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Study of Phytochemicals Profile of Using Different Solvent of Fruit Extract of Gardenia latifolia Ait.

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Abstract - This research paper investigates the organic constituents of Gardenia latifolia, a plant known for its medicinal properties. The study focuses on the isolation, characterization, and activities of these constituents. Plant material was extracted with suitable solvents, and the organic compounds were isolated and purified. Characterization was conducted using spectroscopic methods, including FTIR. The results provide valuable insights into the potential in effects of Gardenia latifolia organic constituents.
Keywords : Gardenia latifolia, antioxidant, suitable solvents.

Introduction - Gardenia latifolia *(G. latifolia*) is a plant that belongs to the family Rubiaceae. It is commonly known as “Cape jasmine” or “Gardenia.” The plant is native to Asia, Africa, and the Pacific Islands. Gardenia latifolia is known for its fragrant flowers and has been traditionally used in various medicinal preparations.Because of the presence of secondary metabolites, this species has been utilized for medical purposes in addition to being used to make toys. According to reports, G. latifolia fruits are employed in folk medicine to cure a variety of conditions, including snake bites, transitory fever in live animals, skin conditions, dental caries, stomach ache, and hemorrhage in humans [1-2]. Furthermore, because fruit extract has a high concentration of yellow pigments, it is also employed as food additives and dye [4].

The fruit of G. latifolia is nutrient-rich and has therapeutic qualities, although little is known about the precise phytochemical analysis that gives these benefits.Isolation and characterization of the organic constituents of Gardenia latifolia involve extracting the plant material with suitable solvents, followed by purification and analysis using techniques such as chromatography and spectroscopy [3].

The biological activities of these constituents can be studied using in vitro assays to assess their potential pharmacological effects, such as antioxidant, anti-inflammatory, or antimicrobial properties.Medicinal plants are useful for curing human diseases and play an important role in healing due to presence of phytochemical constituents. Based on potent biological actions, natural product chemists have been trying hard to isolate and identify bioactive leads from plant sources [4]. Gardenia latifolia Ait. is a small deciduous tree or large shrub growing up to 3 m tall. It is an excellent painkiller and acts as an antiseptic for healing wounds. It is also used in the treatment of diseases like skin problems, indigestion, worm infestation, and diarrhea. It is an excellent pain killer and acts as an antiseptic for healing wounds. It is also used in the treatment of diseases like skin problems, indigestion, worm infestation, and diarrhea. In addition to that, it is known to relieve cough, asthma, and hiccup, constipation, and flatulence [5].

After that, we have study in details of phytochemical profile of organic chemical compounds or molecules present in bark of Gardenia latifolia plant was available in literature.Due to its broad spectrum healing potential, this medicinal tree can serve as a promising research target for various scientific studies. Bark of this plant contains saponins which may find use in asthma due to their inhibitory effect on histamine production. Phytochemical analysis led to isolation of hederagenin, D-mannitol, sitosterol and siaresinolic, episiaresinolic, oleanolic and spinosic acid from the stem bark of G. latifolia [6].

The biological activities of the organic constituents of Gardenia latifolia can be of significant importance due to their potential pharmacological effects. Some of the key biological activities that these constituents may exhibit include:

1. Antioxidant Activity: Organic compounds such as flavonoids and phenolic compounds found in Gardenia latifolia may possess antioxidant properties, which can help protect cells from oxidative stress and damage.

2. Anti-inflammatory Activity: Compounds like iridoids and triterpenoids present in Gardenia latifolia may exhibit anti-inflammatory effects, which could be beneficial for reducing inflammation-related diseases.

3. Antimicrobial Activity: Certain organic constituents of Gardenia latifolia may have antimicrobial properties, which could help in combating various bacterial, fungal, and viral infections.

4. Anticancer Activity: Some studies suggest that organic compounds from Gardenia latifolia may have potential anticancer properties, although further research is needed to validate these claims.

5. Hepatoprotective Activity: Compounds in Gardenia latifolia may exhibit hepatoprotective effects, which could be beneficial for liver health and function.

6. Neuroprotective Activity: There is some evidence to suggest that organic constituents of Gardenia latifolia may have neuroprotective properties, which could be valuable for conditions affecting the nervous system.

7. Anti-diabetic Activity: Certain compounds in Gardenia latifolia may exhibit anti-diabetic effects, which could be useful in managing diabetes and related complications.

8. Anti-obesity Activity: Some studies suggest that organic constituents of Gardenia latifolia may have anti-obesity properties, although more research is needed to confirm these findings.

