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BRIDGING TRADITION AND SCIENCE: SCIENTIFIC VALIDATION OF ETHNOMEDICINAL CLAIMS OF *RHODODENDRON ARBOREUM* SM. (*BURANSH*) IN UTTARAKHAND

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ABSTRACT

Rhododendron arboreum Sm. (*Buransh*) is a culturally and medicinally significant Himalayan tree widely used by communities in Uttarakhand. Traditional uses include treatment of diarrhea, dysentery, fever, cough, headache, rheumatism, gastric irritation, and as a cardiotonic and strength-promoting drink. The present review critically analyzes these ethnomedicinal claims and correlates them with modern phytochemical and pharmacological studies. Phytochemical analyses reveal the presence of flavonoids (quercetin, rutin, hyperin), phenolics (gallic, ellagic acids), tannins, saponins, triterpenoids (ursolic acid), phytosterols (beta-sitosterol), and anthocyanins, which contribute to antioxidant, anti-inflammatory, hepatoprotective, and cardioprotective activities. Pharmacological studies demonstrate anti-diarrheal, hepatoprotective, antimicrobial, wound-healing, anti-inflammatory, antidiabetic, and cardioprotective effects, thereby validating many traditional claims. However, clinical studies, dosage standardization, and toxicity profiling remain largely absent. This review highlights that while R. arboreum holds strong potential as a validated ethnomedicinal and nutraceutical resource, further multidisciplinary research is essential to translate folk knowledge into evidence-based medicine.

KEYWORDS: *Rhododendron arboreum, Buransh,* ethnomedicine, Uttarakhand, phytochemistry, pharmacological validation.

1. INTRODUCTION

Ayurveda, the traditional system of medicine of India, has always emphasized the dynamic and evolving nature of its materia medica. The classical texts such as the *Charaka Samhita*, *Sushruta Samhita*, and *Bhavaprakasha Nighantu* have catalogued hundreds of plant, mineral, and animal drugs. However, the vast biodiversity of India, coupled with regional variations in flora, gave rise to the concept of *Anukta Dravya* (extrapharmacopoeial drugs). These are medicinal plants and substances not described in the classical nighantus or became recognized later through ethnomedicinal practices.[1,2]

The *Ayurvedic* classics encourage inclusion of new medicinal plants under the principle of *Yukti* (rational application) and *Anukta Dravya Prayoga*, acknowledging that knowledge must expand as newer drugs are identified.[3] Over centuries, Himalayan communities developed rich ethnomedicinal practices, many of which are yet to be systematically integrated into the *Ayurvedic* pharmacopoeia.

Despite their therapeutic use, extrapharmacopoeial drugs[1,2] are often excluded from the *Ayurvedic* Pharmacopoeia of India (API) due to lack of standardization.[4,5,6] Standardization is necessary to ensure identity, purity, safety, and efficacy.[4] Variations in nomenclature, habitat, phytochemistry, and usage make it essential to establish pharmacognostic, phytochemical, and pharmacological profiles.[5,6]

By adopting such standardization.[4,5,6] protocols (pharmacognostical characterization, phytochemical profiling, pharmacological validation, and toxicity studies), extrapharmacopoeial drugs[1,2] can transition from folk remedies to evidence-based therapeutic agents.[5,6]

A classic example is *Rhododendron arboreum* Sm. (*Buransh*). Though not mentioned in *Charaka* or *Sushruta Samhita*, it has a long history of use in Uttarakhand. Flowers are consumed as juice or squash for cardiotonic properties, decoctions for fever, diarrhea, and dysentery, leaf pastes for headache, and bark infusions for rheumatism and gastric irritation.[7,8]

Modern pharmacological studies provide justification for these claims. Flowers contain flavonoids, anthocyanins, and phenolic acids that show antioxidant, cardioprotective, anti-inflammatory, and hepatoprotective properties.[9,10] Animal experiments.[3,4,6,7,8,11] have

validated anti-diarrheal, hepatoprotective, antimicrobial, and antidiabetic activities.[11,12] Despite this, *Buransh*[7,8] is absent from the official *Ayurvedic* Pharmacopoeia due to lack of pharmacognostical and standardization[4,5,6] data. Its systematic inclusion would validate folk knowledge and enrich the *Ayurvedic* pharmacopeia.[7,9]

2. Botanical and Taxonomical Overview

Taxonomy: Kingdom Plantae; Order Ericales; Family *Ericaceae*; Genus *Rhododendron*; Species *arboreum* Sm. Morphology: Evergreen tree up to 15 m, leathery lanceolate leaves, bright red flowers in terminal clusters, rough grey bark. Distribution: Found in the Himalayan belt (Pakistan to Arunachal Pradesh), particularly between 1500–3600 m in Uttarakhand.

3. Traditional and Ethnomedicinal Uses in Uttarakhand

Flowers: Consumed as juice/squash for heart weakness, fatigue, fever, diarrhea, dysentery. Leaves: Paste applied for headaches, skin infections, boils. Bark: Decoction used for gastric irritation, rheumatism, and menstrual issues. Cultural role: Used as strength-promoter and cardiotonic.

