World Journal of Biology Pharmacy and Health Sciences
eISSN: 2582-5542
Cross Ref DOI: 10.30574/wjbphs
Journal homepage: https://wjbphs.com/

(REVIEW ARTICLE)

A narrative review of pharmacological and phytochemical properties of decorative flowering plants at Hyde Park Zoo Sanctuary and Tropical Gardens Inc., Guyana

Kimberly Craig * and Reshma Persaud

Department of Biology, Faculty of Natural Sciences, University of Guyana, Guyana.

World Journal of Biology Pharmacy and Health Sciences, 2024, 19(01), 072–077

Publication history: Received on 27 May 2024; revised on 04 July 2024; accepted on 07 July 2024

Article DOI: https://doi.org/10.30574/wjbphs.2024.19.1.0400

Abstract

Throughout history, plants have been used for their medicinal properties due to their ability to produce biochemical compounds. However, the safe use of these plants is a cause for concern due to only some species being medically tested and regulated. This research has utilised existing published information to provide a review which could serve as a global data resource to lend support to medical research. Hyde Park Zoo consists of ninety-nine (99) species of plants belonging to twenty (20) families of which eight (8) species of the decorative flowering plants were found to have medicinal properties based on existing literature. All eight (8) species were found to have antibacterial properties while three (3) species were found to have antifungal properties. Yellow Bellflower (*Allamanda cathartica*) was the only species noted to have antiviral properties while two (2) species have anticancer properties. Two (2) species aid with circulatory issues and one (1) species aids with arthritis. Hungarian Rose (*Rosa gallica var)* was noted to have psychotherapeutic effects aiding with depression through aromatherapy.

Keywords: Medicinal plants; Guyana; Medicinal properties; Phytochemical; Pharmacological

1. Introduction

Medicinal plants, also called medicinal herbs, have been used for several centuries for their perceived medical benefits. Plants may have medicinal value since they are able to make chemicals and other biochemical compounds. Such useful plants are present all over the world including Africa, South America and Asia. However, safe use of these plants has always been a source of concern, since their traditional use may not have been safely regulated for medical use [1]. Many people still rely on traditional plant based treatments but only some of these have become medically regulated. In the world, there was estimated to be over fifty thousand (50,000) medicinal plants [2]. However, only about five thousand (5,000) of these are cited to be medicinally regulated. One hundred and seventy three (173) native plants used as medicine in Guyana [3]. Not all of these, however, are medically tested and regulated.

Ex-situ plant conservation involves the use of botanical gardens [4]. Hyde Park Zoo Sanctuary and Tropical Gardens, established in 2009, conserves, manages and protects plant and animal life. It is located at Plantation Land of Canaan, along the East Bank of Demerara. According to [5], there are ninety-nine (99) plant species found there belonging to twenty (20) families, including Arecaceae, Leguminoseae, Bromeliaceae, Arecaceae, Apocynaceae, Orchidaceae, and Rosaceae. Even with the aim of ex-situ conservation, keen attention must be placed on plants with medical value so as to better aid conservation attempts. In an effort to present information on plants that are not only used as traditional medicine but have regulated medical benefits, this research aims to review the pharmacological and phytochemical properties of decorative flowering plants found within Hyde Park Zoo Sanctuary and Tropical Gardens Inc,, Guyana. This research has utilised existing published information to provide a review which could serve as a global data resource to lend support to medical research.

* Corresponding author: Kimberly Craig

2. Method

The information in this study utilized published and peer-reviewed information which was thereafter reviewed and summarised. In order to ensure presented information was valid and reliable, PubMed and NCBI were used to gain access to peer-reviewed medical science that is factual. In instances where photos were used, they were extracted from [5].

3. Results and Discussion

Based on the method, the following decorative flowering plants were found to have pharmacological and phytochemical properties.

3.1. Ixora (*Ixxora coccinea*)

Ixora is traditionally believed to possess medicinal properties as herbal remedy for fever, skin disorders and dysentery . It has also been traditionally used for hypertension, nausea, anorexia and as a sore throat cure [6]. Phytochemically, this plant has fatty acids, essential oils, triterpenoids, flavonoids, alkaloids,and proanthocyanidins. The leaves are said to have methanolic extract which act as anti-inflammatory agents against several bacterial species including *E.coli*, *B. cereus*, *Pseudomonas sp*., *Staphylococcus aureus*, and *Salmonella species* [7].

