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# *The Antioxidant Activities, Phytochemical Analysis and formulation of an energy drink from Strychnos innocua Stem Bark Extract.*

**BY**

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**A RESEARCH SUBMITTED TO THE DEPARTMENT OF CHEMISTRY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE EDUCATION OF BUSITEMA UNIVERSITY**

**MAY 2023**

**Declaration**

I, **Kyaligonza Wilson,** declare that this research work is my own original work otherwise cited, and where such has been the case reference has been stated and that the same work has not been submitted for any award in any other university or other tertiary institute of higher education.

**Signature**..... **Date**17-02-2023

**Approval**

This research work has been submitted for examination and has been approved by my supervisor.

DR. OWOR RICHARD ORIKO

**Signature**.....  **Date**...19-9-2023

## Dedication

This work is dedicated to my parents Mr. Manyire Wilson and Mrs. Nangobi Jane who have always supported me in my entire journey of pursuing my dream. Special thanks to Uncle Bigumirwa Kenneth and my sisters Basawaki Pavin, Naisanga Unice and Naisanga Esther who have always supported me in their best way.

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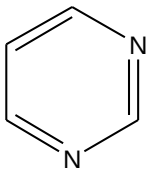
CHARPTER ONE: INTRODUCTION

1.1 Background.

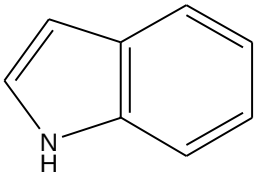
World Health Organization has estimated that 80% of the people in the developing countries depend on traditional medicines for their disease remedy (Mohesh, Joy et al. 2015). (Bowa, Mweemba et al. 2005). Even though the modern medicine has succeeded in management of diseases, reduce pain and vaccination as a preventive measure but there is emerging problems of multi drug resistant by pathogens, which is a real threat to the population (Mohesh, Joy et al. 2015). With lot of reported side-effects of the modern drug therapy, there is always a search for disease drug in alternative medicines from the plant origin(Meuss 2000).

Medicinal plants have potential sources of novel therapeutics against several chronic diseases. They possess naturally occurring bioactive chemicals that have medicinal properties and hence, extensive exploration of medicinal plants in the management of diseases. The drugs derived from medicinal plants are acceptable based on its safety, accessibility and affordability (Karunamoorthi, Jegajeevanram et al. 2013). There is a number of therapeutic agents isolated from the genus Strychnos like indole, tropane, piper dine, purine, imidazole, pyrrolizidine, pyrimidine, and quinolizidine and isoquinolizine alkaloids.



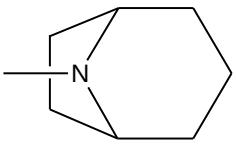

pyrimidine

1



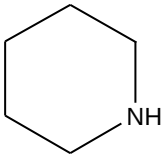

indole

2



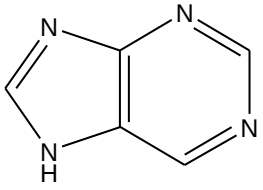

tropane

3

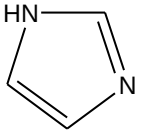



piperidine

4

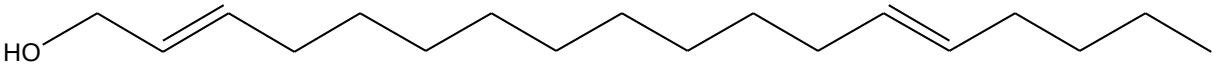



5 purine

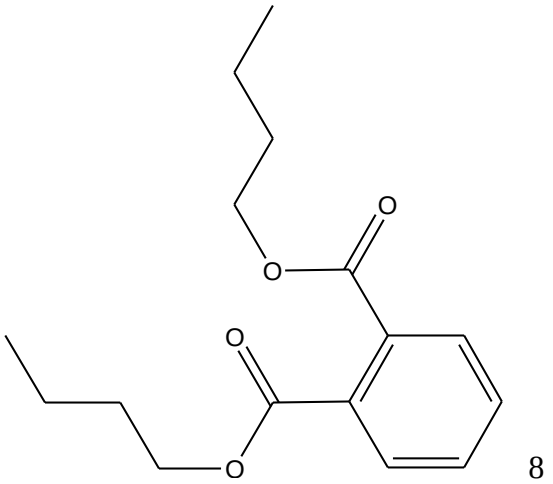



imidazole 6

One of the important medicinal plant is *Strychnos innocua*, which is a flowering plant that belong to the family Loganiaceous. The genus *Strychnos* is largely distributed around tropical regions of Africa. Phytochemical investigations of the genus have led to discovery of alkaloids. Some of the important compounds isolated from the genus Strychnos include Umbelliferon, 2,13-octadecadien-1-ol, dibutylBenzene-1,2-dicarboxylate, Cyclooctane, 1,2-Benzenedicarboxylic acid, 9,15-octadecadienoic acid, methyl ester, 2,4-dimethylheptanedioc acid dimethyl ester.




