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A Review on Plant: Daruharidra (Berberis Aristata)

Mohit Mahajan[1*], Mr. Pardeep Kumar[2], Dr. Abhishek Soni[3], Dr. Chinu Gautam[4]
Student, Corresponding Author[1]
M. Pharm in Pharmacology[2]
M. Pharm, PhD in Pharmaceutics, Dean of Pharmacy[3]
M. Pharm, PhD in Pharmacology, Hod of Pharm D[4]
mohitmahajan844@gmail.com, monu35908@gmail.com
abhisoni.phd@gmail.com, chinu990@gmail.com
School of Pharmacy, Abhilashi University, Mandi, HP, India

Abstract: *Berberis aristata DC, commonly known as Indian Barberry or Daruharidra, is a medicinally significant shrub belonging to the family Berberidaceae. This plant holds a distinguished place in traditional Indian systems of medicine, particularly Ayurveda and Unani, where its roots, stem bark, leaves, and fruits have been employed therapeutically for centuries. The plant is indigenous to the Himalayan foothills, thriving at altitudes of 2,000–3,500 metres across regions spanning Himachal Pradesh, Uttarakhand, Nepal, Bhutan, and Sri Lanka. The present review article comprehensively examines the botanical characteristics, taxonomic classification, cultivation practices, phytochemical composition, and pharmacological properties of B. aristata. The plant is exceptionally rich in isoquinoline alkaloids, with berberine being the principal bioactive constituent responsible for its extensive therapeutic spectrum. Other notable alkaloids include palmatine, jatrorrhizine, berbamine, magnoflorine, epiberberine, and oxyacanthine. Flavonoids such as quercetin and rutin, phenolic acids including chlorogenic and caffeic acids, tannins, vitamins, and essential minerals further enrich its phytochemical profile. Modern pharmacological investigations have validated several traditional uses, demonstrating potent antimicrobial, anti-inflammatory, antioxidant, hepatoprotective, antidiabetic, immunomodulatory, and anticancer activities. At the molecular level, berberine is known to modulate critical signalling cascades including NF-κB/MAPK, STAT4 degradation, and Th1/Th2 cytokine balance. Cytotoxic studies confirm dose-dependent antiproliferative effects against cancer cell lines such as MCF-7, HepG2, and A549. The fruits also demonstrate nutritional value through their high content of vitamin C, carotenoids, and mineral elements. Despite its remarkable therapeutic potential, there remains a significant gap in clinical validation, standardized pharmacokinetic data, and sustainable cultivation strategies. This review consolidates current knowledge and underlines the need for systematic research to fully translate the ethnomedicinal heritage of Berberis aristata into evidence-based medicine.*

Keywords: Berberis aristata, Daruharidra, Berberine, Alkaloids, Pharmacological activities, Anticancer, Phytochemistry, Anti-inflammatory, Hepatoprotective

I. INTRODUCTION

Throughout recorded history, medicinal plants have served as the cornerstone of human healthcare across diverse civilizations. India, aptly described as the Botanical Garden of the World, harbours one of the richest plant biodiversities on the planet, with more than 8,000 plant species documented for their therapeutic applications in traditional medicine. Herbal compounds derived from these plants have not only shaped folk remedies but have also provided the molecular scaffolding for a vast number of modern pharmaceuticals. Among the most pharmacologically

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promising of these botanicals stands *Berberis aristata* DC, a spinous deciduous shrub with deep roots in Ayurvedic and Unani therapeutic traditions.

Commonly referred to as Daruharidra in Sanskrit and Daruhaldi in Hindi, *Berberis aristata* belongs to the family Berberidaceae and is distributed across the northern Himalayan belt stretching from Garhwal to Bhutan, reaching altitudes of 2,000–3,500 metres. Its range extends into Sri Lanka, Nepal, and the temperate zones of South America, making it a plant of truly global botanical significance. The Kullu, Kumaon, and Chamba regions of Himachal Pradesh host particularly dense populations of this shrub, where it thrives in well-drained soils under a temperate climate.