Figure 1 *Ixxora coccinea*

3.2. Yellow Bellflower (*Allamanda cathartica*)

This plant is traditionally used for antifungal, antiviral and anticancer treatments. It is also used as a diuretic, to reduce inflammation, improve blood circulation, and eliminate lice. Its phytochemical components include hydrocarbons, quinones, terpenes and phenolic compounds . Pharmacologically, it can be used as an analgesic. It has been shown to have anti inflammatory activity where hemolytic inhibition was noted. Additionally, treatment by flower ethanol extract was found to promote colon lengthening, less histological damage and less deletion of mucin in the intestine. It is also said to have an effect on microorganism activity including *Bacillus* species, *E. coli, Staphylococcus sp*. and *Streptococcus sp*. [8].

Figure 2 *Allamanda cathartica*

3.3. Periwinkle (*Catharanthus roseus*)

The phytochemicals in periwinkle are principally made up of alkaloids. There are over four hundred (400) alkaloids which have analgesic, bactericidal, and anticancer properties. Quite notable is the presence of Vinblastine and Vincristine which are useful in delaying cell cycle arrests due to cancer [9] [10].

Figure 3 *Catharanthus roseus*

3.4. Pink Poui (Tabebuia impetiginosa)

Traditionally, this plant is used for treating infections caused by bacteria and fungi, along with the treatment of fever and malaria. The bark was traditionally used as a poultice or tea to treat skin inflammation. In the Caribbean, it is also used for treating pains associated with the teeth. It is made up of several glycosides, fatty and other acids, and some volatile constituents. It has been used to treat obesity, bacterial and fungal infections, psoriasis and even anti-cancer activities [11] [12].

3.5. Bougainvillea (*Bougainvillea spectabilis*)

Phytochemically, the bougainvillea plant contains mostly tannins, along with steroids, quinones, saponins and flavonoids. It can be used as an antibacterial agent against *E.coli*, *Streptococcus* species and *Salmonella sp*. It is also useful

for anti-fertile activity to reduce sperm count in males and disrupt the estrous cycle in females. It also has antiulcer and antiinflammatory potential [13] [14].

Figure 5 *Bougainvillea spectabilis*

3.6. Hungarian Rose (*Rosa gallica var*)

The fragrance of the flower associated with this plant is said to have anti-depressive and psychological effects. Overall, it is said to have aromatherapy values. It is also said to be anti-diabetic where it decreases the absorption of carbohydrates from the intestine and reduces glucose levels. There are also antimicrobial effects including inhibition of some bacterial growth such as *Staphylococcus aureus*, *Escherichia coli* and *Salmonella sp*. [15] [16].

Figure 6 *Rosa gallica var*

3.7. Morning Glory (*Ipomea hederacea*)

Traditionally, *Ipomea hederacea*, has been used for several purposes including use as a laxative, fever, headache, constipation and bronchitis [17]. The plant is said to contain alkaloids, terpenoids, saponins, and reducing sugars. It has antioxidant activity. Additionally, it has antimicrobial and antifungal potential to fight off common bacteria such as *E.coli* and *Bacillus* species, and several *Aspergillus* species.The plant can also function as an insecticide and nematicide [18].

Figure 7 *Ipomea hederacea*

3.8. Frangipani (*Plumeria rubra*)

Phytochemically, the plant has several constituents including phenolic compounds, tannins, carbohydrates and flavonoids.It is said to have antimicrobial activity against E.coli. It also has larvicidal activity against *Aedes aegypti* mosquitoes. It also has antiarthritic potential due to vascular permeability and preventing the destruction of cartilage [19] [20].

Figure 8 *Plumeria rubra*

4. Conclusion

Of the ninety-nine (99) species of plants found in the Hyde Park Zoo, eight (8) decorative flowering species were found to have medicinal properties based on the literature analyzed. All of the eight (8) species (Ixora, Yellow Bellflower, Periwinkle, Pink Poui, Bougainvillea, Hungarian Rose, Morning Glory and Frangipani) were found to have antibacterial properties against a range of bacterial species including *E.coli*, *B. cereus*, *Pseudomonas sp*., *Staphylococcus aureus, Bacillus sp*. and *Salmonella sp*. Yellow Bellflower, Morning Glory and Pink Poui were found to have antifungal properties against a number of fungal species including several species of *Aspergillus*. Yellow Bellflower is the only species noted to have antiviral properties while both Yellow Bellflower and Pink Poui have anticancer properties delaying cell cycle arrests due to cancer. Ixora and Yellow Bellflower aid with circulatory issues, including hypertension, and Frangipani aids with arthritis. Only one species (Hungarian Rose) was noted to have psychotherapeutic effects aiding with depression through aromatherapy.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Ahn K. The worldwide trend of using botanical drugs and strategies for developing global drugs. BMB Reports. 2017; 50 (3): 111–116.

