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Review Article

A Comprehensive Review of Pharmacological Potential of *Bougainvillea Glabra*

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ABSTRACT

Numerous medications that affect various groups, including antispasmodics, emetics, anti-cancer, and antimicrobials, are derived from plants. According to WHO estimates, 80% of people in underdeveloped nations still get their primary medical treatment from traditional medicine, primarily plant-based medications. Therefore, research into the antioxidant qualities of herbs that can be used to cure a variety of illnesses is desperately needed. Antioxidants serve a variety of physiological functions in the body because they block the oxidation process, even at comparatively low concentrations. There are two types of antioxidants: natural and synthetic. [1]The plant *Bougainvillea glabra* is widely used in Indian medical systems, such as Ayurveda and Siddha, as well as other traditional medical systems around the world, to cure a variety of illnesses. When examined using several disease-based pharmacological models using different extracts of roots, leaves, flowers, and root oil as test samples, it was found that many of the traditional uses of *Bougainvillea glabra* were authenticated. Our review article focuses on antioxidant and pharmacological actions. This article might provide ideas for future research directions and new formulations in allopathic and certain traditional. [2].

INTRODUCTION

There are fourteen species in the genus *Bougainvillea glabra*, which belongs to the Nyctinaginaceae family of plants. New hybrids have been created by several crossings between the different species. *Glabra Bougainvillea Choisy* is a climber, evergreen shrub with prickly stems. It typically reaches a height of 10 to 12 feet (3.0 to

3.7 meters), though it can occasionally grow as high as 30 feet (9 meters). The name "paper flower" comes from the fact that the tiny white flowers typically bloom in clusters encircled by vibrant papery bracts. The dark green, asymmetrical leaves can grow up to 4 inches (10 cm) in length. The diameter of the blossoms is approximately 0.4 cm. *Bougainvillea glabra*

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decoctions are used in Nigeria to treat digestive disorders, inflammation-related conditions, and discomfort. According to a study, *B. glabra* extracts can suppress tyrosinase activity and TNF- α while also increasing or promoting collagen formation. Extracts of *B. glabra* have been shown to exhibit antioxidant, antibacterial, and bioinsecticidal properties against armyworm, *Spodoptera frugiperda*, and insect pest larvae. Additionally, it is known that *B. glabra* extracts have anti-diabetic, anti-lipidemic, anti-diarrheal, and anti-ulcer qualities. Crude extracts of *B. glabra* have also been shown to have anthelmintic, analgesic, antipyretic, and anti-inflammatory properties. More recently, they have been shown to have cardiogenic effects and in vitro anticancer activities against Hela cell lines.^[3]

II. Description^[4]:

An important ornamental plant that is native to South America is bougainvillea. Introduced and dispersed throughout warm parts of the Caribbean, Mexico, Asia, Australia, South Africa, the United States, and other nations. They are climbing shrubs or woody plants that produce leaves all year long. It can climb thanks to its thorny stems.

Leaves: Arranged alternately, entire, ovate to elliptic or lanceolate in shape

Flowers: flowers are small tubular, appear in groups of three, white or yellow, bloom in spring and summer and even in early autumn the flowers are surrounded by three colorful bracts, which have the consistency of paper, size and appearance of leaves. Flowers 0.4 cm in diameter, bisexual, in

a cymose inflorescence with three white to cream-colored flowers, perianth 1–2.5 cm long.

Growth habit: *B. glabra* habits warm, semi-warm, dry, semi-dry, and temperate climates, direct sunlight allows the growth and flowering of bougainvillea, as well as acidic and well-drained soils, with a pH of 5.5–6; they are tolerant to droughts.

Fruit: its fruit is elongated, no more than 1 cm long.

III. Habitat^[5]:

According to botanical textbooks, certain species of the genus *Bougainvillea glabra* are found all over the world and are not unique to any one location, species, cultivar, or hybrid. A more thorough investigation was conducted in the scientific literature in light of these findings. Regarding the distribution, we highlight a more trustworthy update in this review that is based on scientific study or literature. Originally from Italy, Spain, and France, bougainvillea glabra Egypt, China, India, Israel, and Bangladesh United States of America, Guatemala, Honduras, Virgin Islands, Mexico, Nicaragua, Puerto Rico, Dominican Republic, Venezuela, Brazil, Madagascar, Nigeria, Nigeria, Hawaii, Bolivia, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, and Thailand.

IV. Plant Profile^[6]:

Plant Name: *Bougainvillea glabra*



Fig No.: 1, 2: The *Bougainvillea glabra* leaves and flower.

Botanical information

Common name: Paper flower

Synonyms: Genus *Bougainvillea*, *Bougainvillea Glabra*, vine, Paper flower.

Kingdom: Plantae

Subkingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Caryophyllidae

Order: Caryophyllales

Family: Nyctaginaceae

Genus: *Bougainvillea*.

• Common names

Hindi name: Booganbel

Marathi name: Booganbel

Bengali name: Kathigala Puvvu.

