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Rhododendron arboreum of Shivalik Hills: Bridging Traditional Wisdom with Modern Pharmacognostic and In-Vitro Evidences

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ABSTRACT

Rhododendron arboreum is an evergreen shrub or small tree with a showy display of bright red flowers. The name 'Rhododendron' is derived from the Greek word 'RHODO' means rose & 'DENDRON' means tree. Rhododendron is the national flower of Nepal & is known as (Laligurans) & the state tree of Uttarakhand. It is called 'Burans, Bras, Buras or Barahke-phool' in local dialect. It is widely popular for the processed juice of its flowers which have gained market popularity as rhodo juice sharbat. The plant is found in the Himalayas from Kashmir eastwards to Nagaland. Various parts of the plant exhibited medicinal properties & is used for the treatment of various ailments. The present review is an effort to give the detailed survey of literature on its pharmacognosy, phytochemistry & pharmacological uses of the plant under study.

Keywords- Rhododendron Arboreum, Burans, Pharmacognosy, Phytochemistry, Pharmacology.

I. INTRODUCTION

Rhododendron has been derived from two Greek word "Rhod" meaning "Rosy red "DENDRON"' meaning "tree". The name perfectly symbolizes the red flower of the Hindu religion flower of this plant is used as a holy religious botanical Burans or Rhododendrons an ever-green tree that has grown up to 20mheight and has rough and pinkish brown bark. Burans are mainly found in Asia. They are distributed over the Himalayas and found in India, Nepal, Bhutan, Pakistan and China. In Himachal Pradesh, Uttarakhand, and hilly states. Burans is mainly foundinthehigheraltituderegionswithatemperatureclimateandalpineconditions. The brightly colored flowers which bloom from late winter till early summer are the highlight of this tree. The month from January to march marks the blooming season of burans in Himachal Pradesh [1-15].

Fig.1: Flower of Rhododendron Arboreum

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The best place where you can witness the beauty of burans in its full bloom during spring is valley of flowers national park *in Gobind ghat, Deoria-Tal, Chopta, Harsil, Kausani, barsar, dodital and malla*among other scenic high attitude locations. **Rhododendron arboreum** is one of the most important species found in the Uttarakhand hills. Commonly known as **Burans**, the flower of *Rhododendron arboreum* has been declared the **State Tree of Uttarakhand** and is also the **National Flower of Nepal**. It is an **evergreen shrub or small tree** that can grow up to **15 meters in height**. This species is distributed across the Indian Himalayas, from **Kashmir to Arunachal Pradesh**, including **Nepal, Sikkim, Darjeeling, and Bhutan**, typically found at elevations of **1500 to 3400 meters above sea level**. The species is currently listed as **Vulnerable**. The **bark** is reddish-brown, soft, and rough. The **leaves** are oblong-lanceolate in shape, measuring **10–20 cm in length** and about **3.6 cm in width**, and are crowded towards the ends of branches. The **flowers** are stunning, with colours ranging from deep **scarlet** and **red with white markings** to **pink and white**. Each flower cluster (called a truss) can bear up to **twenty blossoms**, creating a **spectacular sight when in full bloom [15-20].**

Fig.2: Flower of Rhododendron Arboreum

II. USES OF RHODODENDRON ARBOREUM (BURANS)

Along with its beautiful appearance, Burans (Rhododendron arboreum) has significant economic, traditional, and medicinal value.

1. Economic Uses:

- The wood of the tree is used to make charcoal and firewood.
- Its hardwood is useful for making plywood, boxes, tool handles, and in construction.
- The bark is sometimes used to make snuff (a powdered tobacco product).
- The flower petals are used to prepare jelly, juice, squash, and chutneys

2. Household Uses:

- The petals have a sour taste that is loved by many people.
- The flower is used to make Burans squash, juice, and other drinks because of its unique flavour.
- Dried petals are even added to fish curry to soften fish bones.

3. Medicinal Uses:

Burans is well known in traditional medicine for its healing properties, especially due to its antioxidant, anti-inflammatory, and liver-protective effects. Nearly every part of the plant has some medicinal value.

Some common uses:

- Young leaves are applied to the forehead for headaches and breathing problems.
- The bark and flowers are used to treat digestion and respiratory issues.
- Burans is believed to be good for the heart, liver, and diabetes.
- It is also used to treat diarrhoea and improve skin health.
- In homeopathy, a tincture (liquid extract) made from dried leaves is used to treat gout.
- In Ayurveda, a preparation called Asoka Aristha containing Burans is believed to help with women's health and hormonal balance [21-25].

Other Medicinal Insights:

- Dried flowers are used to treat diarrhea and dysentery.
- Fresh or dried petals, which have a tangy-sweet taste, are given when fish bones get stuck in the throat.

