WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 11, 1890-1901. Review Article ISSN 2277–7105

A COMPREHENSIVE REVIEW:- BOUGAINVILLEA SPECTABILIS

[1*]Harshika Singh and [2]Himanshu Singh

Babu Sunder Singh College of Pharmacy, NH24, Raebareli Road, Nigohan, Lucknow (226302).

Article Received on
18 April 2024,

Revised on 08 May 2024,
Accepted on 28 May 2024

DOI: 10.20959/wjpr202411-32660

***Corresponding Author**
Harshika Singh
Babu Sunder Singh College of Pharmacy, NH24, Raebareli Road, Nigohan, Lucknow (226302).

ABSTRACT

Bougainvillea spectabilis, also known as paper flower, is said to possess a variety of health rewards, such as anti-cancer, antidiabetic, anti-inflammatory, antihyperlipidemic, antibacterial, antioxidant, antiulcer features. The ancient medicinal herb Bougainvillea spectabilis Willd. has a variety of bioactive chemicals. Alkaloids, quinones, saponins, tannins, phenolics, glycosides, phlobotannins and terpenoids are among the phytoconstituents that have been identified as the foundation of their medicinal qualities. The other significant ingredients that support the healing qualities are pinitol, quercetin, quercetagetin, bougainvinones, and terpinolene. Research has shown that medicinal plants are readily available and have less adverse effects than other pharmaceuticals, they are frequently used in the manufacturing of new remedies.

KEYWORDS: Bougainvillea spectabilis, Paper flower, Medicinal herb, Phytoconstituents, Remedies.

INTRODUCTION

The medicinal plants are of huge significance to human health. For thousand of years, standard medical procedures in the majority of the world have utilized medicines based on plants.[1,2] Over 80% of people globally rely on conventional medicine for their vital medicine needs, according to a World Health Organization (WHO).[3]

A greater percentage of individuals have grown passionate about reducing the use of synthetic preservatives and switching to natural alternatives in the more recent past due to public concern about potential side effects like diabetes, cancer and cardiovascular

diseases.[4,5] Known as "paper flower", Bougainvillea spectabilis is a member of the **Nyctaginaceae** family, which is recognized as an essential medicine.[6]

Bougainvillea spectabilis is indigenous to South America's tropical regions. In 1860, it was brought from Europe to India.

Dr. Philibert Commerson, a French naturalist who discovered the bougainvillea in Rio de Janeiro, was the first person to record it, Brazil (1727-1773). The name honours the famous French navigator Louis Antoine de Bougainville, who accompanied him on his round of the world in 1766-1769.[21] Twenty years later, Jussieu (1789) published it for the first time in his book "Genera Plantarum."

B. spectabilis is known as the paper flower because of its thin, papery bracts. The most prevalent color of bougainvillea is purple or magenta, though it can also be white or orange.

The local Indian names for Bougainvillea spectabilis Willd are Booganbel, Cherei, Baganbilas, Booganvel, Bouganvila and Kagithala Puvvu. It is also generally known as Bougainvillea, Great Bougainvillea.[19] In tropical and subtropical regions of India, the prickly, woody vine known as bougainvillea spectabilis is grown.

It has been shown that certain varieties of bougainvillea contain phenolics, flavonoids, alkaloids, anthocyanins, tannins, saponins, phytate and oxalate.[7]

Various volatile chemicals, including methyl salicylate terpinolene, 2-furfural cadina-1, 4-diene, methyl salicylate terpinolene and n-octacos-9-enoic, are found in the leaves, roots and branches of the plant and are useful in the treatment of inflammation and diabetes.[9,10]

Different components of B. spectabilis Willd., like leaves and bracts, are traditionally utilized in Mandsaur, Mexico, India, Peru and Brazil to treat a variety of health issues.[12]

Additionally, flower has curative use in dealing with the symptoms of hypotension.[11] In Mexico, to making tea, the plant's blooms are soaked in hot water. The plant's flowers, either by alone or in combination with other medicinalplants, have long been used in Mexican traditional medicine for the treatment of coughs and respiratory problems. Parkinson's disease and leucorrhea are also cured by it.[13]

