



Preliminary Assessment of Phytochemical Constituents and Antimicrobial Potential in *Morinda citrifolia* L.

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Article Info

Received: 09-09-2025,

Revised: 27-10-2025,

Accepted: 20-11-2025

Keywords: *Morinda citrifolia*, phytochemical analysis, antimicrobial activity.

Abstract

The study on *Morinda citrifolia* (commonly known as Noni) focuses on its phytochemical composition and antimicrobial properties. This research investigates the bioactive compounds present in the plant's leaves and their potential in combating microbial infections. Preliminary phytochemical screening identified key secondary metabolites such as alkaloids, flavonoids, phenols, tannins, saponins, and terpenoids. These compounds are known for their therapeutic properties, including antioxidant, anti-inflammatory, and antimicrobial effects. The present investigation revealed that the plant extract exhibits potent antimicrobial activity against *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*.

1. INTRODUCTION

India is renowned for its rich diversity of medicinal plants, which have been used as therapeutic agents since ancient times. Contemporary research increasingly focuses on medicinal plants due to their bioactive compounds, as their medicinal properties largely depend on phytochemical constituents with significant pharmacological relevance. The phytochemicals, natural bioactive compounds, nutrients, and fibers present in medicinal plants, fruits, and vegetables help protect against various ailments (Akinmoladun *et al.*, 2007; Sontakke K. S. and Shinde S. L., 2020). *Morinda citrifolia* Linn. (family: Rubiaceae) is a popular small evergreen tree or shrub native to Southeast Asia. It is grown in India, Malaysia, the Caribbean, Polynesia, Central and South America, and Australia. The tree can reach a height of up to 6 meters and features bright green, oval-shaped

leaves ranging from 10 to 30 centimeters in length. The fruit is ovoid in shape when mature and emits an unpleasant odor due to the presence of butyric acid, accompanied by a strong flavor and astringent taste. An air sac at one end of the seeds enables them to float, which helps explain the wide distribution of noni trees throughout the Indo-Pacific islands. (Moazzam Ali *et al.*, 2020). Phytochemicals are broadly classified into two major groups: primary constituents, such as amino acids, sugars, proteins, and chlorophyll; and secondary constituents, including alkaloids, essential oils, flavonoids, tannins, terpenoids, saponins, and phenolic compounds. These secondary metabolites are especially known for their valuable therapeutic properties (Krishnaiah *et al.*, 2009). Over the past few decades, numerous bioactive compounds have been identified and screened from a wide range of plant species.

Morinda citrifolia L. is one such important medicinal plant, recognized for its rich source of phytochemical constituents. According to the World Health Organization, medicinal plants are considered one of the best sources for obtaining a wide range of drugs. (More *et al.*, 2018). This study collectively provides insight into the antimicrobial and therapeutic properties of the extracts.

2. Material and Methods

2.1 Collection of plant materials

The plant parts of *Morinda citrifolia* L. plant were collected from G.S.G College campus Umarkhed Dist. Yavatmal, Maharashtra, India. It was officially identified by the presence of an expert taxonomist at the Department of Botany, GSG College and authenticated by using standard flora Naik (1998).

2.2 Extraction of the plant material

The extraction of the shade dried leaves was done by using the soxhlet extraction method. The leaves powder was used for the extraction. Fifteen grams of grinding powder of leaves were filled separately in the thimble and extracted successively with 250ml of each distilled water, ethyl acetate and acetone for 3-5 hours. All different solvent leaves extracts were concentrated using a rotary evaporator. Once fully evaporated, each solvent extract was weighed and stored in airtight tubes.

2.3 Phytochemical analysis

Preliminary qualitative phytochemical analysis was carried out on the leaves extracts of *Morinda citrifolia* L. to detect the presence of various phytochemical compounds, such as saponins, flavonoids, tannins, alkaloids, glycosides, steroids, carbohydrates, and terpenoids, using standard qualitative methods as described by Harborne (1998) and Trease and Evans (2002).

i. Test of Alkaloids:

The extract was treated with Mayer's reagent (Potassium Mercuric iodide). The appearance of yellow colored precipitate indicates the Presence of alkaloids.