Overall, the organic constituents of Gardenia latifolia hold promise for various medicinal applications, but further research is needed to fully understand their biological activities and potential therapeutic benefits.

Gardenia latifolia contains a variety of phytochemicals, which are natural compounds produced by plants that often have biological activity. Some of the main phytochemicals found in Gardenia latifolia include:

1. Iridoids: These are a class of compounds known for their diverse pharmacological activities, including anti-inflammatory, antioxidant, and hepatoprotective effects. Examples of iridoids found in Gardenia latifolia include geniposide and gardenoside.

2. Flavonoids: Flavonoids are antioxidant compounds that are known for their potential health benefits, including anti-inflammatory, anti-cancer, and neuroprotective effects. Examples of flavonoids in Gardenia latifolia include quercetin and kaempferol derivatives.

3. Triterpenoids: Triterpenoids are another class of compounds found in Gardenia latifolia that have been studied for their potential pharmacological activities, including anti-inflammatory and anti-cancer effects. Examples include ursolic acid and oleanolic acid.

4. Phenolic Compounds: Phenolic compounds are antioxidants that can help protect cells from damage caused by free radicals. Gardenia latifolia contains various phenolic compounds, such as gallic acid and ellagic acid derivatives.

5. Carotenoids: Carotenoids are pigments responsible for the yellow, orange, and red colors in many fruits and vegetables. They also have antioxidant properties. Gardenia latifolia may contain carotenoids such as â-carotene.

6. Essential Oils: Gardenia latifolia may contain essential oils that contribute to its aroma and flavor. These oils may also have various biological activities, including antimicrobial and antioxidant effects.

7. Alkaloids: While less common in Gardenia latifolia, alkaloids are nitrogen-containing compounds with diverse pharmacological activities. Examples of alkaloids found in some Gardenia species include gardenine and genipin.

These phytochemicals contribute to the medicinal properties of Gardenia latifolia and make it a valuable plant in traditional medicine and potentially in modern pharmacology.

To better understand phytochemical substances and their potential as anti-inflammatory, antibacterial, anti-diabetic, and antioxidant chemicals, some research has been done [5, 6]. Certain phyto-constituents, including hederagenin, D-mannitol, sitosterol, and siaresinolic, episiaresinolic, oleanolic, and spinosic acids, were found in stem bark by Reddy et al. [7]. Nevertheless, there hasn't been any thorough investigation of the phytochemical components in G. latifolia extract. Therefore, it is crucial to identify the compounds in the extract of G. latifolia due to the enhanced efficiency and solubility of the different chemicals in methanol, ethyl acetate, chloroform and hexane [7-8].

In this paper, study extract the solvent systems for phytochemicals extraction from *G. latifolia* has been done using hexane, chloroform, ethyl acetate and methanoland also was confirmed the phytochemicals bymeasurement of FTIR spectra.

Materials and methods

1. Collection of plant material:

i. Bark of Gardenia latifolia Ait. was collected from plant. After collection of bark of G. latifolia were rinsed with running tap water followed by sterile distilled water to remove the dirt on the surface and cut into small pieces.

ii. After that dried at temperature not exceeding 35 to 50°C and followed by the grinding using Herbs Grinding Machine. It was stored in desiccator till the further study.

2. Preparation of Extracts: For the selection of solvent systems for phytochemicals extraction from *G. latifolia* has been done using hexane, chloroform, ethyl acetate and methanol. The process has been same except solvents has to be change for evaluation of more phytochemicals present in different solvent.

i. The powdered material was subjected to hot extraction with hexane/chloroform/ethyl acetate and methanol by the Soxhlet apparatus for 10h.

ii. The extraction was carried out for about 10 h and the extract was filtered through a cotton plug followed by what-man filter paper no. 1.

iii. The extract was then concentrated by evaporating the

solvent bellow 45°C temperature. The concentrated extract was stored at 4 °C until further analysis.

iv. After evaporation of the solvent, a gummy concentrate was obtained which was designated as methanol crude extract of G. latifolia (MGL).