A wide range of remarkable secondary metabolites with a variety of pharmacological characteristics, including antibacterial, antioxidant, anticancer, antidiabetic, anti-inflammatory and antihyperlipidemic effects, may be found in bougainvillea spectabilis.[8,18] It is used as traditional medicine as appetizer, stomachic, alexiteric, seed-tonic and carminative.[20]

The alcoholic leaf extract has been used to treat diabetes mellitus (DM) due to reports that it has a hypoglycemic effect.[14,15] Pinitol is the term given to the leaf extract's hypoglycemic principle that has been identified.[16]

We tried to establish the impact of ethanolic B. spectabilis leaf extract ingestion on several haematological measures that may be used as indicators of bone marrow function and anaemia.

One of the key underlying mechanisms of B. spectabilis's antidiabetogenic effect is thought to be its inhibition of glucosidase against intestinal and pancreatic glucosidase in mice.[17]

PLANT BOTANY

Common Name:- Paper flower and Great bougainvillea

Vernacular Name[22]

- Bougainvillea and Purple bougainvillea in English
- Bougainvilla and Veranera in Spanish
- Bougainvillier in French
- Bougainvillie in Germany
- Bouganvel and Boganvilla in India
- Papelillo in Peru
- Baganbilas, as in Bengali
- Mao bao jin and Ye zi hua in Chinese
- Buganvillea in Italian
- Bunga kertas in Indonesian
- Felila in Japanese
- Bouganvila in Konkani
- Buginvila in Malay
- Kagithala puvvu in Telugu
- Fuang fah in Thai
- Bong giay in Vietnamese

Taxonomy of b. Spectabilis[23]

- Plantae is the kingdom in question.
- Division: Tracheophyta.
- Subkingdom: Viridiplantae.
- Infrakingdom: Streptophyta.
- Superdivision: Embryophyta.
- Subdivision: Spermatophytina.
- Class: Magnoliopsida.
- Caryophyllanae superorder.
- Caryophyllales order.
- The Nyctaginaceae family.
- Species: B. spectabilis.
- Genus: Bougainvillea.

Morphology of Bougainvillea Spectabilis

- B. spectabilis has papery, thin bracts.
- The most prevalent color of bougainvillea is purple or magenta, though it can also be white or orange.[22]
- The woody perennial vine is enormous, clumping stems which may reach upto 2-4 meters, and it has multiple stems. It climbs by publishing thin, arcing canes with sharp, curved thorns on them. The stem color changes from mid-green to a dismal green-brown as they grow.
- The bark has a mild corky texture.
- The leaf has ovate to rounded kinds and is 5-10cm in length and 2-6cm in width. The leaves have a deep green color, a leathery texture and hair on the underside.
- The fruit is a longer than 1-2 cm, elongated, five-lobed achene. It has a stiff, dry fruit cover and is not very noticeable.[24]

EXTRACTION METHOD

MACERATION METHOD

- Bougainvillea spectabilis flowers were dried.
- Using an electronic blender, grind the dry leaves.
- 5g of the blended material was placed into a beaker and 100ml of water, ethanol, chloroform and ethyl acetate were added one at a time.

- Then, filtered using filter paper after 48 hours of standing.

- Following reduced pressure evaporation, the filtrates were dried at 55· C in a rotary evaporator.

Extraction using Soxhlet apparatus

- Following a water wash & 168 hours of shade drying at 30· C, the flowers were pulverized succesive solvent using ethanol and water.
- About 10 grams of dried flower were thoroughly extracted using a Soxhlet apparatus by hot continuing extraction, 500ml of ethanol & conducted for different duration (2, 5, 8, 10 and 12 hours).
- Aqueous extraction was carried out using the decoction method, which involved placing 10 grams at 40-450· C for 2 hours, respectively, in 500ml of distilled water.
- For the concentration mass to have a constant weight, vacuum drying was used.

IDENTIFICATION TEST OF CHEMICAL COMPOUNDS

Steroids test:- 2 ml acetic acid + 0.5 ml of ethanolic extract

↓

Then 2 ml of concentrated H_2SO_4 Were added

↓

Color that was either blue or green or a combination of these two hues.

