



**INTERNATIONAL JOURNAL OF  
PHARMACEUTICAL SCIENCES**  
[ISSN: 0975-4725; CODEN(USA): IJPS00]  
Journal Homepage: <https://www.ijpsjournal.com>



## Research Article

# Phytochemical Investigation and Antibacterial Activity of *Gnidia glauca*

**Narendra Jadhav, Pranav Jadhav, Vandana Dongare\*, Farida Inamdar, S. S. Wadkar**

Department of Biotechnology and Microbiology, Kasturbai Walchand Arts, Science College, Sangli, Maharashtra, India.

## ARTICLE INFO

Published: 08 Mar. 2025

### Keywords:

Antibacterial Activity,  
*Gnidia glauca*,  
Phytochemical  
Investigation.

### DOI:

10.5281/zenodo.14992044

## ABSTRACT

The increase of antibiotic resistant is a substantial worldwide health challenge, and researchers are discovering various strategies to fight this issue, including potential role of plants. Medicinal plants have potential to play a significant role in the fight against antibiotic resistance. *Gnidia glauca* used in medicine for the treatment of cancer, wound, burns, snake bites. The plant was evaluated for phytochemical and antibacterial property. A fruit, flowers, leaves and stems of this plant are the reservoirs of naturally occurring phytochemical. Therefore, this study aimed at determining the phytochemicals and antibacterial activities of *Gnidia glauca*. Evaluation of phytochemical and antibacterial potential of *Gnidia glauca* leaves; ethanol and water were used for preparation of test extracts. The antibacterial activity was screened against Gram positive bacteria *Bacillus megaterium*, and Gram negative *Pseudomonas aeruginosa*, *S. typhi*, *E. coli*, *E. coli* O157:H7, *S. paratyphi* using streptomycin as reference drug. The phytochemical screening revealed that presence of alkaloids, flavonoids, steroids and tannin in aqueous extract. The ethanolic extract showed presence of alkaloids and flavonoids. Well diffusion method was used to assess the antibacterial effect of the extracts on micro-organisms. The ethanolic and aqueous extracts were active against all strains, when it is compared with standard streptomycin. Results concluded that *Gnidia glauca* having tremendous antibacterial potential.

## INTRODUCTION

*Gnidia glauca* commonly known as 'Rametha' vernacular name is Datpadi. *Gnidia glauca* is a plant belonging to family Thymelaeaceae[1]. It is used as antiviral agent against rabies. In the

agriculture the plant used as insecticide, pesticide and even larvicidal agents. Fruits, flowers, leave and stems of this plant are the reservoirs of naturally occurring phytochemical. Ayurveda is also a traditional strength in India and many

**\*Corresponding Author:** Vandana Dongare

**Address:** Department of Biotechnology and Microbiology, Kasturbai Walchand Arts, Science College, Sangli, Maharashtra, India.

**Email** ✉: [gavadejp@gmail.com](mailto:gavadejp@gmail.com)

**Relevant conflicts of interest/financial disclosures:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



research scholars now recommend for natural remedies regarding some diseases that were already completely treated with the help of phytochemical components. Phytochemical analysis is extremely beneficial to the next generation of scientists. To determine how much phytochemicals will be effective for new diseases like COVID-19, we must develop new methods for analyzing phytochemicals [2]. Phytochemicals are the natural compounds found in all plant parts and work together with nutrients and fibres to act as a defence system in plants and protect human against diseases [3]. Phytochemicals such as alkaloids, terpenes, flavonoids, lignans, plant steroids, curcumines, saponins, phenolics, flavonoids and glycosides [4]. Medicinal plants constitute the main source of new pharmaceuticals and healthcare products. In industrialized countries, these plants have been extracted and used in the development of new drugs. They constitute the basis of health care throughout the world since the ancient days and are still widely used and have considerable importance in international trade. Approximately 20% of the world plants have been subjected to pharmacological or biological test and it could be said that natural products of plant origin are important source of constituents that could be developed into drugs, dyes, fragrance and pesticides. These plants contain secondary metabolites (alkaloids, flavanoids, saponins, steroids, tannins and phenolic compounds), vitamins and minerals which are bioactive compounds and have been known to have antimicrobial properties, medicinal importance physiological effect in animals and are widely distributed among different plant species. Also, these compounds are found in varying concentrations in human and animal diets [5]. *G. glauca* leaf phytochemicals prepared as solvent extracts that proved to be significantly effective against *X. oryzae*, can be used as antibacterial