The genus *Berberis* encompasses approximately 450–500 species worldwide, of which *B. aristata* is among the most medicinally celebrated. Every part of this plant — from the deep yellow roots and woody stems to the ovate leaves, yellow racemose flowers, and blue-black berries — has been historically utilized in the preparation of traditional remedies. The roots and stem bark are particularly valued for their high alkaloid content, especially berberine, a yellow isoquinoline alkaloid with demonstrated broad-spectrum biological activity.

The pharmacological relevance of *B. aristata* has expanded dramatically in recent decades, with scientific studies validating its antimicrobial, anti-inflammatory, antioxidant, hepatoprotective, antidiabetic, immunomodulatory, and anticancer properties. Berberine, the plant's most abundant alkaloid, acts on multiple molecular targets and signalling pathways, positioning it as a versatile therapeutic agent. The present review article offers a comprehensive examination of the botanical identity, chemical composition, and pharmacological activities of *Berberis aristata*, synthesizing existing knowledge and identifying gaps that warrant further scientific investigation.

Table 1: Vernacular Names of Berberis aristata

Language	Name(s)
English	Indian Barberry, Tree Turmeric
Hindi	Daruhaldi, Chitra, Kashmal
Sanskrit	Daruharidra, Pitadaru
Punjabi	Chitra, Simlu, Kasmal
Himachal Pradesh	Rasont, Kashmal
Tamil	Mullukala, Garamenjal
Marathi	Daruhalad
Malayalam	Maramanjal

II. TAXONOMY

Berberis aristata occupies a well-defined position within the plant kingdom. Its taxonomic classification is as follows: Kingdom — Plantae; Division — Magnoliophyta; Class — Magnoliopsida; Order — Ranunculales; Family — Berberidaceae; Genus — *Berberis*; Species — *B. aristata* DC. The family Berberidaceae is characterised by the presence of isoquinoline alkaloids, and the genus *Berberis* is further distinguished by its trifoliate thorns, yellow wood, and characteristic yellow flowers arranged in drooping racemes.

III. CULTIVATION AND HARVESTING

Berberis aristata demonstrates notable adaptability across a variety of soil types, though it grows most vigorously under temperate conditions with well-drained, loamy soils. Propagation is achieved naturally through self-seeding, although deliberate cultivation typically employs either seed sowing or stem cuttings, with the spring season being optimal for both methods. Seeds are collected after the berries have fully matured and sown at a field spacing of approximately 100 × 100 cm to ensure adequate growth.

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The cultivation approach is predominantly organic, favouring farmyard manure (FYM), vermicompost, and green manures over synthetic fertilizers and chemical pesticides. Natural bio-pesticides derived from neem, Chitrakmool, Dhatura, and cow urine are employed for pest and disease management. Regular weeding and thinning at intervals of 15–30 days promotes vigorous plant development. Irrigation is provided on a weekly or fortnightly basis depending on seasonal rainfall patterns. The root bark, which constitutes the primary medicinal raw material, is harvested from mature plants approximately two years after planting. Harvested root bark pieces are shade-dried to preserve their phytochemical integrity before use in medicinal preparations.

IV. MORPHOLOGY

4.1 General Morphology of the Plant

Berberis aristata is a large, deciduous shrub typically reaching 1.8–3.6 metres in height, though specimens of up to 4.5 metres have been documented under favourable conditions. The stem diameter measures approximately 20 cm, with twigs displaying a whitish to pale yellowish-brown coloration. The bark is pale brown, rough, and prominently furrowed. Leaves are simple, alternate, and measure 3.8–10 cm in length, with obovate to elliptic blades featuring spinous-toothed margins. The upper leaf surface is glossy dark green, while the lower surface exhibits a lighter, glossy pale green. Inflorescences are simple, drooping racemes of 2.5–7.5 cm in length, bearing bright yellow flowers.

Figure 1: Leaves of Berberis aristata showing characteristic morphology

4.2 Flowers and Fruits

The flowers of *Berberis* species are yellow to orange, often marked with red stripes, and possess six sepals and six petals in alternating whorls. The petals are smaller than the sepals, and the stamens are comparatively inconspicuous. Flowers occur singly or in racemose clusters forming pendant inflorescences. Quantitative phytochemical analyses of the flowers have revealed significant levels of phenolic compounds (approximately 30 mg gallic acid g^{-1}), flavonoids (24.2 mg quercetin g^{-1}), and anthocyanins (13.85 mg cyanidin-3-glucoside g^{-1}). The alkaloids berberine and isocorydine are the predominant constituents identified in floral tissues.

