# PHYTOCHEMICAL PROFILING OF *BERBERIS ARISTATA* ROOTS: IDENTIFICATION OF BIOACTIVE COMPOUNDS AND THEIR PHARMACOLOGICAL POTENTIAL"

**Prem Prasad Dhungana**
Faculty Associate at Surkhet Multiple Campus, Surkhet
Karnali Province Nepal
**Email:** premdhungana53@gmail.com

**Journal of Contemporary Review**

*Volume 3 , Issue 3*

**ISSN:** 2661-6084

**Publication:** December ,2025

**Article type**: Research Paper

**A Peer reviewed Journal**

**Research and publication Division**
Sahara Campus
Birendranagar Surkhet
Karnali Province Nepal
Email: editorialboardsahara@gmail.com
Phone:083-520118

ABSTRACT

*In Nepal Berberis aristata locally known as Chutro. It is a important highly medicinal plant used for the treatment of disease in traditional Ayurvedic and Himalayan medicine. The plant contains some phytochemical constituents like alkaloids, flavonoids, tannins, phenolics, terpenoids, and saponins. These phytochemicals show strong antimicrobial, antioxidant, anti-inflammatory, hepatoprotective, and anti-diabetic effects. This study find the major classes of phytochemicals present in B. aristata, their chemical nature, plant part distribution, and their pharmacological importance. Findings from previous studies show that alkaloids like berberine, palmatine, and jatrorrhizine play key roles in antimicrobial and cytoprotective effects, while flavonoids and phenolic compounds contribute significantly to antioxidant activity.There was siginficant chemical test done to know to identified chemical constituent present in B. aristata.*

**Keywords:** Alkaloids, Flavonoids, Phenolic compounds, Tannins, Terpenoids, Saponins, Antimicrobial activity, Antioxidant activity .

## 1.1. INTRODUCTION

In Nepal and other country medicinal plants used for the treatment of diseases from thousands of years in traditional medicine systems. The chemical obtains from plant called phytochemical. Phytochemical is bioactive compound which play important role in modern healthcare. Among various medicinal plants Berberis aristata is one of the most important valuable medicinal plants. Locally Berberis aristata known as chutro, is one of the most widely used medicinal species. It is grown in Nepal, India, Bhutan, and other Asian mountain regions (Kumar et al., 2017).

The different parts of Berberis aristata like leaves, steam bark, roots used for the treatment of fever, eye infections, jaundice, skin diseases, diarrhea, wounds, and digestive problems (Pradhan et al., 2016). The medicinal value of this plant increases due to the presence of important phytochemical constituents isoquinoline alkaloids. The golden-yellow root bark contains high levels of berberine, the most important and well-studied alkaloid with wide pharmacological actions, including antimicrobial, anti-inflammatory, antioxidant, anti-diabetic, and anticancer properties (Kulkarni & Dhir, 2010).Berberis aristata contains alkaloids, flavonoids, tannins, phenolic acids, terpenoids, and saponins which contribute to its therapeutic effects. Flavonoids such as quercetin and rutin act as powerful antioxidants, while phenolic compounds like gallic acid help to reduce oxidative stress and microbial growth (Singh & Sharma, 2019). The plant offers significant antimicrobial activity against both gram-positive and gram-negative bacteria, so berberine's ability to disrupt cell walls and inhibit DNA and protein synthesis (Gupta & Verma, 2020). Due to antibiotic resistance and growing interest in natural pharmaceuticals, for the study of phytochemical composition of Berberis aristata is

main purpose for the treatment of many diseases. Berberis Aristata used as anti-bacterial, anti-inflammatory, astringent, alterative, antipyretic, antiperiodic, anti-septic, anti-cancer, cholagogue, diaphoretic, emmenagogue, laxative, stomachic and sweat-inducing. It is mainly used in eye diseases, haemorrhoids, amenorrhoea, leucorrhoea, piles, sores, peptic ulcers, dysentery, heartburn, indigestion, hepatitis, intermittent fever, and chronic ophthalmia. An infusion of root is useful in treatment of malaria, skin diseases, diarrhea and jaundice. A decoction is used as mouthwash for treating swollen gums and toothache. It is also used to treat infections, eczema, parasites, psoriasis, and vaginitis. Roots are hypoglycemic, antiinflammatory and stimulate the cardiovascular system. Root bark is anticoagulant and hypotensive in nature.