agents to control/manage the bacterial blight disease. Further efforts are needed to explore the possible potential of *G. glauca* as a biopesticide that can be applied at the field level on rice/paddy crop, along with currently being used controlling agents for the bacterial blight [6]. Evaluation of phytochemical and antibacterial potential of *Gnidia glauca*(Fresen) ethanol, petroleum ether and water were used for preparation of test extracts[7]. Complex synergistic interplay of the composite mixture of compounds present in plants may be the rewind of their beneficial effects [8]. *Gnidia glauca* is traditional medicinal plants that can be considered as sources of natural antioxidants [9]. Natural antioxidants have the ability to inhibit the processes of oxidation and the growth of microorganisms, including many pathogenic ones, e.g., *Salmonella spp.* and *Escherichia coli*[10]. Taking in to account the increasing number of antibiotic-resistant bacteria, actual research focused on plant extracts. The aim of the present work was to investigate the phytochemical of leaf extracts of *Gnidia glauca* and screening of antibacterial activity of Leaf extracts against bacteria.

## MATERIALS AND METHODS

### Chemicals and reagents

Ethanol, Nutrient agar, DMSO, Wagner's reagent, Molish reagent, 5% Ferric chloride, 10% Alcoholic Ferric Chloride, 10% NAOH, Distill Water, HCL, H<sub>2</sub>SO<sub>4</sub>, Glacial Acetic Acid, 20% NaOH, Chloroform. All chemicals used for the study were of AR grade and purchased locally.

### Plant material

#### Authentication of the plant

Fresh and healthy leaves of *Gnidia glauca* was collected from the various localities of Patan Satara on August 2024 and identified by the Botany Department of Kasturbai Walchand College, Sangli. The material was washed with water and dried it completely to obtain fine powder.



## **Preparation of extract**

### **For Aqueous Extract**

20-gram powder of plant was weighed and transferred into 200ml conical flask. 200 ml Water and 20 ml chloroform were added in flask. The conical flask was closed by foil paper and placed at Room temperature for 7 Days. The crude extracts were then filtered by passing the extracts through Whatmann No. 1 filter paper.

### **For Ethanol Extract**

20-gram powder of plant was weighed and transferred into 200ml conical flask. 200ml of Ethanol was added in flask. The conical flask was closed by foil paper and placed at Room temperature for 7 Days. The crude extracts were then filtered by passing the extracts through Whatmann No.1 filter paper.

These extracts (Ethanolic and aqueous) were stored at 4°C and used in further process [11].

### **Phytochemical Investigation of aqueous and ethanolic Extract–**

Qualitative Phytochemical Investigation of aqueous and ethanolic extracts were carried out for the detection of phytoconstituents.

**Test for Alkaloids-Wagner's test-** To about 1ml of extract few drops of Wagner's reagent were added. Reddish – brown precipitate indicates presence of alkaloids.

### **Test for Flavonoids-**

**Lead acetate test-** 1ml of extract was taken and 10% of lead acetate was added. The yellow precipitate is positive inference for the flavonoids.

**H<sub>2</sub>SO<sub>4</sub> test-** The extract is treated with concentrated H<sub>2</sub>SO<sub>4</sub> resulting in the formation of orange indicates the positive result for flavonoids.

### **Test for Carbohydrates–**

**Benedict's test** - About 0.5 ml of the filtrate was taken to which 0.5 ml of Benedict's reagent is added. This mixture was heated for about 2 minutes in a boiling water bath. The appearance of

green, yellow and red precipitate indicates the presence of sugars.

**Test for steroids-** 2ml of extract with 2ml of chloroform and 2ml of concentrated H<sub>2</sub>SO<sub>4</sub> are added, the appearance of red colour and yellowish green fluorescence indicates the presence of steroids.

### **Test for protein**

2ml of filtrate was taken to which 1 drop of 2% copper sulphate solution was added; 1ml of 95% ethanol was added. Then it was followed by excess addition of KOH. The appearance of pink colour indicates the presence of protein.

**Test for amino acid-** To 1ml of the extract, few drops of ninhydrin reagent (10mg of ninhydrin in 200ml of acetone) were added. The appearance of purple colour indicates the presence of amino acids.

**Test for tannins-** To 5ml of extract few drops of neutral 5% ferric chloride solution was added, the production of dark green color indicates the presence of tannins[12].

### **Methods for Assessing Antimicrobial activity – Microbial strains for testing**

The organisms used were gram positive *Bacillus megaterium* and gram negative *E. coli*, *Pseudomonas aureogen*a, *S. typhi*, *E.Coli* Devis, and *S.Paratyphi*. The organisms were obtained from MTCC Chandigarh were maintained on nutrient agar medium and retrieved when required. Sub culturing was done at the interval of 15 days.