The fruits are oval berries measuring 6–12 mm in length and 6–9 mm in diameter, borne in dense clusters. They are bright red at maturity with a pleasantly sour taste, and are widely used in the preparation of jellies, syrups, marmalades, and traditional condiments. Phytochemically, the fruits are rich in carotenoids, flavonoids, phenolics, anthocyanins, and alkaloids, along with essential minerals such as calcium, iron, potassium, phosphorus, and sodium. Potassium is the most abundant mineral (0.6–14.0 mg g^{-1}), and carbohydrates constitute the major biochemical fraction (162–248.5 mg g^{-1}), followed by proteins (9–103 mg g^{-1}) and lipids (5.2–29.6 mg g^{-1}).

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4.3 Stem

The stems of *Berberis aristata* are woody and armed with sharp tripartite thorns, a feature characteristic of the genus. The wood displays a red to yellow-brown coloration, and the bark is pale brown with rough, deeply furrowed texture. On transverse section, the wood is diffuse-porous with clearly visible growth rings and a bright yellow cut surface. The phytochemical profile of the stem includes flavonoids, phenolic compounds, saponins, and a range of isoquinoline alkaloids such as berberine, berbamine, palmatine, magnoflorine, and jatrorrhizine. Among these, magnoflorine has been found in particularly high concentrations in certain species such as *B. asiatica* and *B. chitria*. Chlorogenic acid is generally absent from stem tissue, and total phenolic content in the stem is lower compared to other plant parts.

Figure 2: Stem of Berberis aristata showing woody and spiny features

4.4 Roots

The roots of *Berberis aristata* are thick, woody, and cylindrical with a yellowish-brown coloration and a knotty appearance. They are covered by a thin, brittle bark that detaches easily from the underlying wood. The outer bark is rough and pale brown, while the inner surface is lighter in colour. The cut surface on transverse section is bright yellow with a rough, fibrous texture and clearly discernible growth rings. The fracture is hard and short, and the material is odourless but intensely bitter in taste — a quality directly attributable to the high berberine content. The roots contain the highest concentration of alkaloids among all plant parts, primarily belonging to the protoberberine and bisbenzylisoquinoline groups, which underpin the plant's anti-inflammatory and immunosuppressive activities.

Figure 3: Root system of Berberis aristata with characteristic yellow inner wood

V. GEOGRAPHICAL DISTRIBUTION

Berberis aristata is predominantly distributed across the temperate and subtropical regions of Asia, with its core habitat centred on the Himalayan foothills of India and Nepal. The species thrives at altitudes between 2,000 and 3,000 metres

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above sea level and is also found in the wet zones of Sri Lanka. In India, substantial populations exist in the Kullu, Kumaon, and Chamba districts of Himachal Pradesh, as well as in the Nilgiri hills of South India. The plant flowers between February and April, with fruiting occurring from May to June.

Beyond the subcontinent, *B. aristata* is distributed across temperate zones of the Northern Hemisphere and parts of temperate South America. In Jammu and Kashmir, the plant is known by tribal communities as Khumblai and Kawbash, and its roots are traditionally used for treating fungal and bacterial infections. This wide distributional range underscores the plant's ecological resilience and its accessibility as a raw material for traditional medicine systems across diverse cultural contexts.

VI. PHYTOCHEMICAL COMPOSITION

The phytochemical richness of *Berberis aristata* is one of its most distinguishing features. Alkaloids, particularly those of the isoquinoline class, constitute the dominant bioactive group, with berberine being the most pharmacologically significant. Berberine is chemically designated as 5,6-dihydro-9,10-dimethoxybenzo[g]-1,3-benzodioxolo[5,6-a]quinolizinium, and belongs to the protoberberine subtype. It is a yellow-coloured, bitter compound predominantly concentrated in the roots and stem bark.

