coconut water: As a multipurpose nutrition. Int. J. Pharm. Sci. Rev. Res. 2021;68(2):63-70. https://doi.org/10.47583/ijpsrr.2021.v68i02.010

2. Naik M, CK S, Rawson A, N V. Tender coconut water: A review on recent advances in processing and preservation. Food Reviews International. 2022 Aug 18;38(6):1215-36. https://doi.org/10.1080/87559129.2020.1785489

3. Prithviraj V, Pandiselvam R, Babu AC, Kothakota A, Manikantan MR, Ramesh SV, Beegum PS, Mathew AC, Hebbar KB. Emerging non-thermal processing techniques for preservation of tender coconut water. Lwt. 2021 Sep 1;149:111850. https://doi.org/10.1016/j.lwt.2021.111850

4. Prithviraj V, Pandiselvam R, Babu AC, Kothakota A, Manikantan MR, Ramesh SV, Beegum PS, Mathew AC, Hebbar KB. Emerging non-thermal processing techniques for preservation of tender coconut water. Lwt. 2021 Sep 1;149:111850. https://doi.org/10.1016/j.lwt.2021.111850

5. Xu S, Ma Z, Chen Y, Li J, Jiang H, Qu T, Zhang W, Li C, Liu S. Characterization of the flavor and nutritional value of coconut water vinegar based on metabolomics. Food Chemistry. 2022 Feb 1;369:130872. https://doi.org/10.1016/j.foodchem.2021.130872 PMid:34455324

6. Wang T, Huang R, Wei Z, Xie M, Chen L, Wang WT, Yun YH. Multimodal nondestructive testing of tender coconut water quality using spectroscopy, computer vision, and deep learning. Food Control. 2025 Aug 19:111660. https://doi.org/10.1016/j.foodcont.2025.111660

7. Sum ZQ, Yusri AS, Sarbon NM. Investigation of physicochemical characterization, thermal inactivation kinetics of enzymes, and shelf-life study of pandan coconut water with honey addition. Food Chemistry Advances. 2025 Sep 1;8:101052. https://doi.org/10.1016/j.focha.2025.101052

8. Chandrasekhar V, Rajan K, Kanakam SR, Sharma N, Weißenborn V, Schaub J, Steinbeck C. COCONUT 2.0: a comprehensive overhaul and curation of the collection of open natural products database. Nucleic Acids Research. 2025 Jan 6;53(D1):D634-43. https://doi.org/10.1093/nar/gkae1063 PMid:39588778 PMCid:PMC11701633

9. Lemos ID, Aniceto A, Teodoro AJ. Coconut water: production, nutritional properties and health benefits. Observatório De La Economía Latinoamericana. 2023 Apr 19;21(2):971-93. https://doi.org/10.55905/oelv21n2-021

10. Rethinam P, Krishnakumar V. Health benefits of coconut water. InCoconut water: a promising natural health drink-distribution, processing and nutritional benefits 2022 Oct 15 (pp. 385-455). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-10713-9_9

11. Mu Z, Tran BM, Xu H, Yang Z, Qamar UZ, Wang X, Xiao Y, Luo J. Exploring the potential application of coconut water in healthcare and biotechnology: a review. Beverage Plant Research. 2024 Jan 29;4(1). https://doi.org/10.48130/bpr-0024-0009

12. Aba RP, Luna MB, Villasis JC, Ching AA. Characterization of mature coconut (Cocos nucifera L.) water from different varieties. Food and Humanity. 2024 May 1;2:100248. https://doi.org/10.1016/j.foohum.2024.100248

13. Shayanthavi S, Kapilan R, Wickramasinghe I. Comprehensive analysis of physicochemical, nutritional, and antioxidant properties of various forms and varieties of tender coconut (Cocos nucifera L.) water in Northern Sri Lanka. Food Chemistry Advances. 2024;4:100645. https://doi.org/10.1016/j.focha.2024.100645

14. Rethinam P, Krishnakumar V. Value addition in coconut water. InCoconut Water: A Promising Natural Health Drink-Distribution, Processing and Nutritional Benefits 2022 Oct 15 (pp. 287-384). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-10713-9_8