V. Morphology ^[7]:

B. glabra was discovered in 1850 by Swiss botanist Jacques Denys Choisy (Napoleon et al., 2013). It's a perennial climbing shrub that grows 1–7 m tall. Its branches have curled spines and simple, dark green, somewhat glossy leaves that are 5–15 mm long. Its petiole is 1 cm long, and its adaxially glabrous and abaxially pubescent leaves are around 10 cm long. Bisexual, 0.4 cm in

diameter, with three white to cream-colored flowers in a cymose inflorescence; perianths are 1–2.5 cm long, somewhat pubescent, and include an ovary, six–eight stamens, and a single carpel; Chartaceous bracts of various colors, ovate, 5 cm long, 1.54 cm broad, with a cardioid base and pointy points, are attached to the flowers at the middle rib's terminal region. The achene fruit is small, dry, one-seeded, and ribbed. *B. glabra* thrives in temperate, dry, semi-dry, warm, and semi-warm regions.

VI. Medicinal uses: ^[8]

Bougainvillea glabra shows Antiulcer activity, Ant diarrheal activity Antimicrobial activity and for cough & sore throat treatment. Plant also used for hepatitis and leucorrhea treatment, Act as antacid for reducing acidity. However *B. glabra* also shows Antibacterial activity Ant diabetic activity, Anti fertility activity. Moreover *Bougainvillea glabra* also possess Antioxidant activity Anti-inflammatory activity.

VII. Chemical Constituents: ^[9]

1. Phenolic compounds from Genus *Bougainvillea Glabra*.

Table1: chemical constituents of Bougainvillea Glabra

Part of plant	Chemical constituents
1. Flower	Gallic acid, ferulic acid, syringic acid, p-Hydroxybenzoic acid, Protocatechuic acid, Sinapic acid, 2-Propenoic acid, 3-(2-hydrophenyl)-(E), Cafeic acid, Chlorogenic acid.
2. Leaves.	Coumaric acid, Vanillic acid.

2. Peltogynoids and Flavonoids from genus *Bougainvillea Glabra*:

Part Of Plant	C. Chemical Constituents
1. Flower	Rutin, Isovitexin, Apigenin, Kaempferol, Myricetin, Quercetin.
2. Stem bark	Quercitrin,
3. Leaves	Is isovitexin, Vitexin, Chrysoeriol, Luteolin, Luteolin-7-O-[2-O-(5O-

Table: 2- Phytochemical constituents of *Bougainvillea glabra* Linn. ^[11]

Phytochemicals	Aqueous extract of <i>B. glabra</i> Linn. Flowers.	Methanol extract of <i>B. glabra</i> Linn. Flowers.	Test for methanol extract.
Phenol	+++	+++	Ferric chloride test
Sterols	+++	+++	Liebermann–burchard test
Carbohydrates	+++	+++	Anthrone test
Alkaloids	+++	+	Mayer's test
Quinines	+++	+	Sulphuric acid
Tannins	+++	++	Ferric chloride
Flavonoids	--	+++	Ethyl acetate test
Glycosides	--	+++	Borntranger's test
Triterpinoids	+++	+++	Salkowski test
Saponin	--	+	Frothing test

IX. Pharmacological Activities:

1. Antidiabetic Activity:

In this study, 25 male wistar rats were used to examine the anti-diabetic and anti-lipidemic properties of *Bougainvillea glabra*. Five groups of five rats each were created from the rats. These groups consist of a diabetes control (untreated

	feruloyl)-D-apiofuranosyl]-Dglucopyranoside.
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3. Phytosterol, terpenes, and carbohydrates from genus *Bougainvillea Glabra*:

Part of Plant	Chemical constituents
1. Leaves	Stigmasterol, squalene.

VIII. Phytochemicals of *Bougainvillea glabra* ^[10]

Phytochemical constituents of aqueous extract of *B. glabra* Linn. Were evaluated by elementary phytochemical screening examination; screening was performed utilizing standard systems. The strategies for discovery of phenols, sterols, carbohydrates, alkaloids, quinines, tannins and triterpinoids.

group), an extract control (100 mg/kg of extract), and a normal control (saline). The extract was given to the other two groups at doses of 100 mg/kg and 400 mg/kg, respectively. Although blood samples were taken from the rat tails once a week, the trial lasted for three weeks. The findings indicate that the extract Decreased the hyperglycemia from 12±0.40 mmol/L (Diabetic Control) to 4.04±0.03 mmol/L (400 mg/kg group)



considerably ($p < 0.05$). The extract also resulted in a large increase in HDL-C, high-density lipoprotein cholesterol, and a significant decrease in TC, TG, and LDL-cholesterol. In summary, the findings of this study support the use of *Bougainvillea glabra* by practitioners of traditional medicine to treat diabetes mellitus since it has anti-diabetic and positive effects on blood lipid profiles.

2. Anthelmintic Activity:

Explains the goal of the current study was to investigate the anthelmintic activity of several leaf extracts from *Bougainvillea glabra* utilizing water, petroleum ether, ethyl acetate, and methanol as solvents. All of the extracts were tested at different concentrations (25 and 50 mg/ml), and the worms' paralysis and death times were recorded. Normal saline was used as the control and albendazole as the standard reference. According to the study, *Manihot esculenta* may be helpful in preventing earthworm infestations.

