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Phytopharmacology Profile of *Bougainvillea glabra*: An Overview

Shweta Sehrawat*, Himesh Soni
GVM College of Pharmacy, Murthal Road, Sonepat. DHS, Bhopal(M.P.)

ABSTRACT

Plants are a source of huge amount of drugs compromising to different groups such as anti diabetic, antispasmodics, emetics, anti-cancer, anti-microbial etc. The WHO estimated that 80% of the population of developing countries still relies on traditional medicine, mostly plant drugs for their primary health care needs. Paper flower is the other name used for the Bougainvillea. Bougainvillea is a popular woody scandent shrub. The leaves of Bougainvillea glabra are reported to have anti- inflammatory activities, anti-hyperglycemic activity, insecticidal activity, anti hyperglycemic activity anti ulcer, antimicrobial and anti-diarrheal activity and its antiviral proteins. This review spotlights the recent updates on *Bougainvillea glabra* with reference to their morphology, phytochemistry and phytopharmacology.

Keywords: *Bougainvillea glabra* (*B.glabra*), bioactive constitute, phytochemical, pharmacological

*Corresponding Author Email: himeshsoni@rediffmail.com
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INTRODUCTION

Medicinal plants are of great significance to the health of individuals and communities. India is well known as the "Emporium of Medicinal Plants". Due to their great importance, demand of medicinal plants has increased numerous folds[1].Bougainvillea genus is an incredibly widespread group throughout the world. It belongs to the family Nyctaginaceae and, according to the "The Plant List", contains approximately18 species[2]. The objectives of this review are to provide recent update on *Bougainvillea glabra* with emphasis on their morphological characteristics features along with their phytochemistry and pharmacological activity. Bougainvillea was named after the world traveler, Louis de Bougainville, who discovered it in Brazil in 18th century and brought it to Europe where it became both widespread and popular[3]. Bougainvillea commonly name as the paper flower owing to bracts are thin and papery.

Bougainvillea glabra

Botanical description of *B.glabra*

Ethnobotany	**Vernacular names**	**Uses**	**Reference**
Taxonomical Classification Kingdom: Plantae Subkingdom: Tracheobionta Superdivision: Spermatophyta Division: Magnoliophyta Class: Magnoliopsida Subclass: Caryophyllidae Order: Caryophyllales Family: Nyctaginaceae Genus: Bougainivillea	English: Lesser Bougainvillea/Paper flower • Hindi: Booganbel • Manipuri: Cherei • Bengali: Baganbilas • Marathi: Booganvel • Konkani: Bouganvila • Telugu: Kagithala Puvvu	Coughing and Pertussis For the treatment of asthma, bronchitis, and dysentery. It also indicated for stomach pain, rust, pimples, and blackheads	4-8

Morphological description of *B. glabra*[9-10]

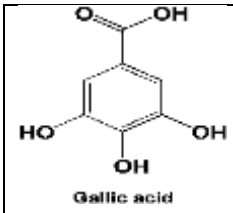
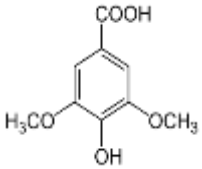
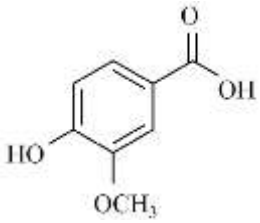
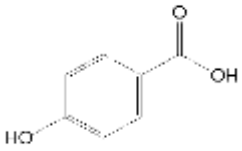
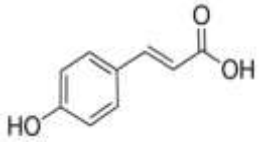
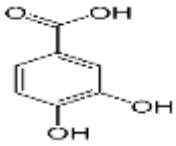
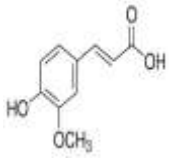
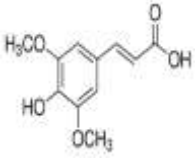
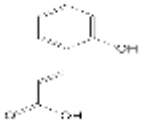
Leaves	**Flower**	**Tree**

		
The leaves are alternate, simple ovate-acuminate. Generally, 4–13 cm long and 2– 6 cm broad. Leaf Arrangement: Alternate Leaf Venation: Pinnate Leaf Persistence: Evergreen Leaf Type: Simple Leaf Blade: Less than 5 Leaf Shape: Lanceolate Leaf Margins: Undulate Leaf Textures: Smooth Leaf Scent: No Fragrance	Flower of the plant is small and generally white, but each cluster of three flowers is surrounded by three or six bracts with the bright colors associated with the plant, including pink, magenta, purple, red, orange, white, or yellow. Flower Showiness: True Flower Size Range: 0 - 1.5 Flower Type: Solitary Flower Sexuality: Monoecious (Bisexual) Flower Scent: No Fragrance Flower Color: Yellow, Orange, Red, Purple, Variegated, White Seasons: Spring, Summer	Evergreen, climbing woody vine. Its grows 1 – 12 m (4 – 40 ft). The woody trunk tends to be twisted and the thin stem has sharp thorns and dark green leaves.