Five ml of the extract was mixed with 1.5 ml of 10% HCl and heated for 20 minutes. After cooling

and filtration, 1 ml of Dragendorff's reagent was added. The formation of a reddish or orange precipitate indicated the presence of alkaloids.

ii. Test for Saponins:

Two milliliters of distilled water were added to the plant extract and shaken vigorously in a lengthwise motion for 15 minutes. The formation of a 1 cm foam layer indicated the presence of saponins.

iii. Test for Terpenoids:

Each 5 ml extract was mixed with 2 ml of chloroform, followed by the gentle addition of 3 ml of concentrated H₂SO₄ to form a distinct layer. The presence of terpenoids was indicated by the appearance of a reddish-brown coloration at the interface.

iv. Test for Phenols:

Ferric chloride test: To extract 3-4 drops of Ferric chloride solution is added. The development of a bluish black color indicates the presence of Phenols.

v. Test for Tannins:

For the 5% ferric chloride test, 5 mg of the extract was mixed with 0.5 ml of 5% ferric chloride solution. The appearance of a dark bluish-black color indicated the presence of tannins.

vi. Test for flavonoids:

To 300 µl of extract, 1 ml of 10% ammonia and 1 ml of concentrated sulfuric acid were added. The disappearance of the yellow color indicated the presence of flavonoids.

2.3 Antimicrobial Activity: Disk diffusion assay

The Kirby-Bauer disk diffusion method was used to assess the synthetic formulations' antibacterial potential (Hudzicki, 2009). In short, 50 µL (1 mg/mL) of synthesized compounds were put onto each sterile disk (Himedia Pvt. Ltd., Mumbai) and then dried. The sterile, solidified agar medium was then spread with 24-hour-old microbial culture inoculums and the corresponding standards (1 mg/mL) on each disk. After one hour of diffusion in the refrigerator, the plates were moved to an incubator set at 37°C for 24 to forty-eight hours.

Following incubation, the zone scale (Himedia Pvt.

Ltd., Mumbai) was used to measure the zones surrounding the discs.



Fig. 1: Shade dried *M. citrifolia* leaves



Fig. 2: Dried leaves powder.



Fig. 3: Soxhlet extraction.



Fig. 4: Various solvent extracts.

3. Results and discussion

3.1 Phytochemical analysis

Morinda Citrifolia leaves powder was extracted with ethyl acetate, acetone and water. The Presence of different solvent phytochemicals detected from the extract by qualitative phytochemical analysis are listed in table 1. The acetone extract of *Morinda citrifolia* L. leaves powder shows the presence of alkaloids, phenols, saponins, tannins and tepenoids. The ethyl acetate extract of *Morinda citrifolia* leaves shows the presence of flavonoids, phenols, saponins, and tannins. The distilled water extract of *M. Citrifolia* leaves shows the presence of alkaloids, phenols, saponins, tannins and terpenoids.

Table 1: Phytochemical analysis of *Morinda citrifolia* leaf extract

Phytochemical test	Ethyl acetate	Distilled water	Acetone
Alkaloids	-	++	++
Flavonoids	++	-	-
Phenols	+	++	+
Saponins	++	+	++
Tannins	+	++	++
Terpenoids	-	+	++

Legend: + = Present, ++ = Strongly Present, - = Absent

3.2 Antimicrobial Activity

The antibacterial assay was performed by disc diffusion method and results are summarized in table 2. The results showed that among extracts MC Ethyl Acetate and MC Acetone showed moderate and MC Water showed negligible activity against selected pathogens. The assay was performed in triplicate.

Table 2: Antibacterial activity of *Morinda citrifolia* L. leaf extract against selected bacterial pathogens

Extract	<i>E. coli</i>	<i>B. subtilis</i>	<i>S. aureus</i>	<i>P. aeruginosa</i>
MC Ethyl Acetate	++	++	+	+
MC Water	+	+	+	+
MC Acetone	++	+	+	+
Streptomycin	+++	++	+++	+++

+= < 5 mm, ++= >5 & <10 mm, +++= >10 & < 18 mm, NZ=No zone, NA= Not applicable



Fig.5. Representative Images of antibacterial activity of *Morinda citrifolia* L. leaf extract.

4. Conclusion

Preliminary phytochemical surveys and an understanding of the chemical constituents of plants are essential for the development of herbal drugs and their preparations. In this context, the present phytochemical investigation of *Morinda citrifolia* L. reveals the presence of various potentially valuable phytochemical constituents including alkaloids, saponins, flavonoids and phenols, which could be of significant interest to the pharmaceutical industry. The various extracts showed moderate to negligible antibacterial activity against selected pathogens. These findings suggest the presence of bioactive compounds in crude extracts and fractions with potential therapeutic activities.

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