15. Shi S, Wang W, Wang F, Yang P, Yang H, He X, Liao X. Research Progress in Coconut Water: A Review of Nutritional Composition, Biological Activities, and Novel Processing Technologies. Foods. 2025 Apr 25;14(9):1503. https://doi.org/10.3390/foods14091503 PMid:40361585 PMCid:PMC12072132

16. Lemos ID, Aniceto A, Teodoro AJ. Coconut water: production, nutritional properties and health benefits. Observatório De La Economía Latinoamericana. 2023 Apr 19;21(2):971-93. https://doi.org/10.55905/oelv21n2-021

17. Carvalho F, Lahlou RA, Pires P, Salgado M, Silva LR. Natural functional beverages as an approach to manage diabetes. International Journal of Molecular Sciences. 2023 Nov 30;24(23):16977. https://doi.org/10.3390/ijms242316977 PMid:38069300 PMCid:PMC10707707

18. Giri NA, Sakhale BK, Nirmal NP. Functional beverages: an emerging trend in beverage world. Recent Frontiers of Phytochemicals. 2023 Jan 1:123-42. https://doi.org/10.1016/B978-0-443-19143-5.00002-5

19. Fu T, Chen H, Chen X, Sun Y, Xie Y, Deng M, Hesketh T, Wang X, Chen J. Sugar-sweetened beverages, artificially sweetened beverages and natural juices and risk of inflammatory bowel disease: a cohort study of 121,490 participants. Alimentary Pharmacology & Therapeutics. 2022 Sep;56(6):1018-29. https://doi.org/10.1111/apt.17149 PMid:35848057 PMCid:PMC9546432

20. Madhumita M, Rohini C. Natural preservatives for beverages. InNatural Preservatives for Food 2025 Jan 1 (pp. 291-308). Academic Press. https://doi.org/10.1016/B978-0-323-95614-7.00004-1

21. Devi M, Ghatani K. The use of coconut in rituals and food preparations in India: a review. Journal of Ethnic Foods. 2022 Sep 5;9(1):37. https://doi.org/10.1186/s42779-022-00150-7

22. Kalimuthu AS. Health Benefits of Coconut and Palm Drinks.

23. Atmojo IR, Ardiansyah R, Saputri DY. A simple water purification tool as an effort to meet clean water needs. InIOP Conference Series: Earth and Environmental Science 2024 Mar 1 (Vol. 1314, No. 1, p. 012111). IOP Publishing. https://doi.org/10.1088/1755-1315/1314/1/012111

24. Rethinam P, Krishnakumar V. Coconut Water.

25. Gunasekara IK, Lincoln NK, Meyer MA, Mikasobe-Keali 'inohomoku J, McMillen H. Identification and Preservation of the Hawaiian "Niu Hiwa" Within Hawai 'i's Coconut Diversity: Gunasekara et al.: Niu Hiwa. Economic Botany. 2025 Sep 29:1-20. https://doi.org/10.1007/s12231-025-09653-1

26. Steckley M. What is Coconut Water?: commodification, globalization and place.

27. Roy S. Coconut Tree (Cocus nucifera). Trees of Ramayana, F Bast, Editor., Today & Tomorrow's Printers and Publishers India. 2022:35-50.

28. Tuyekar SN, Tawade BS, Singh KS, Wagh VS, Vidhate PK, Yevale RP, Gaikwad S, Kale M. An overview on coconut water: As a multipurpose nutrition. Int. J. Pharm. Sci. Rev. Res. 2021;68(2):63-70. https://doi.org/10.47583/ijpsrr.2021.v68i02.010

29. Coulibaly WH, Camara F, Tohoyessou MG, Konan PA, Coulibaly K, Yapo EG, Wiafe MA. Nutritional profile and functional properties of coconut water marketed in the streets of Abidjan (Côte d'Ivoire). Scientific African. 2023 Jul 1;20:e01616. https://doi.org/10.1016/j.sciaf.2023.e01616

30. Ajeigbe KO, Oladokun OO, Owonikoko MW, Adegoke GA. Effect of coconut water and milk on heat stress-induced gastrointestinal tract dysmotility in rats: Role of oxidative stress and inflammatory response. Journal of Food Biochemistry. 2022 Jul;46(7):e14129. https://doi.org/10.1111/jfbc.14129