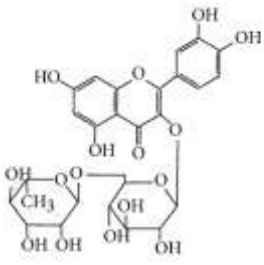
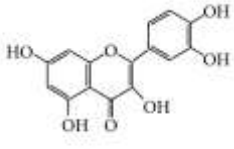
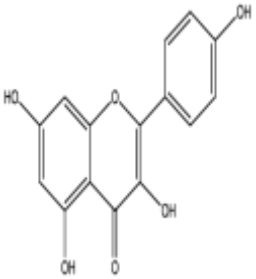
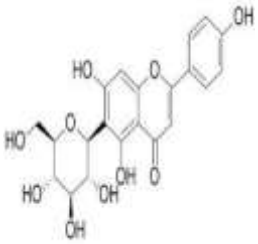
Phytochemistry of *B. glabra*

Preliminary phytochemical screening of leaves in different extracts revealed the presence of alkaloid, glycosides (minute amount), flavanoids, tannins, steroid, protein and saponins[11].*B.glabra* is rich source of Phenolic compounds present in flower and leaves. Some example of compounds are as follows.

***B. glabra* Flowers**	***B. glabra* Leaves**	**Reference**

 Gallic acid  Syringic acid	Vanillic acid 	12
p-Hydroxybenzoic acid 	Coumaric acid 	
Protocatechuic acid 		
Ferulic acid  Sinapic acid 		
2-Propenoic acid, 3-(2-hydrophenyl) 		

Various types of flavanoids reported in the *B.glabra*. They are as follows.

***B. glabra* Flowers**	***B. glabra* Leaves**	**Reference**
Rutin Quercetin Kaempferol  Rutin  Quercetin 	Isovitexin 	12-14
Apigenin	Vitexin B	

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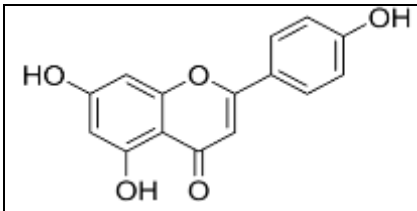
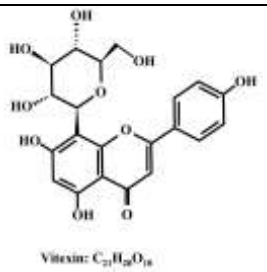
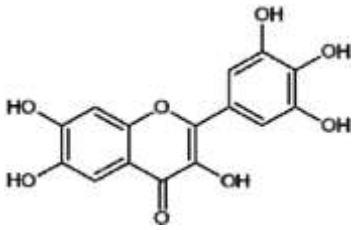
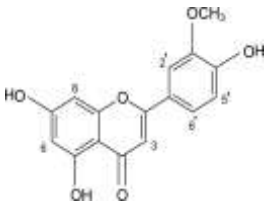
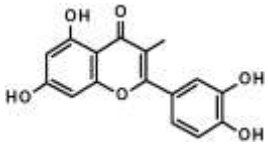
<tr><td>  </td><td>  </td><td rowspan="3"></td></tr>
<tr><td>Myricetin
  </td><td>Chrysoeriol
  </td></tr>
<tr><td></td><td>Luteolin
  </td></tr>
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Other important constituent present in B.glabra responsible for their therapeutic activity are[15-16].

Name	Nature	Activity
3-o-methyl-d-glucose tetradecanoic acid, ethyl ester	Sugar moiety	Anti cancer ,hypocholestrolemic
Phytol	diterpene	Antiinflamatory, antioxidant
9,12,15-octadecatrienoic acid	Linolenic acid ester	Hypocholestrolemic ,nematicide ,hepatopeotective, antiacne
Squalene	Triterpene	Antibacterial, antioxidant, immuno stimulant, Chemoprotective
Vitamine E	Vitamine compound	Antidiabetic, analgesic, antioxidant, hepatoprotective

Phyopharmacology of *B.glabra*

Bouainvillea glabra shows Antiulcer activity[17], Antidiarrheal activity[18], Antimicrobial activity and for cough &sore throat treatment. Plant also used for heptatitis and leucorrhea treatment, Act as antacid for reducing acidity[18].However B. glabra also shows Antibacterial activity[19], Antidiabetic activity[20], Antifertility activity[21]. Moreover Bougainvilea also possess Antioxidant activity[22]Antiinflammatory activity[23].

Previous Studies carried out on *Bougainvillea Glabra*

The anti-bacterial action of various extracts of Bougainvillea glabra 'Choicy' leaves may indicate their potential as antibacterial herbal remedies. Now there is use of these plants in the therapy against disease caused by the test bacterial species and other micro-organisms. It is possible that better therapy for many microbial diseases can be found in the leaves extracts. The preliminary results of this investigation indicates that Bougainvillea glabra 'Choicy' and Bougainvillea glabra 'Snow White' leaves have good potential of antimicrobial activity[24].