2,13-OctadecadiUmbelliferone 7

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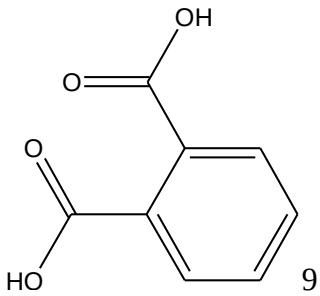


9

Dibutylbenzene-1,2-dicarboxylate 1,2-benzenedicarboxylic acid

In Africa *S. innocua*, is used as therapy against fever, wound, snakebites and emetic properties, treatment of diseases related to stomach and skin diseases including leprosy (Sani, Khan et al. 2022).

The stem bark and twigs of *S. innocua* are used to enlarge the cervix during childbirth (Sani, Khan et al. 2022), the leaves are used to treat malaria and also serve as antibacterial agent (Muvengwi, Ndagurwa et al. 2014) . The seeds have emetic properties and the fruit pulp is used as a remedy for dysentery and eardrops.

Antioxidants are compounds that inhibits the majority of oxidation reactions that begin with the generation of free radicals. They trap free radicals, delaying or preventing damage to live tissues and cells of organism.

However, there is still a scarcity of scientific evidence regarding the antioxidant and phytochemicals of this plant.
Hence, this study will be able to evaluate the efficiency of the antioxidant and phytochemicals of this plant.

## 1.2 PROBLEM STATEMENT.

Free radicals are compounds generated in the body in response to environmental insults such as tobacco smoke, ultraviolent rays, air pollution and as a natural byproduct of normal processes in cells. Since they lack a full complement of electrons, they steal electrons from other molecules and damage them in the process. This results into oxidative stress and rapid aging.

There are several synthetic antioxidant agents for example butylated hydroxyl anisole (BHA)and butylated hydroxyl toluene (BHT) are commercially available, however, are reported to be toxic to people (Gupta and Gupta 2016). So there is need to look for alternative antioxidants from natural plants with less side effect. Flavonoids, lutein and polyphenols are ones of the antioxidant chemicals discovered in *Strychnos innocua* responsible for its antioxidant activities. (Ayo, Achika et al. 2022).

Despite the fact that Strychnos innocua is largely used in ethno medicine, there is still little literature on its antioxidant activities and phytochemical properties(Oyedemi, Bradley et al. 2010). As result, the aim of this research is to assess the antioxidant activities and phytochemical constituents of Strychnos innocua for alternative source of natural antioxidants with less side effect

REFERNCES

Ayo, R. G., et al. (2022). "Phytochemical Analysis, Antibacterial and Antioxidant Activities of Leaf Extracts of Strychnos Innocua Del.: doi. org/10.26538/tjnpr/v6i6. 24." Tropical Journal of Natural Product Research (TJNPR) **6**(6): 962-968.

Bashar, H. K., et al. (2021). "A Mystic Weed, Parthenium hysterophorus: Threats, Potentials and Management." Agronomy **11**(8): 1514.

Bhandari, P. R. (2012). "Curry leaf (Murraya koenigii) or cure leaf: review of its curative properties." Journal of medical nutrition and nutraceuticals **1**(2): 92.

Blake, D., et al. (1987). "Free radicals in biological systems—a review orientated to inflammatory processes." British medical bulletin **43**(2): 371-385.

Bowa, K., et al. (2005). The Zambia Health Information Digest July-September 2005, Medical Journal of Zambia.

Cadenas, E. and K. J. Davies (2000). "Mitochondrial free radical generation, oxidative stress, and aging." Free radical biology and medicine **29**(3-4): 222-230.

Coriandrum Sativum, L. "International Journal of Research in Pharmacy and Science."