3. Antioxidant Activity:

Explains numerous medications, including antispasmodics, emetics, anti-cancer, antimicrobial, and others, are derived from plants. According to WHO estimates, 80% of people in underdeveloped nations still get their primary medical treatment from traditional medicine, primarily plant-based medications. Therefore, research into the antioxidant qualities of herbs that can be used to cure a variety of illnesses is desperately needed. Antioxidants serve a variety of physiological functions in the body because they block the oxidation process, even at very low concentrations. There are two types of antioxidants: natural and synthetic. According to recent reports, synthetic antioxidants like BHT and BHA are harmful to human health. Thus, in recent years, there has been a greater effort to find natural

compounds with anti-oxidative properties that are both effective and non-toxic. In this review, an effort has been made to give information about the antioxidant activity of *Bougainvillea Glabra*, which is an immensely showy, floriferous and hardy plant.

4. Antibacterial Activity:

Explains that the current study's objective was to assess and contrast the antibacterial activity of the extracts of *Bougainvillea glabra* "Snow White" and "Choicy" leaves. The cultivated cultivar of *Bougainvillea glabra* "Choicy," known as "Snow White," features white bracts with greenish veins. By looking at the zone of inhibition, the antimicrobial activity of various solvent extracts of these plant leaves was evaluated against strains of both Gram-positive and Gram-negative bacteria. Using ofloxacin (5 g/disc) as the reference, antimicrobial activity was assessed using the disc diffusion method at a concentration of 500 g/disc of the extract. *Staphylococcus aureus*, *Salmonella typhii*, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus vulgaris*, and *Vibrio cholera* were the bacterial strains used in the investigation. All microorganisms were more susceptible to the effects of the hydroalcoholic extract. While *B. glabra* "choicy" was ineffective against *Proteus vulgaris*, *B. glabra* "snow white" was ineffective against *Bacillus subtilis* and *Micrococcus leuteus*.^[12]

5. Analgesic activity:

When taken orally, *B. glabra*'s analgesic properties were assessed. The highest percentage of analgesic effect achieved in male Wistar rats utilizing the tail method for *B. glabra* methanol extracts was 79.88%. Using the acetic acid and formalin techniques, the analgesic efficacy of *B. buttiana* (var. Orange) ethanol extracts was investigated in female CD1 mice. The analgesic percentage for



the acetic acid approach was 95.65%, but the extract demonstrated inhibition in both stages for the formalin method. In a different investigation, the acetic acid, tail immersion, and formalin models were used to assess the analgesic efficacy of the *B. buttiana* ethanol extract in BALB/c mice following oral treatment. The extract had a strong analgesic impact across all techniques^[13]

5. Antiulcer activity:

The oral administration of extracts of acetone of leaves of *B. glabra* “Choicy” and their antiulcer effect were evaluated in male Wistar rats, and this extract showed a marked antiulcer activity.

6. Anti-diarrhoeal:

A significant anti- diarrheal activity was observed in male wistar rats orally treated with the acetone extract obtained from leaves of *B. glabra* “Choicy”.

7. Antipyretic:

The oral administration of methanol extracts from *B. glabra* in groups of rats showed a significant antipyretic activity^[13]

X. Bioactivities of *Bougainvillea glabra*:

Activity	Part used	Extract/compound	References
Anthelmintic	Leaves	Methanol	M. Chinna Eswaraiah et.al ^[14]
Anti-diarrhoeal	Leaves	Ethanol	Edwin et, al ^[15]
Antimicrobial	Leaves	Ethanol /aqueous	Edwin et, al ^[16]
Antioxidant	Flower	Methanol	Saleem H, Htar TT, Naidu R, Zengin G, Ahmad I, Ahemad N (2019). ^[17]
Antimicrobial	Flower	Methanol	P.M Ravikumar1 , Thangaraj Pratheep (2022). ^[18]
Analgesic	Bark	Methanol	Amir Hossain, Akbar Hossain, Sultana (2019). ^[19]
Anti-Cancer	Leaves	Hydro-alcoholic	Joshny J et.al. ^[20]

X. CONCLUSION:

Review research on *Bougainvillea glabra* Linn indicates that these plants have a vast amount of pharmacological potential. Many people firmly believe that comprehensive data on the different pharmacological and phytochemical characteristics of the extracts included in this review can offer comprehensive support for the application of this plant in a range of therapeutic applications. Regional differences exist in the phytochemical variety and therapeutic

effectiveness of *Bougainvillea glabra* Linn. A large portion of the global population still primarily obtains their medicine from plants today. The task of developing safe, effective, and reasonably priced medications still faces scientists, particularly in rural areas. In vitro, in vivo, and clinical trials are used to quantify these *Bougainvillea glabra* Linn species, as well as to determine the quantity of each phytoconstituent and their pharmacological profiles.



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