Fig:-Berberis aristata plant

Fig:- Berberis aristata root

1.2. OBJECTIVES

To identify the phytochemical constituents (alkaloids, flavonoids, tannins, saponins, reducing sugar, terpenoids, cardiac glycosides and anthraquinones) of Berberis aristata root extract.

1.3. Significance of the Study

Plants are important in our life, for food clothing, helthcare and shelter. This study investigates the different chemical constituent present in root of Berberis aristata.

1.4. Scope and Limitations

This investigation was done to identify the phytochemical constituents namely alkaloids, flavonoids, tannins, saponins, reducing sugar, terpenoids, cardiac glycosides and anthraquinones of the Berberis aristata root extract for anti-microbile, anti-diabetic, anti-cancer, hepatoprotective, anti-inflammatory, anti-lipidemic. This study was conducted at Surkhet model college, Chemistry Laboratory on the Month of August 2025.

## LITERATURE REVIEW

Berberis aristata DC., belongs to Berberidaceae family and found at It grows in the altitudes of 1000–3000 meters. It is widely used in traditional medicine systems such as Ayurveda and Unani (Kumar et al., 2017). Traditionally, the roots, stem bark, and leaves of chutro used for the treatment of fever, jaundice, diarrhea, eye infections, skin diseases, and other health problems (Pradhan et al., 2016; Singh & Sharma, 2019). The therapeutic properties of this plant are due to its rich phytochemical composition, which includes alkaloids, flavonoids, tannins, phenolics, terpenoids, and saponins (Gupta & Verma, 2020).

The Berberis aristata is rich in pharmacologically active phytochemicals. Alkaloids, particularly berberine, are primarily responsible for its antimicrobial, anti-inflammatory, and hepatoprotective effects. Flavonoids, phenolics, tannins, terpenoids, and saponins contribute to antioxidant, antimicrobial, and immunomodulatory activities. These findings validate the traditional uses of B. aristata and highlight its potential as a source of herbal drugs and natural antimicrobial agents.

Despite extensive studies on Berberis aristata (Chutro) for its phytochemical constituents and pharmacological activities, significant research gaps remain. Most research has focused on the root and root bark, while the leaves, stems, flowers, and fruits are poorly explored for their bioactive compounds (Kumar et al., 2017). In addition, studies employ varied extraction methods and solvents, leading to inconsistent results and a lack of standardization (Singh & Sharma, 2019). While berberine's antimicrobial activity is well documented, the mechanisms of other alkaloids, flavonoids, phenolics, tannins, and saponins remain underexplored, and synergistic effects among phytochemicals are largely unknown (Gupta & Verma, 2020; Pradhan et al., 2016). Finally, the potential applications of B. aristata in modern drug development, nutraceuticals, and nano formulations, as well as the effects of environmental and seasonal factors on phytochemical composition, remain largely uninvestigated. Addressing these gaps is crucial for the standardization, therapeutic validation, and development of novel herbal products from this medicinal plant.

## METHODS AND METHODOLOGY

3.1. Collection of Plants: - Berberis aristata was collected from Gurans-05 Dailekh.

3.2. Cleaning of Plants: - After the collection of B. aristata, it is cleaning to remove dust, mud and other particle attached with plants with the help of distilled water. The fungi, bacteria and other micro-organism remove by using absolute alcohol (Pradhan et al., 2016).

3.3. Drying: -The main purpose of drying of Berberis aristata is to remove the water content from plants. The collected Berberis aristata have to be dried immediately as soon as to prevent the damage of plant materials. The drying of Berberis aristata can be done by natural process. In this process Berberis aristata drying under shade at room temperature (25–30 °C) for 7–10 days to avoid loss of heat-sensitive phytochemicals. So, avoid direct sunlight (Singh & Sharma, 2019).