Flavonoids test:- 2 ml Sodium hydroxide + 2 ml of solvent extract

↓

Yellow color indicates the presence of flavonoid

Alkaloids test:- Picric acid solution + 2 ml solvent extract

↓

Orange color indicates presence of alkaloids

Phenols test:- 2 ml ferric chloride solution + 2 ml of solvent extract

↓

Form of deep bluish green solution

Cardenolides test:- 2 ml benzene + 1 ml solvent extract

↓

Turbid brown color was observed

Tannins test:- 0.5 g leaf powder + 20 ml of water

↓

Boil for 5 minutes

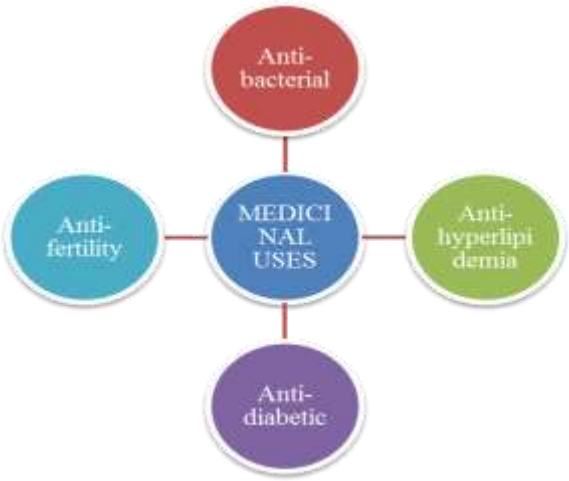
↓

Then add 2 drops of 5% $FeCl_3$

↓

Formation of greenish precipitate

MEDICINAL USES OF BOUGAINVILLEA SPECTABILIS



Antibacterial Activity:- The antibacterial activity of leaf extracts (ethanol, chloroform, ethyl acetate and water) from B. spectabilis Willd. was assessed against Pseudomonas aeruginosa, Proteus vulgarius, Klebsilla pneumoniae and Bacillus subtilis.[25]

In comparison to ethyl acetate and chloform extracts, ethanol and water extracts were reported to demonstrated the strongest antibacterial potential against these microorganisms.

Antihyperlipidemic Activity:- Lowering serum cholestrol levels was one of the benefits of B. spectabilis leaf consumption.[26]

Significant reductions in the levels of low density lipoprotein, very low density lipoprotein, cholesterol and total cholesterol were observed in the plant extract. In addition, there has been an apparent increase in high density lipoprotein.

Antidiabetic Activity:- By studying diabetic mice, the leaf of B. spectabilis exhibited a high oral glucose tolerance and a significant decrease in intestinal glucosidase activity.[27]

Another study using diabetic rats given alloxan indicated that B. spectabilis stem bark demonstrated a potent hypoglycemic effect.[28]

Anti-fertility Activity:- Evaluated the effect of oral B. spectabilis leaf administration on male and female fertility and reproductive organs.[29]

This plant treatment revealed the leydig interstitial cell hypertrophy, the germinal epithelial cells' thickness, and the reduction of seminiferous tubule size.

Anti-oxidant Activity:- Evaluated the antioxidant potential of B. spectabilis leaf and stem aqueous and hydroalcoholic extracts.[30]

Compared to the aqueous extract, the methanolic extract had higher antioxidant activity and a larger concentration of phytochemicals.[31]

Anti-inflammatory Activity:- Used carrageenan and dextran to assess the B. spectabilis leaf methanolic extract acute anti-inflammatory properties, the extract's long-term anti-inflammatory qualities were evaluated using Freud's adjuvant-induced arthritis model.[32]

Anti-ulcer Activity:- The ethanolic extract of B. spectabilis demonstrated a 100% ulcer inhibition rate along with a decrease in gastric volume, free acidity and total acidity.