Results and Discussion

1. Phytochemical Screening of G. latifolia Extract: Preliminary phytochemical screening tests are important for the identification of bioactive principles and may subsequently guide drug discovery and improvement. In the present study, several phytochemical constituents of *G. latifolia* were identified. Among various solvents evaluated in the study, methanolic extract showed presence of alkaloids, saponins, glycosides, flavonoids and particularly phenols and terpenoids. In hexane, no compounds were present, while chloroform manifested the presence of phenols and flavonoids. Ethyl acetate showed presence of phenols, flavonoids, glycosides and terpenoids. The results of the phytochemical analyses are presented in Table 1. Such phytochemicals may provide new avenues for the development of new classes of pharmaceutical, biopesticidal, insecticidal, and antimicrobial agents. Previously, various organic extracts of *G. latifolia* leaves were reported to contain flavonoids, tannins, and fixed oil. [10] These phytochemical compounds are the top candidates conferring medicinal value to this plant. Indeed, the most abundant compounds found in all solvent extracts in the present study, including several flavonoids, glycosides, terpenoids, and alkaloids isolated from this plant, have been reported to exert diverse biological activities

Table 1 (see in next page)

Presence of majority compounds in methanolic extract implies that the solvent is having potential owing to its higher efficiency and solubility of phytochemical compounds. Hence, characterization of phytochemical compounds from *G. latifolia* has been done using methanol. Phenolic compounds are important class of secondary metabolites in plants that predominantly help in defense against pathogens, parasites, and predators.Researchers reportedin several papers that the phenolic compounds possess antioxidants, anti-bacterial, anti-atherosclerotic, anti-cancer, anti-viral and anti-inflammatory activities [9]. Flavonoids showed anti-allergic, anti-inflammatory, anticancer, antithrombotic, antimicrobial, antiviral, and hepato-protective properties owing to their ability in scavenging the free radicals effectively. Terpenoids have been reported with antibiotic, antiseptic, anti-helminthic and insecticidal activities.

2. FTIR analysis: FTIR spectroscopy revealed the Numerous functional groups, including phenols, amines, alcohols, alkenes, carboxylic acids, aliphatic compounds, carbonyl compounds, and esters, were detected by FTIR spectroscopy. Figure 1 displays representative FT-IR spectra of the extracts of methanol, ethanol, and ethyl acetate. Bands relating to the stretching hydroxy (-OH) group vibration were seen at 3465, 3458, and 3460 cm^1. The stretching vibration of the C=C groups, which include cyclic structures with a ring resonance bond that affords enhanced stability, and the vibration of the C=O groups of the flavonoids and lipids may have resulted in the bands detected at 1629 cm^1 and 1630 cm^1. The CH_3 and CH_2 groups of flavonoids and aromatics may be connected to the band at 1345 cm^1.The stretching vibration of the aromatics and the bending vibration of C-H would be the vibrations in this case. The stretching vibration of the carboxyl group (O-H and C-O stretch), or the stretching of the COOH groups in flavonoids and lipids, was linked to the bands at 1250 cm1 and 1247 cm^1. C-O stretching in the ester groups was linked to bands at 1126 and 1130 cm^1. The C-C stretching vibration was the cause of the band at 778 cm^1. The band at 2295 cm^1 may have been associated with the stretching vibration of the O-H groups in carboxylic acid as well as the C-H stretching vibration of the methyl and methoxy groups.

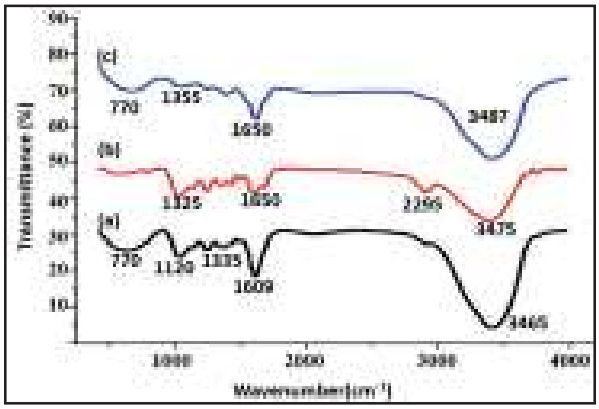

Figure 1. Fourier transform–infrared spectra of (a) methanol, (b) ethyl acetate, and (c) chloroform in *G. latifolia* leaf extracts.

Conclusions: Phytochemical compounds of G. latifolia fruits showed several secondary metabolites such as saponins, alkaloids, glycosides, phenols, terpenoids and flavonoids having various putative functions. FTIR spectra reflects the antioxidant activity of methanolic fruit extract showed that it has huge potential to be used in medicinal purpose as well as food industry.

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Table 1- Preliminary phytochemical analysis of G. latifolia fruit extracts.

Solvent Extract	Phytochemicals					
	Alkonides	Phenols	Flavonoids	Saponins	Glycosides	Terpenoids
Hexane	-	-	-	-	-	-
Chloroform	-	+	+	-	-	-
Ethyl acetate	-	+	+	-	+	+
Methanol	+	++	+	+	+	+++

"+++" high; "++" moderate; "+" weak; -absent

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