The root bark contains an extensive array of alkaloids, including dihydrokarachine, tetrahydropalmatine, tetrahydroberberine, epiberberine, palmatine, jatrorrhizine, columbamine, aromoline, oxyberberine, berbamine, oxyacanthine, taxilamine, pakistanine, and 1-O-methylpakistanine. The flowers are enriched with polyphenolic flavonoids — quercetin, meratin, and rutin — and organic acids such as E-caffeic acid and chlorogenic acid. The heartwood yields the aliphatic hydrocarbon n-docosane in ethanolic extracts. Trace heavy metals including cadmium, lead, chromium, zinc, iron, and manganese have also been detected in the rhizome, highlighting the importance of quality standardisation in herbal material evaluation.

The concentration of berberine in *B. aristata* varies with altitude, with plants at lower elevations exhibiting higher berberine content. Soil conditions also significantly influence alkaloid biosynthesis — elevated potassium levels and adequate soil moisture have been positively correlated with increased berberine accumulation in root and stem tissues. These environmental dependencies have practical implications for cultivation strategies aimed at maximising the yield of therapeutically active constituents.

Table 2: Biological Roles of Key Phytochemicals in Berberis aristata

Compound	Plant Part	Activity
Berberine	Root, Stem, Bark	Anti-inflammatory, antidiabetic, anticancer, hepatoprotective, cardiovascular
Epiberberine	Root	Antioxidant, anti-inflammatory, antidiabetic
Palmatine	Root, Stem bark	Antimicrobial, anti-inflammatory, antioxidant
Jatrorrhizine	Root, Stem bark	Antidiabetic, anti-inflammatory, cardiovascular
Berbamine	Root, Stem bark	Antitumor, antilipidemic, anti-inflammatory
Quercetin	Flowers, Root bark	Anticancer, anti-inflammatory, antihistamine
Columbamine	Root bark	Anticancer, anti-proliferative, antidiabetic
Karachine	Root bark	Antioxidant, anticancer

VII. PHARMACOLOGICAL ACTIVITIES

7.1 Hepatoprotective Activity

One of the most clinically relevant and traditionally established properties of *Berberis aristata* is its hepatoprotective activity. Classical Ayurvedic texts reference its use in treating Bahupitta kamala — a condition corresponding to

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hepatitis — and contemporary research has largely validated these observations. Experimental studies using CCl_4-induced hepatic injury models in rodents have demonstrated that berberine at doses of 80, 120, and 160 mg/kg body weight significantly reduces elevated hepatic marker enzymes, though lower doses such as 4 mg/kg proved ineffective. Intraperitoneal administration of berberine at 0.5–5 mg/kg in mice mitigated tert-butyl hydroperoxide-induced hepatotoxicity primarily through the attenuation of cellular oxidative stress.

Oral administration of *Berberis vulgaris* root extract at 800 mg/kg produced significant hepatoprotective effects, approximately eight times the standard therapeutic dose. The protective mechanisms appear to involve antioxidant modulation, inhibition of lipid peroxidation, and restoration of depleted cellular antioxidant enzymes. Efforts to enhance the bioavailability and hepatoprotective efficacy of berberine through β-cyclodextrin complexation have also shown promising results, improving aqueous solubility and gastrointestinal absorption.

7.2 Antimicrobial Activity

Berberine exhibits well-documented antimicrobial activity across a broad spectrum of pathogens. It demonstrates effectiveness against enteric bacteria responsible for acute diarrhoeal infections, including *Klebsiella* spp., *Shigella* spp., and *Salmonella paratyphi*. Berberine sulfate has been shown to inhibit the adherence of *Streptococcus pyogenes* and *Escherichia coli* to host epithelial cells, thereby disrupting the critical initial stages of infection. The proposed mechanisms underlying berberine's antimicrobial action include inhibition of microbial adhesion, disruption of cell membrane integrity, and interference with bacterial DNA replication and protein biosynthesis.

A particularly significant observation is the synergistic enhancement of berberine's antibacterial potency when combined with compounds that inhibit bacterial efflux pumps. This suggests that *Berberis* species may naturally co-produce both antibacterial agents and efflux pump inhibitors within the same plant matrix — a strategy that effectively circumvents bacterial resistance mechanisms. Extracts of *B. aristata* root bark have also demonstrated activity against fungal pathogens and have been traditionally employed by tribal communities in Jammu and Kashmir for treating fungal and bacterial skin infections.