Investigation the anti-helmintic activity of different extracts of leaves of Bougainvillea glabra using petroleum ether, ethyl acetate methanol and water as solvents was carried out . Various concentrations (25 and 50mg/ml) of all the extracts were tested, which involved determination of time of paralysis and time of death of the worms. It was compared with Albendazole as standard reference and normal saline as control. The study indicated the potential usefulness of Manihot esculenta against earthworm infections. Anthelmintic activity of Bougainvillea glabra is confirmed by examining the time taken for paralysis (P) and death (D) for Pheretima posthuma worms were reported. methanolic extract of Bougainvillea glabra exhibited anthelmintic activity in dose dependent manner taking shortest time for paralysis (P) and death (D) with 50mg/ml concentration.so, it was observed that methanolic extract was more potent than the other three extracts (petroleum ether, ethyl acetate and water) even though chloroform and ethyl acetate extracts were not accomplished with anthelmintic property when compared with control and standard group. Thus, the activity revealed concentration dependence nature of the different extracts. It could be concluded that methanolic extract of Bougainvillea glabra showed most potent anthelmintic activity[25].

The studied carried out on ethanolic extract of B. glabra bract (EEBGB) to assess the antioxidant potential using 4 different antioxidant pathways, quantification of phenolics, flavanoids and betalains. The EEBGB showed high antioxidant activity (IC50)in DPPH free radical scavenging activity and superoxide radical scavenging. The EEBGB possessed good reducing power in FRAP (105.37 ± 5.3 mg TE/100 g of extract) and antioxidant capacity with ORAC score of 166,920 ± 27,962 µM TE/100g[26].

Investigation of anti-hyperlipidemic activity was carried out on the extract of Bougainvillea glabra leaves against triton induced hyperlipidemia in rats. Ethanolic extract, aqueous extract, chloroform fraction of ethanolic extract and ethylacetate fraction of ethanolic extract administered at different doses to the triton induced hyperlipidemic rats. Bougainvillea glabra has shown a significant decrease in the levels of serum cholesterol, triglyceride, LDL and significant increase in the level of serum HDL[27].

The antidiabetic and antilipidemic effects of Bougainvillea glabra was investigated in this study using 25 male wistar rats.. The results revealed that the extract significantly ($p< 0.05$) reduced

the hyperglycaemia from 12±0.40 mmol/L (Diabetic Control) to 4.04±0.03 mmol/L (400 mg/kg group). Likewise, the extract significantly reduced the Total Cholesterol (TC), Triglyceride (TG) and Low-Density Lipoprotein Cholesterol (LDL Cholesterol), while increasing the High-Density Lipoprotein Cholesterol (HDL-C). In conclusion, the observations from this study show that Bougainvillea glabra has antidiabetic effect and beneficial effects on blood lipid profile, thus justifying the use of the plant by traditional medicine practitioners for the treatment of diabetes mellitus[28].

The work was establish to assess the properties of Bougainvillea glabra leaf extract and chitin synthesis inhibitor, flufenoxuron on larvicidal and pupicidal activity against the paddy army worm, Spodoptera mauritia. The methanol extract of B. glabra leaves showed larvicidal and pupicidal activity, after 24 h of exposure; against third- to sixth- instar larvae and pupae of S. mauritia, with obtained values of LD50=5.340% in 3rd instar, 9.730 % in 4th instar,14.891% in 5th instar and 18.755 % in 6th and 21.468% in pupae respectively. Moreover, combined treatment of the B. glabra and flufenoxuron LD50 values of 3rd instar was 0.638 %,4th instar was 1.571%, 5th instar was 2.475 %, and 6th instar was 4.768 %, and pupae was 8.266 %, respectively. The results showed the leaves extract of B. glabra and insect growth regulator, flufenoxuron are best choice for controlling Spodoptera mauritia. Hence, B. glabra and flufenoxuron can be considered for eco-friendly pest control programs[29].

Anti-diarrhoeal and reducing anti–oxidant power of Bougainvillea glabra “Snow White” was carried out. An animal study (antidiarrhoeal activity) was carried on experimental albino rats. Extract of leaf was extracted by soxhlet apparatus by using hydro alcoholic solvent (50:50). hydroalcoholic extract in 200 mg kg-1 and 400 mg kg-1 doses were administered in two group and loperamide was administered in dose 3mg kg-1 in separate group. After 5 h fecal matter was collected and test groups were compared with those in the control animals and analyzed statistically. The extracts were shown anti diarrhoeal activity and reducing antioxidant power. These activities were statistically significant ($P< 0.05$) when compared with control. These results suggest that Bougainvillea glabra “Snow White” is able to reduce free radical and effective in bowl imbalance[30].

Acute toxicity studies

The acute toxicity studied were carried out by Gupta *etal* [31]and the extracts were safe up to the dose of 2000 mg kg^{-1}.

CONCLUSION

This review focus the ethno-medical, phytochemical, pharmacological and toxicological uses of the Bougainvillea glabra. The plant showed potential source of natural antioxidant due to presence of various bio-active substances which neutralizes free radicals which could cause

oxidative damage of cell membranes and DNA and thereby possess various pharmacological effects.

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