CONCLUSION

This paper demonstrates Bougainvillea glabra's entire range of activities as well as its pharmacological properties, including antibacterial and anticancer properties. More bioactive components found in Bougainvillea leaf extracts like saponins, tannins, flavonoids etc. work against common human diseases. Additionally, the examined article demonstrated other pharmacological applications and contributed to the development of conventional and allopathy.

REFERENCE

1. Chariandy CM, Seaforth CE, Phelps RH. Screening of medicinal plants from Trinidad and Tobago for antimicrobial and insecticidal properties. J. Ethnopharmacol, 1999; 64: 265-270.
2. Newman DJ, Cragg GM, Snader KM. The influence of natural products upon drug discovery. Nat. Prod. Reports., 2000; 17: 215-234.
3. Umamaheswari A, Shreevidya R and Aparna Nuni. In vitro Antibacterial Activity of Bougainvillea spectabilis Leaves Extracts. Advances in Biological Research, 2008; 2(1-2): 01-05.
4. Bao, C., Jiang, P., Chai, J., Jiang, Y., Li, D., Bao, W., Liu, B., Liu, B., Norde, W., & Li, Y. (2019). The delivery of sensitive food bioactive ingredients: Absorption mechanisms, influencing factors, encapsulation techniques and evaluation models. *Food Research International*, *120*: 130–140.

5. Orozco-Villafuerte, J., Escobar-Rojas, A., Buendía-González, L., García-Morales, C., Hernandez-Jaimes, C., & Alvarez-Ramirez, J. Evaluation of the protection and release rate of Bougainvillea (*Bougainvillea spectabilis*) extracts encapsulated in alginate beads. *Journal of Dispersion Science and Technology*, 2018; *40*: 1065–1074.
6. Abarca-Vargas, R., Peña Malacara, C. F., & Petricevich, V. L. Characterization of chemical compounds with antioxidant and cytotoxic activities in *Bougainvillea* x *buttiana* Holttum and Standl, (var. Rose) extracts. *Antioxidants*, 2016; *5*(4): 45.
7. Ikpeme, E., Ekaluo, U., Udensi, O., Ekerette, E., & Pius, M. Phytochemistry and reproductive activities of male albino rats treated with crude leaf extract of great Bougainvillea (*Bougainvillea spectabilis*). *Asian Journal of Scientific Research*, 2015; *8*(3): 367–373.
8. Alsamadany, H. De novo leaf transcriptome assembly of *Bougainvillea spectabilis* for the identification of genes involves in the secondary metabolite pathways. *Gene*, 2020; *746*: 144660.
9. L.T. Do, T. Aree, P. Siripong, T.N. Pham, P.K. Nguyen, S. Tip-pyang, A.- H. Bougainvinones, Peltogynoids from the stem bark of purple Bougainvillea spectabilis and their cytotoxic activity, J. Nat. Prod., 2016; 79: 939–945.
10. G. Mandal, C. Chatterjee, M. Chatterjee, Evaluation of anti-inflammatory activity of methanolic extract of leaves of Bougainvillea spectabilis in experimental animal models, Pharmacogn. Res., 2015; 7: 18–25.
11. C.N. Hajare, E.R. Inamdar, R.V. Patil, C.S. Shete, S.S. Wadkar, K.S. Patil, J. S. Ghosh, Anti-bacterial activity of the leaves of Bougainvillea spectabilis against E. coli NCIM 2832 and M. aureus NCIM 5021, Int. J. Pharmaceut. Sci. Rev. Res., 2015; 34: 194–196.
12. C.J. Nitesh, N.J. Ambika, G.F. Alkama, Efficiency of bougainvillea spectabilis willd in monitoring dust, Int. J. Appl. Environ., 2017; 12: 773–785.
13. O.M. Abdel-Salam, E.R. Youness, N.A. Ahmed, S.A. El-Toumy, A.M. Souleman, N. Shaffie, D.M. Abouelfadl, Bougainvillea spectabilis flowers extract protects against the rotenone-induced toxicity, Asian Pac. J. Tropical Med., 2017; 10: 478–490.
14. **Irvine, F.R. (1961)** Woody plants of Ghana. Oxord University Press, Lodon, 878.
15. **Narayanan, C.R., Joshi, D.D., and Mujumdar, A.M. (1984)** Hypoglycemic action of *Bougainvillea spectabilis* leaves. *Curr. Sci.*, 53: 579-581.
16. **Narayanan, C.R., Joshi, D.D, Mujumdar, A.M., and Dhekne, V.V. (1987)**. Pinitol – a new antidiabetic compound from tea leaves of *Bougainvillea spectibilis. Currr. Sci.*, 55: 139-141.