### **Antibacterial activity:**

Both the extract will be screened for antimicrobial activity. Agar well diffusion method is widely used to evaluate the antimicrobial activity of plant extracts. The Nutrient agar plate surface is inoculated by spreading a volume of the microbial inoculum over the entire agar surface. Then, a hole with a diameter of 6 to 8 mm is punched aseptically with a sterile cork borer or a tip, and a volume (50 and 100 µL) of the antimicrobial agent or extract solution at desired concentration



(5mg/ml) is introduced into the well. Then, agar plates are incubated under suitable conditions depending upon the test microorganism. The antimicrobial agent diffuses in the agar medium and inhibits the growth of the microbial strain will be tested [13].

## RESULT

**Table 1: Qualitative Phytochemical Screening of Ethanol and Aqueous Leaf Extract of *Gnidia glauca***

| Solvent used For extraction | Alkaloids | Flavonoids | Amino acids | Carbohydrates | Protein | Steroids |
|-----------------------------|-----------|------------|-------------|---------------|---------|----------|
| Ethanol                     | +         | +          | –           | –             | –       | –        |
| Aqueous                     | +         | +          | –           | –             | +       | +        |

Groups of secondary plant metabolites, antioxidant phenolics, and flavonoids are commonly found in various fruits, vegetables and herbs and they have been shown to provide a fruitful defence against oxidative stress from oxidizing agents and free radicals [14]. Studies have shown that plants, with their different parts, are rich in phytochemicals like phenolic acids and flavonoids that have therapeutic potentials such as antimicrobial, anti-carcinogenic and antioxidant potential [15]. Tanins and flavonoids have been reported to possess biological activities that lead to

Phytochemical analysis of aqueous and ethanolic extracts was carried out and obtained results were shown in Table 1. The present study reveals that *Gnidia glauca* plant shows the presence of phytochemical constituents like alkaloids, flavonoids, steroids and proteins in aqueous, while in ethanol presence of alkaloids and flavonoids as shown in Table 1.

prevention and management of many ailments [16]. Antibacterial activity of *Gnidia glauca* was seen against several bacteria namely *Bacillus megaterium*, *Bacillus thuringensis*, and gram negative *E.coli*, *Pseudomonas aurogena*, *S. typhi*, *E.Coli* Devis, and *S.Paratyphi* in Table 2 & 3. The ethanol leaf extract showed maximum activity against *E.coli* Davis and *Bacillus megaterium* shown in the Table 3. Antibacterial results compared using standard streptomycin shown in Table 4.

**Table 2: Antibacterial activity of Aqueous Extract of *Gnidia glauca***

| Extract                       | Antibacterial activity<br>Zone of inhibition<br>(mm) |       |
|-------------------------------|------------------------------------------------------|-------|
|                               | 50µl                                                 | 100µl |
| <i>Escherichia coli</i>       | 6                                                    | 9     |
| <i>Escherichia coli</i> devis | 5                                                    | 9     |
| <i>Bacillus meagaterium</i>   | 7                                                    | 11    |
| <i>Salmonella typhi</i>       | 4.5                                                  | 9     |
| <i>Salmonella paratyphi</i>   | 4                                                    | 10    |
| <i>Pseudomonas aerogenosa</i> | 3.5                                                  | 8     |

**Table 3: Antibacterial activity of Ethanolic Extract of *Gnidia glauca***

| Organism                      | Antibacterial activity<br>Zone of inhibition<br>(mm) |       |
|-------------------------------|------------------------------------------------------|-------|
|                               | 50µl                                                 | 100µl |
| <i>Extract</i>                |                                                      |       |
| <i>Escherichia coli</i>       | 11                                                   | 12    |
| <i>Escherichia coli devis</i> | 11                                                   | 14    |
| <i>Bacillus meagaterium</i>   | 11                                                   | 13    |
| <i>Salmonella typhi</i>       | 8                                                    | 10    |
| <i>Salmonella paratyphi</i>   | 10                                                   | 13    |
| <i>Pseudomonas aerogenosa</i> | 8                                                    | 12    |

**Table 4: Antibacterial Activity of Standard Streptomycin**

| Organism                      | Antibacterial activity<br>Zone of inhibition (mm) |
|-------------------------------|---------------------------------------------------|
|                               | 50µl                                              |
| <i>Escherichia coli</i>       | 40                                                |
| <i>Escherichia coli devis</i> | 34                                                |
| <i>Bacillus meagaterium</i>   | 43                                                |
| <i>Salmonella typhi</i>       | 20                                                |
| <i>Pseudomonasaerogena</i>    | 35                                                |
| <i>Salmonella paratyphi</i>   | 33                                                |