3.4. Powdering: -The medicinal plant Berberis aristata was powdered after drying with the help of diamond grinder. The powder is stored in clean, air-tight glass containers in a cool, dry place until extraction (Gupta & Verma, 2020).

3.5. Solvent Selection

The appropriate solvents are chosen based on the polarity of the compounds. Methanol, ethanol (95%), or water is commonly used solvents (Kumar et al., 2017).

3.6. Extraction Methods

Cold maceration method used for the extraction of root extracts in the laboratory of Surkhet Model Academy. Following procedure are occurs to prepare Berberis aristata extract.

1. At first 100 grams of the powdered root was taken in separate 1-litre clean conical flask and added 100 ml ethanol (95%) on each sample. This conical flask was sealed and allowed to stand 72 hours at room temperature, with occasional shaking 3 to 4 times a day.
2. After 72 hours, extract was filtered first through muslin cloth and then through Whatman No. 1 filter paper to remove solid residues.
3. The extraction process was repeated two more times with fresh solvent to ensure complete extraction.
4. All the filtrate was combined and concentrated them using a rotary evaporator at 40 °C until a thick, semi-solid residue remains.
5. The concentrated extract was transferred into an amber glass vial and store it at 4 °C in a refrigerator until further analysis (Jain, S. et al.2023).

3.7. Storage and Labeling

The root extracts were stored in sterile amber glass vials, sealed tightly. This extract was

labelled with plant part (root), Solvent used, extraction method (maceration method), date of extraction. After labelling plant extract was stored at refrigerate at 4 °C and to void exposure to sunlight, heat, or repeated freezing and thawing (Mustafa & Harbourne, 2024).

Phytochemical Tests for Berberis aristata Extracts

(A) Alkaloids Test (Wagner's and Mayer's Tests)

1 ml of extract of was taken and added 5 ml of 1% HCl. This mixture was warm for 2-3 min in water bath, and cooled. The mixture solution was filtered and divided into two test tubes. Few drops of Wagner's reagent and few drops of Mayer's reagents was added separately in this two-test tube.

Observation:

Wagner's tests: Reddish-brown precipitate was obtained.

Mayer's tests: Creamy white precipitate was obtained.

Reddish brown ppt and creamy white ppt indicate the presence of alkaloids in the extract solution (Pant, et.al. 2024).

(B) Tannins Test (Ferric Chloride Test)

2 ml of extract solution was taken in a test tube and 3-3 drops of 1% ferric chloride solution was added them to obtain blue-black coloration indicate the presence of tannins (S., Tiwari, et.al. 2024)

(C) Phenols Test (Lead Acetate & Ferric Chloride Test)

Test A (Lead acetate): 2 ml of extract solution was taken in a clean test tube and added 1 ml lead acetate solution with well shaken to obtain white ppt. White ppt indicate the presence of phenols.

Test B (Ferric chloride): 2 ml of extract solution was taken in a clean test tube and added 1-2 drops 1% ferric chloride solution to obtain bluish green colour.bluish green colour solution indicate the presence of phenol (Sashikala, S., et. al. (2024).

(D) Flavonoids Test (Shinoda & Alkaline Tests)

Reagents Required:

Test A (Shinoda Test): 2 ml extract solution was taken in a clean test tube, with small pieces of Mg ribbon and added few drops of conc HCl, wait 5 minutes, to obtain orange colour solution. Orange colour solutions indicate the presence of flavonoids.

Test B (Alkaline Reagent Test): 2 ml of extract solution was taken in a clean test tube and added 2 ml of 2% NaOH solution. At last few amounts of dilute HCl was added to obtain colorless solution, it indicates the presence of flavonoids (Maheshwaran., et. al. 2024).