4. Phytochemical Constituents

Major phytochemicals include flavonoids[9,10] (quercetin, rutin, hyperin), phenolic acids (gallic, ellagic, ferulic), tannins, saponins, triterpenoids (ursolic acid), anthocyanins (cyanidin, delphinidin), and phytosterols (beta-sitosterol). These compounds explain antioxidant, anti-inflammatory, hepatoprotective, cardioprotective, and adaptogenic effects.

5. Pharmacological Studies: Modern Validation

Anti-inflammatory[7,8] & Analgesic: Leaf/bark extracts reduce carrageenan-induced edema and show analgesic effects. Cardioprotective[9,10] & Antioxidant: Flower extracts reduce oxidative stress, improve cardiac markers. Antimicrobial[6,7] & Wound Healing: Leaf/flower extracts active against bacteria, accelerate wound healing. Antidiabetic[11]: Flower extracts inhibit alpha-glucosidase and lower glucose. Hepatoprotective[4]: Flower decoctions restore SGOT/SGPT in CCl4 models. Anti-diarrheal[3]: Extracts reduce motility and fluid loss. Strength-promoting: Antioxidant-rich flower juice improved endurance in fatigue models.

Table 1: Ethnomedicinal Claims of *Rhododendron arboreum* Sm. in Uttarakhand and Their Modern Pharmacological Validation.

Traditional Claim / Use	Part Used & Mode of Use	Ethnomedicinal Context	Modern Pharmacological Evidence
Cardiotonic, refreshing drink	Flower juice	Consumed for heart weakness, fatigue, altitude stress	Flavonoids & anthocyanins show antioxidant & cardioprotective effects
Anti-diarrheal & dysentery	Decoction of flowers	Given during acute diarrhea/dysentery	Flower extracts reduced motility & fluid loss
Fever & cough remedy	Flower decoction/infusion	Remedy for fever, cough, respiratory ailments	Flavonoid-rich extracts show antimicrobial and antipyretic activity
Headache relief	Paste of young leaves	Applied on forehead	Analgesic & anti-inflammatory activity in rodent models
Skin disorders & wound healing	Leaf paste	Applied on boils, rashes, wounds	Antimicrobial & wound-healing confirmed
Rheumatism & joint pain	Bark decoction	Used for pain, stiffness	Bark extracts reduced inflammation in paw edema models
Gastric irritation, indigestion	Bark infusion	Taken for digestive issues	Bark extract showed gastroprotective activity
Hepatoprotective	Flower/leaf decoction	Used for jaundice, digestion	Flower extract restored liver markers in CCl4 toxicity
Antidiabetic	Flower infusion	Given for 'sugar imbalance'	Flower extracts inhibited alpha-glucosidase & reduced glucose
Strength-promoting	Fresh flower juice	Taken for stamina, vitality, altitude adaptation	Antioxidant-rich juice improved endurance

Table 2: Major Phytochemicals Reported from *Rhododendron arboreum* and Their Biological Activities.

Phytochemical / Class	Part Reported	Known Biological Activities	Relevance to Ethnomedicinal Claims
Quercetin (flavonoid)	Flowers, leaves	Antioxidant, anti-inflammatory, cardioprotective	Supports cardiotonic, anti-inflammatory uses
Rutin (flavonoid glycoside)	Flowers	Vasoprotective, antioxidant, anti-diarrheal	Justifies cardiotonic & anti-diarrheal claims
Hyperin (flavonoid)	Flowers	Anti-inflammatory, analgesic, anti-stress	Correlates with headache & rheumatism uses
Ursolic acid (triterpenoid)	Leaves, bark	Anti-inflammatory, hepatoprotective, antimicrobial	Validates rheumatism & liver protective uses

Beta-sitosterol (phytosterol)	Leaves, bark	Hypolipidemic, immunomodulatory	Supports stamina & joint pain claims
Tannins	Flowers, bark	Astringent, antimicrobial, anti-diarrheal	Explains diarrhea/dysentery treatment
Saponins	Flowers, bark	Immunomodulatory, expectorant, adaptogenic	Supports cough & tonic uses
Phenolic acids	Flowers, leaves	Antioxidant, hepatoprotective	Aligns with digestive & liver protective claims
Anthocyanins	Flower petals	Antioxidant, cardioprotective, anti-fatigue	Explains cardiotonic & restorative folk claims
Essential oils	Leaves	Antimicrobial, aromatic	Justifies skin & wound healing uses

6. DISCUSSION

Many folk claims, including cardiotonic, hepatoprotective, and anti-diarrheal uses, are strongly supported by phytochemical and pharmacological studies. Flavonoids, anthocyanins, and tannins explain antioxidant, cardioprotective, and astringent effects. However, gaps remain: (i) absence of human clinical trials, (ii) lack of standardized dosage and formulations, (iii) limited toxicity and pharmacokinetic studies.

7. CONCLUSION

Rhododendron arboreum is a Himalayan treasure with validated pharmacological activities that strongly correlate with its ethnomedicinal applications. Its role as a cardiotonic, digestive aid, hepatoprotective, and strength-promoting tonic is well supported. Future research must prioritize clinical studies, extract standardization[4,5,6], toxicity evaluation, and formulation development.

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