Antibacterial activity of *Gnidia glauca* was seen against several bacteria namely *Bacillus megaterium*, and gram negative *E.coli*, *Pseudomona saurogena*, *S.typhi*, *E.Coli Devis*, and *S.Paratyphi* in Table 2& 3. The ethanol leaf extract showed maximum activity against *E.coli davis* and *Bacillus megaterium* shown in the Table 3

#### DISCUSSION –

Several studies showed that medicinal plants have bioactive components, like flavonoids and phenols, with such various functions as bacteriostatic, bactericidal, chemotherapeutic, and antimicrobial functions[17].The antibacterial activity of ethanolic and aqueous extracts were estimated using the well diffusion method against gram- positive ( *Bacillus megaterium*) and gram-negative (*E. coli*, *Pseudomonas aurogena*, *S.typhi*, *E.Coli Devis*, and *SParatyphi*) bacteria that are common etiology of skin and wound infections. The findings revealed *both the extracts showed inhibition zone against Bacillus megaterium E.coli, Pseudomonas aurogena, S. typhi, E.Coli Devis, and S.Paratyphi*(Table 2.and 3.).

Consumption of fruit is known to provide a wide variety of flavonoids, which play a protective role by reducing the risk for cancer and cardiovascular diseases. The present study showed the presence of flavonoids in aqueous and ethanolic extract.[18] Flavonoids shows anti-inflammatory, antimicrobial, antioxidant, vascular activities along with other medicinal properties [19] and it has been found only in aqueous and ethanolic extract of flowers. Several reports on the antimicrobial activity of flavonoids are available [20]. Tannin may be toxic to bacteria, yeast and filamentous fungi[21], have potential antiviral[22]and antibacterial activity[23]. The ethanolic and aqueous extract (50 µl and 100 µl) found effective against *Bacillus megaterium*, and gram negative *E. coli*, *Pseudomona saurogena*, *S. typhi*, *E.Coli Devis*, and *SParatyphi*. The study shown presence of novel compounds in *Gnidia glauca*. The results obtained may support the use of *Gnidia glauca* in traditional medicine for the treatment of various diseases and drug developments.



## CONCLUSION:

Skin and wound infections are among the most common health problems affecting people of all ages. Nowadays, the effects of natural products from plants and the mechanisms of their activity have been studied experimentally, with results showing a complex effect of these products, useful in the therapy of skin and wound infections. The research concludes that aqueous extract of leaves of *Gnidiaglauca* are the rich source of valuable phytochemicals as compared with ethanol extract. It was estimated that aqueous extract is efficient solvent system to yielding high amount of phytochemicals than that of ethanol extract. Both the extracts having significant potential for antimicrobial activity. The research on the phytochemical composition and antibacterial activity of *Gnidiaglauca* leaf extracts aims to contribute to the understanding of its potential health benefits, support its traditional uses, and explore its application in developing novel antibacterial agents. Such studies can also cover the way for further research into natural products and their derivatives in combating antibiotic resistance.