7.3 Immunomodulatory and Anti-inflammatory Activity

The immunomodulatory properties of *Berberis aristata* represent one of the most mechanistically complex aspects of its pharmacology. Both alcoholic and aqueous extracts of *Berberis* species have demonstrated significant effects on mitogen-stimulated lymphocytes, selectively suppressing T-cell proliferation while promoting B-cell expansion. This dual action implies a sophisticated regulatory influence on adaptive immune responses. The phytoconstituents of *B. aristata* modulate cytokine secretion patterns, notably reducing the production of interferon-gamma (IFN-γ) while increasing synthesis of interleukin-4 (IL-4), interleukin-10 (IL-10), and transforming growth factor-beta (TGF-β), collectively shifting the immune milieu toward an anti-inflammatory Th2-dominated profile.

At the molecular level, berberine has been identified as an epigenetic regulator with the capacity to influence histone acetylation and methylation. Its demonstrated ability to facilitate STAT4 degradation results in a marked reduction of IFN-γ–producing T cells, further contributing to immune suppression in inflammatory contexts. In LPS-induced inflammatory models, berberine pretreatment effectively inhibited the activation of the NF-κB/MAPK signalling pathway, leading to decreased production of pro-inflammatory mediators such as TNF-α, IL-1β, and IL-6. In primary murine splenocyte cultures, berberine also increased the IL-4/IL-2 ratio, reinforcing Th2 polarisation and the attenuation of Th1-driven inflammatory pathways.

7.4 Anticancer Activity

The anticancer potential of *Berberis aristata* is one of the most actively researched aspects of its pharmacology. The cytotoxic activity of the methanolic stem extract has been extensively evaluated against MCF-7 human breast cancer cell lines. At concentrations of 125, 250, and 500 µg/mL with 48 hours of incubation, the extract demonstrated dose-dependent inhibition of cell growth with an IC_{50} value of 220 µg/mL. At 500 µg/mL, significant reduction in

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clonogenic potential was observed, and in an in vitro scratch assay, cell migration was inhibited by approximately 50% at 250 µg/mL. Most strikingly, the extract induced apoptosis in 68% of cells at the highest test concentration, indicating a potent pro-apoptotic mechanism.

Studies with pure berberine have confirmed cytotoxic effects across a range of cancer cell lines: A549 lung carcinoma (64%), HepG2 hepatocellular carcinoma (85%), MCF-7 breast cancer (87%), Jurkat T-cell lymphoma (85%), and K562 chronic myelogenous leukaemia (23%) at a concentration of 0.5 mg/mL. Notably, the combination of berberine with curcumin produced synergistic anticancer activity, suggesting that phytochemical combinations from *B. aristata* may be therapeutically superior to isolated compounds. In DMBA-induced tumour-bearing mouse models, both pure berberine and *B. aristata* extract showed cytoplasmic TNF-α positivity in ductal epithelial cells, suggesting immunological mechanisms underlying its antitumour actions.

7.5 Antidiabetic and Antioxidant Activities

Berberine has attracted considerable attention for its antidiabetic properties, primarily through its ability to activate AMP-activated protein kinase (AMPK) and improve insulin sensitivity in peripheral tissues. Clinical and preclinical evidence suggests that berberine can lower fasting blood glucose, reduce glycated haemoglobin (HbA1c), and improve lipid profiles in type 2 diabetic subjects with efficacy comparable to metformin. Several alkaloids in *B. aristata*, including palmatine, jatrorrhizine, epiberberine, and pakistanine, contribute independently to antidiabetic activity through various mechanisms including inhibition of α-glucosidase, stimulation of insulin secretion, and reduction of hepatic glucose production.

The antioxidant capacity of *B. aristata* is rooted in the rich phenolic, flavonoid, and alkaloid content across its various parts. Berberine's ability to scavenge reactive oxygen species (ROS) and upregulate endogenous antioxidant enzymes — including superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx) — provides a molecular basis for many of its protective effects against oxidative stress-associated diseases. The leaves, in particular, contain high concentrations of chlorogenic acid, flavonoids (59.9 mg quercetin g^{-1}), and anthocyanins (11.34 mg cyanidin-3-glucoside g^{-1}), making them a particularly potent source of natural antioxidants.