31. Elekwa I, Ude VC, Emmanuel O, Amachaghi VO, Ugbogu EA. In vivo studies on the ameliorative effect of coconut water against carbon

tetrachloride induced toxicity in rats. Biomarkers. 2021 Aug 18;26(6):570-7. https://doi.org/10.1080/1354750X.2021.1946848 PMid:34167403

32. Ct DR, Palaninathan V, James RA. Anti-uropathogenic, antioxidant and struvite crystallization inhibitory potential of fresh and fermented coconut water. Biocatalysis and Agricultural Biotechnology. 2023 Jan 1;47:102555. https://doi.org/10.1016/j.bcab.2022.102555

33. Zhang X, Peng L, Dai Y, Xie Q, Wu P, Chen M, Liu C. Anti-cataract effects of coconut water in vivo and in vitro. Biomedicine & Pharmacotherapy. 2021 Nov 1;143:112032. https://doi.org/10.1016/j.biopha.2021.112032 PMid:34488080

34. Oghenemaro EF, Sochi EO, Oghenovo OF, Michael O. The evaluation of the In-Vitro antibacterial and anti-inflammatory potentials of the tender water of Cocosnucifera (L.). World Journal of Environmental Biosciences. 2023;12(4-2023):8-13. https://doi.org/10.51847/JqUXHGZ6r0

35. Windarsih A, Indrianingsih AW, Maryana R, Apriyana W, Rosyida VT, Nurhayati S, Jatmiko TH, Ratih D, Suwanto A. Gold modified bacterial cellulose from coconut water waste and its antibacterial activity. Waste and Biomass Valorization. 2022 Oct;13(10):4157-64. https://doi.org/10.1007/s12649-022-01769-y

36. Aziz NS, Chin ZK, Mohd Razali NS, Sofian-Seng NS, Kasim KF. Development of mature coconut (Cocos nucifera L.) probiotic beverage: Physicochemical characteristics, microbial count, antioxidant activity, and sensory acceptance. International Food Research Journal. 2023 Feb 1;30(1). https://doi.org/10.47836/ifrj.30.1.09

37. Bose D, Olorunlana A, Abdel-Latif R, Famurewa AC, Othman EM. Virgin coconut oil and its lauric acid, between anticancer activity and modulation of chemotherapy toxicity: A review. Journal of Xenobiotics. 2025 Aug 5;15(4):126. https://doi.org/10.3390/jox15040126 PMid:40863333 PMCid:PMC12387313

38. Ismail HF, Akhir FN, Othman NA, Hara H. Bioresources of Anticancer and Potential Medicinal Compound from Coconut Waste. Journal of Advanced Research Design. 2024 Sep 2;119(1):16-26. https://doi.org/10.37934/ard.119.1.1626

39. El Naggar HM, Mohammed BO, Aboushousha T, Abdelmaksoud HF. Study on the Therapeutic Effect of Coconut Oil Extracts as An Alternative Medicinal Plant in Cryptosporidium Infected Mice. Turkish Journal of Parasitology. 2023 Sep 18. https://doi.org/10.4274/tpd.galenos.2023.22932 PMid:37724361

40. Hammi KM, Essid R, Khadraoui N, Ksouri R, Majdoub H, Tabbene O. Antimicrobial, antioxidant and antileishmanial activities of Ziziphus lotus leaves. Archives of Microbiology. 2022 Jan;204(1):119. https://doi.org/10.1007/s00203-021-02733-5 PMid:34989872

41. Archana B, Mudavath RN, Enumula V, Ravali N, Kumar PS. Evaluation of antiepileptic activity of flowers of cocos nucifera L. Against experimentally induced convulsions in rats. J. Drug Deliv. Ther. 2021 Dec 27;11(6):159-66. https://doi.org/10.22270/jddt.v11i6.5097

42. Chandrasekhar V, Rajan K, Kanakam SR, Sharma N, Weißenborn V, Schaub J, Steinbeck C. COCONUT 2.0: a comprehensive overhaul and curation of the collection of open natural products database. Nucleic Acids Research. 2025 Jan 6;53(D1):D634-43. https://doi.org/10.1093/nar/gkae1063 PMid:39588778 PMCid:PMC11701633