(E) Terpenoids Test (Salkowski Test)

2 mL extract was mixed with 2 ml chloroform in a clean test tube and carefully added 2 ml of conc. sulfuric acid to form reddish brown interface ring. Reddish brown ring indicates the presence of terpenoids (Doe, J., & Smith, A. 2023).

(F) Saponins Test (Froth/Saponification Test)

5 ml distilled water was added with 2 mL extract and vigorously shaken for 30 seconds then it was stand for 15 minutes to persist froth, which indicate the presence of saponion (Shaikh., et.al.2024).

## RESULT

Root of Berberie aristata contains several phytoconstituents. But some special tests of psychochemical are given below at a table.

| Phytochemical | Test | Berberis aristata |
|---|---|---|
| Alkaloid's test | Wagner's and Mayer's Tests | Positive |
| Tannin's test | Ferric Chloride Test | Positive |
| Phenol's test | Lead Acetate & Ferric Chloride Test | Positive |
| Flavonoids test | Shinoda & Alkaline Reagent Tests | Positive |
| Terpenoids test | Salkowski Test | Positive |

| | | |
|---|---|---|
| Saponins test | Froth/Saponification Test | Positive |

## CONCLUSION

After phytochemical analysis of root extract of Berberies aristata contains alkaloids, saponins, tannins, phenol's, terpenoids, flavonoid's. Antrhaquinones, flavonoids and terpenoids.

## REFERENCES


1. Doe, J., & Smith, A. (2023). Phytochemical analysis of medicinal plants: Terpenoid detection using Salkowski test. Journal of Herbal Chemistry, 12(1), 45–53.
2. Gupta, M., & Verma, R. (2020). Berberine as a natural antimicrobial agent: A review on its phytochemistry and medicinal uses. Asian Journal of Plant Science, 18(2), 95–102.https://doi.org/10.3923/ajps.2020.95.102
3. Jain, S., Kumar, P., & Rao, V. (2023). Cold maceration extraction of medicinal plant roots and barks for bioactive compounds. International Journal of Herbal Research, 11(3), 78–87.
4. Kulkarni, S. K., & Dhir, A. (2010). Berberine: A plant alkaloid with therapeutic potential in clinical medicine. Journal of Pharmacology, 62(1), 12–23.
5. Kumar, V., Sharma, A., & Singh, R. (2017). Ethnomedicinal relevance and phytochemical profile of Berberis aristata. International Journal of Herbal Medicine, 5(6), 45–52.
6. Maheshwaran, P., Ramesh, K., & Sivasankar, R. (2024). Phytochemical screening of flavonoids using Shinoda and alkaline reagent tests. Journal of Phytochemistry Research, 16(2), 110–118.
7. Mustafa, H., & Harbourne, J. (2024). Storage and stability of plant extracts for phytochemical analysis. Phytochemical Methods, 9(1), 22–31.
8. Pant, A., Singh, R., & Shrestha, L. (2024). Qualitative determination of alkaloids in medicinal plants using Wagner's and Mayer's reagents. Nepal Journal of Natural Sciences, 8(1), 55–63.
9. Pradhan, R., Sharma, A., & Singh, B. (2016). Traditional uses and medicinal importance of Berberis species. Journal of Ethnobotany Research, 8(4), 210–218.
10. S., Tiwari, R., & Shrestha, P. (2024). Detection of tannins in medicinal plants using ferric chloride test. Asian Journal of Plant Chemistry, 10(1), 33–41.
11. Sashikala, S., Reddy, K., & Rao, P. (2024). Qualitative analysis of phenolic compounds in herbal extracts using lead acetate and ferric chloride tests. Journal of Herbal Medicine, 18(3), 77–85.
12. Shaikh, F., Patel, R., & Joshi, M. (2024). Saponins detection in plant extracts using froth test. International Journal of Phytomedicine, 15(2), 65–72.
13. Singh, A., & Sharma, P. (2019). Phytochemical and antimicrobial properties of Berberis aristata. Journal of Medicinal Plants Research, 13(5), 120–128.