VIII. TRADITIONAL AND ETHNOMEDICINAL USES

The ethnomedicinal legacy of *Berberis aristata* is as extensive as it is diverse. In Ayurveda, the plant is classified under the Tikta Skandha group, denoting its bitter taste and associated detoxifying properties. It is prescribed in classical formulations for the treatment of jaundice, skin diseases, eye disorders, fever, diarrhoea, piles, ulcers, and inflammatory conditions. The Ayurvedic preparation Rasauta or Rasont, derived from a concentrated aqueous extract of the root bark, is a well-known traditional remedy widely used across northern India and Nepal as an eye tonic, antimicrobial paste, and digestive aid.

In the Unani system of medicine, *B. aristata* is regarded as a cold and dry agent with hepatocellular protective, digestive, and anti-inflammatory qualities. The roots and stem bark are incorporated into formulations used for managing chronic liver disease, spleen disorders, and metabolic dysfunction. In folk medicine across Himachal Pradesh and the tribal belts of Jammu and Kashmir, the plant is used topically for wound healing and skin infections, and internally for managing gastrointestinal and respiratory disorders. Barberry fruits are consumed as a tonic, appetite stimulant, and source of vitamin C, and are traditionally employed for throat cleansing and prevention of chronic bleeding disorders.

IX. CONCLUSION

Berberis aristata (Daruharidra) stands as one of the most pharmacologically versatile and ethnomedicinally significant plants in the Indian medicinal flora. The converging evidence from traditional use, phytochemical investigation, and modern pharmacological research paints a compelling picture of a plant with enormous therapeutic potential. Its principal alkaloid, berberine, acts through multiple molecular and cellular pathways — modulating cytokine

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production, inhibiting inflammatory signalling cascades, inducing apoptosis in cancer cells, regulating glucose metabolism, and protecting hepatocytes from oxidative injury. These diverse mechanisms not only validate centuries of traditional application but also open exciting frontiers for the development of novel plant-derived therapeutics.

The phytochemical diversity of the plant — encompassing protoberberine alkaloids, bisbenzylisoquinoline alkaloids, flavonoids, phenolic acids, tannins, vitamins, and minerals — ensures that its therapeutic effects arise from the synergistic interplay of multiple bioactive constituents rather than any single compound. The superior anticancer activity observed when berberine is combined with curcumin exemplifies this principle and highlights the value of investigating natural compound combinations. Environmental factors such as altitude, soil potassium, and moisture content further influence alkaloid biosynthesis, suggesting that optimised agronomy could significantly enhance the therapeutic yield of cultivated populations.

Despite the wealth of preclinical evidence, critical gaps remain. Systematic pharmacokinetic and pharmacodynamic studies, rigorously designed clinical trials, standardised extraction protocols, and evidence-based safety profiles are urgently needed to translate the ethnomedicinal heritage of *B. aristata* into validated clinical applications. Sustainable harvesting practices and biotechnological cultivation strategies are equally essential to prevent the overharvesting that threatens wild populations across the Himalayan region. In summary, *Berberis aristata* represents a rich reservoir of bioactive molecules with profound therapeutic promise, and a concerted research effort focused on this plant could yield significant dividends for both traditional and modern medicine.

REFERENCES

[1] Singh V, Jaisali S, Deeksha. Review of Daruharidra in classical texts. EPRA Int J Multidiscip Res (IJMR). 2023;9(11):332–335.

[2] Rathi B, Sahu J, Koul S, Khosa RL. Salient features of Berberis aristata and Berberis asiatica: a comparative pharmacognostical study. Der Pharmacia Lettre. 2013;5(2):40–42.

[3] Ali M, Malik AR, Sharma KR. Vegetative propagation of Berberis aristata DC: an endangered Himalayan shrub. J Med Plants Res. 2008;2(12):374–377.

[4] Awari A, Kumar M, et al. Proximate analysis and techno-functional properties of Berberis aristata root powder. Foods. 2024;13(17):2802.

[5] Sood H, Kumar Y, Gupta VK, Arora DS. Scientific validation of the antimicrobial and antiproliferative potential of Berberis aristata DC root bark. AMB Express. 2019;9(1):143.

[6] Khan MI, Rahman MA, et al. Quality control standardization and antimicrobial potential of Daruhaldi stem bark. J Diet Suppl. 2020;17(1):97–109.