Dockery, K. P. and W. G. Bentrude (1997). "Free radical chain reactions of [1.1. 1] propellane with three-coordinate phosphorus molecules. Evidence for the high reactivity of the bicyclo [1.1. 1] pent-1-yl radical." Journal of the American Chemical Society **119**(6): 1388-1399.

Dreher, D. and A. F. Junod (1996). "Role of oxygen free radicals in cancer development." European Journal of cancer **32**(1): 30-38.

Gupta, J. and A. Gupta (2016). "Isolation and identification of flavonoid in Strychnos nux-vomica L., and evaluation of antioxidant potential." IJCS **4**(4): 33-37.

Ibrahim, H., et al. (2021). "Gas chromatography–mass spectrometry (GC–MS) analysis of ethyl acetate root bark extract of S trychnos innocua (Delile)." Beni-Suef University Journal of Basic and Applied Sciences **10**: 1-8.

Ibrahim, N. N. A., et al. (2023). "A Comprehensive Review with Future Prospects on the Medicinal Properties and Biological Activities of Curcuma caesia Roxb." Evidence-Based Complementary and Alternative Medicine **2023**.

Karunamoorthi, K., et al. (2013). "Traditional medicinal plants: a source of phytotherapeutic modality in resource-constrained health care settings." Journal of Evidence-Based Complementary & Alternative Medicine **18**(1): 67-74.

Kumar, S., et al. (2014). "In vitro antibacterial, antioxidant, and cytotoxic activities of Parthenium hysterophorus and characterization of extracts by LC-MS analysis." BioMed Research International **2014**.

Machlin, L. J. (1988). "Free radical tissue damage and the protective role of antioxidant nutrients."

Meuss, A. (2000). "Herbal medicine." Curr. Sci **78**: 35-39.

Mohesh, M. G., et al. (2015). "Antibacterial and antioxidant activity of Strychnos nux vomica flower extract." Journal of Chemical and Pharmaceutical Research **7**(7): 748-752.

Muvengwi, J., et al. (2014). "Termitaria as preferred browsing patches for black rhinoceros (Diceros bicornis) in Chipinge Safari Area, Zimbabwe." Journal of Tropical Ecology **30**(6): 591-598.

Oyedemi, S., et al. (2010). "In-vitro and-vivo antioxidant activities of aqueous extract of Strychnos henningsii Gilg." Afr J Pharm Pharmacol **4**(2): 70-78.

Rao, P. S., et al. (2011). "Free radicals and tissue damage: Role of antioxidants." Free radicals and antioxidants **1**(4): 2-7.

Rathod, N. B., et al. (2021). "Biological activity of plant-based carvacrol and thymol and their impact on human health and food quality." Trends in Food Science & Technology **116**: 733-748.

Sani, M., et al. (2022). "Evaluation of the sleep modulating effects of methanolic extracts of Strychnos spinosa and Strychnos innocua fruits in mice." Sokoto Journal of Veterinary Sciences **20**(5): 91–96-91–96.

Schnabel, U., et al. (2015). "Decontamination and sensory properties of microbiologically contaminated fresh fruits and vegetables by microwave plasma processed air (PPA)." Journal of Food Processing and Preservation **39**(6): 653-662.

Smith, R., et al. (2020). "Antibiotic delivery strategies to treat skin infections when innate antimicrobial defense fails." Antibiotics **9**(2): 56.

Southorn, P. A. and G. Powis (1988). Free radicals in medicine. I. Chemical nature and biologic reactions. Mayo Clinic Proceedings, Elsevier.

Sudhira, L., et al. (2015). "Phytochemical Screening, antioxidant and antibacterial activity of Strychnos colubrina L. as an important endangered medicinal species in eastern ghats." Journal of pharmaceutical sciences and research **7**(5): 242.

Vannucci, R. C. (1990). "Experimental biology of cerebral hypoxia-ischemia: relation to perinatal brain damage." Pediatric research **27**(4): 317-326.

Wei, L. S., et al. (2011). "Characterization of antimicrobial, antioxidant, anticancer property and chemical composition of Michelia champaca seed and flower extracts." Stamford Journal of Pharmaceutical Sciences **4**(1): 19-24.

Zhang, L., et al. (2017). "Contrastive analysis of chemical composition of essential oil from twelve Curcuma species distributed in China." Industrial Crops and Products **108**: 17-25.