[2] Schippmann U, Leaman DJ, Cunningham AB. Impact of cultivation and gathering of medicinal plants on biodiversity: global trends and issues. In: FAO (ed) Biodiversity and the ecosystem approach in agriculture, forestry and fisheries. Inter-Departmental Working Group on Biological Diversity for Food and Agriculture; 2022.

[3] Lachman-White, D.A., Adams, C.D. and U.O. Trotz. A Guide to the Medicinal. Plants of Coastal Guyana. 350 pp. London: Commonwealth Science Council; 1992.

[4] Mounce R, Smith P, Brockington S. Ex situ conservation of plant diversity in the world's botanic gardens. Nat. Plants. 2017; 3, 795–802. https://doi.org/10.1038/ s41477-017-0019-3.

[5] Craig, K. A preliminary survey of the flora and vegetation of an ex-situ conservation area (Hyde Park Zoo Sanctuary and Tropical Gardens Inc., Guyana). GSC Biological and Pharmaceutical Sciences, 2024, 26(03), 170–182.

[6] Dontha S, Kamurthy H, and Manthripragada B: Phytochemical and Pharmacological Profile of Ixora: A Review.Int J Pharm Sci Res 2015; 6(2): 567-84.

[7] Torey A, Sasidharan S, Latha LY, Sudhakaran S, Ramanathan S. Antioxidant activity and total phenolic content of methanol extracts of Ixora coccinea. Pharmaceutical Biology. 2010; 48(10), 1119–1123.

[8] Petricevich VL, Abarca-Vargas R. *Allamanda cathartica*: A Review of the Phytochemistry, Pharmacology, Toxicology, and Biotechnology. Molecules. 2019 Mar 29;24(7):1238.

[9] Nejat N, Valdiani A, Cahill D, Tan YH, Maziah M, Abiri R. Ornamental exterior versus therapeutic interior of Madagascar periwinkle (*Catharanthus roseus*): the two faces of a versatile herb. ScientificWorldJournal. 2015; 2015:982412.

[10] Kumar S, Singh B, Singh R. *Catharanthus roseus* (L.) G. Don: A review of its ethnobotany, phytochemistry, ethnopharmacology and toxicities. J Ethnopharmacol. 2022 Feb 10; 284:114647.

[11] Zhang J, Hunto ST, Yang Y, Lee J, Cho JY. *Tabebuia impetiginosa*: A Comprehensive Review on Traditional Uses, Phytochemistry, and Immunopharmacological Properties. Molecules. 2020 Sep 18;25(18):4294.

[12] Castellanos JRG, Prieto JM, Heinrich M. Red Lapacho (*Tabebuia impetiginosa*)—A global ethnopharmacological commodity? *J. Ethnopharmacol.* 2009; 121:1–13.

[13] Abarca-Vargas R, Petricevich VL. *Bougainvillea* Genus: A Review on Phytochemistry, Pharmacology, and Toxicology. Evid Based Complement Alternat Med. 2018 Jun 24; 2018:9070927.

[14] Sahu N, Saxena J. *Bougainvillea glabra* a Natural Antioxidant: A Review. *Chemistry.* 2012; 46:4113–4117.

[15] Wang H. Beneficial medicinal effects and material applications of rose. Heliyon. 2023 Dec 10;10(1):e23530.

[16] Marmol I, Sanchez-de-Diego C, Jimenez-Moreno N, Ancin-Azpilicueta C, Rodriguez-Yoldi M.J. Therapeutic applications of rose hips from different rosa species. *Int. J. Mol. Sci.* 2017;18(6)

[17] Nowak J, Woźniakiewicz M, Klepacki P, Sowa A, Kościelniak P. Identification and determination of ergot alkaloids in Morning Glory cultivars. Anal Bioanal Chem. 2016 May;408(12):3093-102.

[18] Zia-Ul-Haq M, Riaz M, De Feo V. *Ipomea hederacea* Jacq.: a medicinal herb with promising health benefits. Molecules. 2012 Nov 5;17(11):13132-45.

[19] Kaur J, Sanghavi AD, Chopra A, Lobo R, Saha S. Antimicrobial and cytotoxicity properties of *Plumeria alba* flower extract against oral and periodontal pathogens: A comparative *in vitro* study. J Indian Soc Periodontol. 2022 Jul-Aug;26(4):334-341.

[20] Syakira MH, Brenda L. Antibacterial capacity of *Plumeria alba* petals. *World Acad Sci Eng Technol.* 2010;44:1473–6.