[7] Sharma C, Aneja KR, Kasera R. Screening of Berberis aristata DC for antimicrobial potential against ear pathogens. Int J Pharmacol. 2011;7(4):536–541.

[8] Patel MC. Isolation of berberine from Berberis aristata by acid dye method. Int J Pharm Sci Rev Res. 2013;20(2):187–189.

[9] Neag MA, Mocan A, Echeverría J, et al. Berberine: botanical occurrence, traditional uses, extraction methods. Front Pharmacol. 2018;9:557.

[10] Rigillo G, et al. Comprehensive analysis of Berberis aristata bark extracts: bioaccessibility and safety. Nutrients. 2024;16(17):2953.

[11] Mitra MP, et al. Phytopharmacology of Berberis aristata DC: a review. J Drug Delivery Ther. 2011;1:46–50.

[12] Goswami R, et al. Phytochemical, antioxidant and proximate analysis of Berberis aristata roots. Int J. 2024;8(8S):608–615.

[13] Chander V, et al. A review on pharmacological potential of berberine from Himalayan Berberis aristata. J Phytopharmacol. 2017;6(1):53–58.

[14] Ashok DR, Rajesh BA, et al. Phytochemical study of Daruharidra and its hepatoprotective efficacy in infective hepatitis.

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[15] Paudel K, Ramamurthy A, Sharma G. Review on hepatoprotective effect of Berberis aristata DC. Int Ayurvedic Med J. 2021;9:192–199.
[16] Bhatt LR, et al. Antioxidant activity and total phenolic content of Berberis aristata from Sagarmatha National Park. Pharmacogn J. 2018;10(6s).
[17] Saxena AV, et al. Pharmacognostic and phytochemical analysis of Berberis aristata stem. Int J Sci Dev Res IJSDR. 2021;6:378–385.
[18] Belwal T, et al. Phytopharmacology and clinical updates of Berberis species against diabetes. Front Pharmacol. 2020;11:41.
[19] Rajasekaran A, Pokhriyal R, Singh YP. Quantitative estimation of berberine in Berberis aristata by HPLC. Pharmacogn Mag. 2009;5(20).
[20] Balakrishna A, Kumar MH. Synergetic anticancer activity of berberine and curcumin on cancer cell lines. BioMed Res Int. 2015;2015:354614.
[21] Choudhary S, et al. Daruharidra (Berberis aristata): review based upon Ayurvedic properties. Int J Res Appl Sci Biotechnol. 2021;8(2):98–106.
[22] Nema P, et al. A precise study on Berberis aristata. Int J Curr Pharm Res. 2022;14(6):10–16.
[23] Anonymous. Indian Berberry (Daruhaldi) [Internet]. 2001 [cited 2025 Nov 3].
[24] Sarraf M, et al. Investigating functional properties of barberry species: an overview. J Sci Food Agric. 2019;99(12):5255–5269.
[25] Kunwar M, Varshney S. Comprehensive analysis of Daruharidra (Berberis aristata DC.). IJNRD. 2023;8(3):794–806.
[26] Fathima N, et al. Chemical constituents and pharmacological properties of Rasaut (Berberis aristata DC). IJSRM. 2025;28(2):29–35.
[27] Husain N, et al. Ethnic tribes of Jammu and Kashmir and their ethnomedicinal preferences. Int J Bot Stud. 2022;7(1):258–263.
[28] Verma S, Singla S, Goyal S. Medicinal potential of Berberis aristata: a review. Indo Am J Pharm Sci. 2018;5(6):5515–5525.
[29] Sharma S, et al. Berberis aristata and its endophytes for pharmacological applications. J Appl Biol Biotech. 2024;12:37–46.
[30] Khan WA, Widunbiliu, Gurjar OP. Berberry (Berberis vulgaris): development, collection, and hepatic treatment studies. JETIR. 2022;9(6):456–470.
[31] Chauhan AD, Rao SP. A review of Berberis vulgaris: cultivation, collection, and pharmacological studies. IJCRT. 2020;8(5):935–950.
[32] Goswami R, et al. Unveiling the medicinal potential of Berberis aristata: a native plant of Uttarakhand.
[33] Kumar A, et al. Nutritional composition, phytochemicals, and health benefits of barberry. J Food Process Preserv. 2022;46(10):e16906.