17. Bhat M, Zinjarde SS, Bhargava SY, Kumar AR, Joshi BN. Antidiabetic Indian plants: a good source of potent amylase inhibitors. Evid Based Complement Alternat Med., 2011; 810207.
18. Maity T K, Mandal SC, Mukherjee PK, Saha K, Das J. Studies on Anti-inflammatory effect of *Cassia tora* leaf extract (Fam. Leguminosae), Phytotherapy research, 1998; 12(3): 221-223.
19. Nadkarni AK, editor. The Indian Materia Medica. Bombay: Popular Prakashan, 2002; 822.
20. Rastogi RP. Compendium of Medicinal Plants. Publication and Information Directorate, New Delhi, India, 1995.
21. Pal, B.P. and Swarup, V. 1974. Bougainvilleas. *Indian Council of Agricultural Research, New Delhi.*
22. Warren W. Handy Pocket Guide to Tropical Flowers. Singapore: Tuttle Publishing, 2013; 64.
23. Integrated Taxonomic Information System (ITIS). *Bougainvillea spectabilis* Willd. Taxonomic Serial No.:895413. VA, USA: Geological Survey, 2016.
24. Kobayashi KD, McConnell J, Griffis J. Bougainvillea. Ornamentals and flowers. OF 38, Cooperative Extension Service, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, 2007.
25. M.K. Swamy, K.M. Sudipta, P. Lokesh, M.A. Neeki, W. Rashmi, S.H. Bhaumik, S. H. Darshil, R. Vijay, S.S.N. Kashyap, Phytochemical screening and in vitro antimicrobial activity of Bougainvillea spectabilis flower extracts, Int. J. Phytomed., 2012; 4: 375–379.
26. Adebayo JO, Adesokan AA, Olatunji LA, Buoro DO, Aoladoye AO. Effect of ethanolic extract of *Bougainvillea spectabilis* leaves on haematological and serum lipid variables in rats. Biochem, 2005; 17: 45–50.
27. Bhat M, Kothiwale SK, Tirmale AR, Bhargava SY, Joshi BN. Antidiabetic properties of *Azardiracta indica* and *Bougainvillea spectabilis*: In vivo studies in murine diabetes model. Evidence-Based Complementary and Alternative Medicine 2011; Article ID 561625. p. 9.
28. Jawla S, Kumar Y, Khan MSY. Hypoglycemia activity of *Bougainvillea spectabilis* **s**tem bark in normal and alloxaninduced diabetic rats. Asian Pac J Trop Biomed., 2012; 2: 919–23.

29. Mishra N, Joshi S, Tandon VL, Munjal A. Evaluation of antifertility potential of aqueous extract of *Bougainvillea spectabilis* leaves in swiss albino mice. Int J. Pharm Sci. Drug Res., 2009; 1: 19–23.
30. Chaires-Martinez L, Monroy-Reyes E, Bautista- Bringas A, Jimenez-Avalos HA, Sepulveda-Jimenez G. Determination of radical scavenging activity of hydroalcoholic and aqueous extracts from *Bauhinia divaricata* and *Bougainvillea spectabilis* using the DPPH assay. Pharmacognosy Res., 2009; 1: 238–44.
31. Venkatachalam RN, Singh K, Marar T. *Bougainvillea spectabilis*, a good source of antioxidant phytochemicals. Res J Pharm Biol Chem Sci., 2012; 3: 605–13.
32. Mandal G, Chatterjee C, Chatterjee M. Evaluation of antiinflammatory activity of methanolic extract of leaves of *Bougainvillea spectabilis* in experimental animal models. Pharmacognosy Res., 2015; 7: 18–22.