## REFERENCES

- Godghate, Ashvin & Patil, Rahul & Sawant, Rajaram. (2015). *Gnidiaglauca* (Fresen) Gilg: Phytochemical and antibacterial view. International Journal of Recent Scientific Research. 6. 4854-4857.
- Arshi Siddiqui, Hira Moid. An Introduction on phytochemical Analysis and their Types. Der Pharmacia Letter, 2022, 14(2):01-05.
- Mohan, Brij & Kakkar, Arun. (2020). Evaluation of phenolic, flavonoid contents and antioxidant activity in leaves, stem and roots of *Solanum indicum* Linn.. Environment Conservation Journal. 21. 167-172. 10.36953/ECJ.2020.211221.
- Mamta Saxena, Jyoti Saxena, Rajeev Nema, Dharmendra Singh, and Abhishek Gupta. Phytochemistry of medicinal plants. Journal of pharmacognosy and phytochemistry, 1(6): 1-15.
- Ochekwu, Edache Bernard, Ekeke, Chimezie, Nwadiaro, Pat O2 and Christopher, Sampson. Journal of Pharmacy and Biological Sciences, 2015, 10(2):26-31.
- Sannabommaji, Torankumar. . Antibacterial Activity of *Gnidiaglauca* (Fresen) Gilg. Phytochemical Extracts against Rice Bacterial Blight Pathogen *Xanthomonas oryzae*. International Journal of Pure & Applied Bioscience. 2019, 7: 287-296.
- Ashvin G. Godghate, Rahul Shivaji Patil. Rajaram S. Sawant (2015). Phytochemical and Antibacterial view *Gnidiaglauca* (FRESEN) Recent scientific Research, 6, 4854-4857
- Abhilashsk, Ajay kv, Ramesh Renukaradhyak. *Lasiosiphonglaucus* a potenter botanical medicinal plant against breast cancer targeting multiple pathways on invitro study. Pharma Bio science, 2022, 8, 742-749.
- Sougata Ghosh et al. Phytochemical analysis and free radical scavenging activity of medicinal plants *Gnidiaglauca* and *Dioscorea bulbifera*, National library of medicine, 2013, 8(12)
- Flieger, J.; Flieger, W.; Baj, J.; Maciejewski, R. Antioxidants: Classification, Natural Sources, Activity/Capacity Measurements, and Usefulness for the Synthesis of Nanoparticles. Materials 2021, 14,
- Chibuye Bitwella, Singh Sen Indra, Chimuka Luke, Maseka Kenneth Kakoma. A review of modern and conventional extraction techniques and their applications for extracting phytochemicals from plants, Scientific African (2023) 1-19.
- Nivedita Patel, Pinal Patel, Dhara Patel, Sharav Desai, Dhananjay Meshram. Phytochemical analysis and antibacterial activity of *Moringa olifera*, 2014, 4(2): 27-34.
- Mounyr Balouiri. Moulay Sadiki, Saad Koraichi, Ibusouda, 2016, Methods for in



- vitro evaluating antimicrobial activity: A review, *Journal of Pharmaceutical Analysis*.
14. Ahmed, Firoj&Akter, Dilruba&Muhit, Md&Raihan, Sheikh &Faroque, A. (2018). DPPH Free-radical Scavenging and Cytotoxic Activities of *Leeamacrophylla*. *Bangladesh Medical Research Council Bulletin*. 44. 77. 10.3329/bmrcb.v44i2.38690.
  15. Shen, Nan & Wang, Tf&Gan, Quan& Liu, Sian & Wang, Li & Jin, Biao. (2022). Plant flavonoids: Classification, distribution, biosynthesis, and antioxidant activity. *Food Chemistry*. 383. 132531. 10.1016/j.foodchem.2022.132531.
  16. Muthu, Santhoshkumar&Brindha, Durairaj. (2015). Evaluation of antioxidant and free radical scavenging activity of *Annonamuricata*. *European Journal of Experimental Biology*. 5. 39-45.
  17. Tibebe, Dessie&Akele, MulugetaLegesse&Melese, A..(2022). Analysis of total phenolic contents, flavonoids, antioxidant and antibacterial activities of *Croton macrostachyus* root extracts. *BMC Chemistry*. 16. 10.1186/s13065-022-00822-0.
  18. Rajani Nigam, Phytochemical and antioxidant activities of apple ber, a hybrid variety of *Ziziphus Mauritlanav*, *World journal of pharmaceutical research* 7(7), 1033-1038.
  19. Harborne JB, and Willians CA. *Advances in flavonoid research since 1992*. *Phytochemistry*, Oxford, 2000, 55,481-504.
  20. Ogundipe OO, Moody JO, Houghton PJ and Odelola HA. *Bioactive chemical constituents from *Alchormealaxiflora* (benth) pax and hoffman*. *J. Ethnopharmacol.*, Lausanne, 2001, 74: 275-280.
  21. Harborne JB. *Phytochemical Methods: A guide to modern techniques of plant analysis*. Chapman andHallNewYork, 1973, pp.2793rdEdn.
  22. Lü, Lin & Liu, Shuwen& Jiang, Shi-bo& Wu, Shu-guang. (2004). Tannin inhibits HIV-1 entry by targeting gp41. *ActapharmacologicaSinica*. 25. 213-8.
  23. Akiyama H. Kazuyasu F, Yamasaki O, Onno T and Iwatsuki K. Antibacterial action of several tannins against *Staphylococcus aureus*. *J Antimicrobial Chemotherapy* 2001, 48(45):487-491.

**HOW TO CITE:** Narendra Jadhav, Pranav Jadhav, Vandana Dongare\*, Farida Inamdar, S. S. Wadkar, *Phytochemical Investigation and Antibacterial Activity of *Gnidia glauca**, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 3, 430-436. <https://doi.org/10.5281/zenodo.14992044>