- The plant has low side effects and is generally considered safe in small amounts.
- However, young leaves can be poisonous if eaten in large quantities and may cause intoxication

Healing Compounds in the Plant:

Different parts of Burans contain natural substances that are helpful in treating many illnesses:

- The stem has natural chemicals that may help with:
  - Bleeding
  - Allergies
  - Asthma
- The roots contain compounds that may help prevent cancer and support heart health.
- The leaves contain substances that may relieve:
  - Headaches
  - Fever
  - Toothache
  - Cough
  - Lung infections

III. COMMERCIAL USES

In hilly areas, the flowers of Rhododendron arboreum with sweet & sour taste are used in the preparation of squash, jams, jellies and local brew. It is a very common and pleasant drink, drunk once daily as refreshing appetizer & also to prevent high-altitude sickness. Fresh petals are used to prepare chutney known as barah ki chutney. The juice of the leaves is spread over cots and beds to get rid of bed lice. Wood of the plant is used to make charcoal & fuel. The grained wood ofR. arboreum is used for making 'khukri' handles, packsaddles, gift-boxes, gunstocks and posts. Flowers & leaves are fitted in long ropes made of munja grass & tied around the houses including temples as decorations [25-30].

Traditional use of Rhododendron arboretum

The beautiful, magnificent flower of Rhododendron arboreum is having so many ethnical and commercial uses. Flowers are presented as offerings in hill temples, also widely used in wedding bouquets. The extraction from the flower and bark is used as an ingredient in commercial cosmetic preparations such as skin conditioner. The stem wood of this plant is used to make 'khukri' handles [31-45], furniture, gift boxes, gunstocks, packsaddles, fuel and charcoal.

Table 1: Vernacular Names

Nepali	Lali Gurans
Punjabi	Adrawal
Garhwali	Burans
Kumaoni	Eras
Tamil	Billi
Kannada	Pu
Malayalam	Kattupoovarasu

Table 2: Taxonomical Classification

Kingdom	Plantae
Phylumn	Magnolliophyta
Class	Angiospermae
Order	Ericales
Family	Ericaceae
Genus	Rhododendron
Species	Rhododendron arboreum

Table 3: Phytochemical Rhododendron arboreum

S.NO	Parts of plant	Bioactive compound	Reference
1.	Flower	Quercetin-3-rhamnoside Phenolic compounds Rutin Coumaricacid Glucoside	Swaroop et al., 2005.
2.	Leaves	Ericolin Ursolicacid Quercetin Hyperoside	Verma et al., 2011.

		Flavoneglycosides Flavonoids	
3.	Bark	Triterpenoids Ursolic acid Betulinic acid Leuco-pelargonidin	Hariharan and Rangaswami,1996

IV. PHARMACOGNOSY

Trunk

The trunk is often much branched, crooked or gnarled. Bark is reddish brown, soft and rough, exfoliating in thin flakes.

Leaves

Leaves are oblong-lanceolate, 10-20 cm long and 3.6 cm wide. Crowded towards the ends of branches, petiole covered with white scales when young. It is glossy green, with deeply impressed veins from above white fawn, cinnamon or rusty brown felt is found at the under surface.

Flowers

The flowers of R. arboreum range in color from a deep scarlet, to red with white markings, pink to white. Bearing up to twenty blossoms in a single truss this rhododendron is a spectacular sight when in full bloom. It is reported that the bright red forms of this rhododendron are generally found at the lower elevations. Flowers are showy, red in dense globose cymes. Calyx- fine cleft, Corolla-tube spotted funnel shaped, Stamens-hypogynous declining, Filaments filiform, Anthers-ovate, Style- capitate.

Fruit

Capsule-curved central column composed of fine lobes, ribbed, up to 3.8 cm long and 1.25 cm wide.

Seeds

Seeds-minute, dark brown, compressed, thin linear having an obvolute membrane [46-50].

V. PHYTOCHEMISTRY

Bark

The petroleum ether extract of the bark indicated the presence of a single triterpenoid substance taraxerol ($C_{30}H_{50}O$) & ursolic acid acetate ($C_{32}H_{50}O_4$). The ether extract of the bark following petroleum ether extract showed the identity of botulinic acid ($C_{30}H_{48}O_3$). The acetone extract of the bark gave the substance leuco-pelargonidin ($C_{15}H_{14}O_6$).

Leaves

Greenleavesarereportedtocontainglucoside, ericolin(arbutin)($C_{12}H_{16}O_7$), ursolicacid ($C_{30}H_{48}O_4$), α-amyrin ($C_{30}H_{50}O$), epifriedelinol ($C_{30}H_{52}O$), a new triterpenoid named campanulin, quercetin &hyperoside ($C_{21}H_{20}O_{12}$). Chemical analysis of the leaves of R. arboreum var. nilagiricum revealed the presence of hyperoside (3-D - galactosidase of quercetin), ursolic acid and epifriedelinol, a triterpenoid compound. The leaves are also reported to contain the flavone glycoside and dimethyl ester of terephthalic acid and certain flavonoids.

Flowers

Quercetin-3-rhamnosideacrystalline chemical compound has been reported from the flowers of this species. Three biologically active phenolic compounds i.e. quercetin ($C_{15}H_{10}O_7$), rutin ($C_{27}H_{30}O_{16}$) and coumaric acid ($C_9H_8O_3$) have been reported in flowers of R. arboreum using high-performance thin-layer chromatography (HPTLC) [51-55].

VI. SIGNIFICANCE OF BURANS IN UTTARAKHAND AND HIMACHAL PRADESH

Burans (*Rhododendron arboreum*) holds a **special place** in the hearts of people in **Uttarakhand** and **Himachal Pradesh**. It is not only the **identity of these Himalayan states**, but also deeply reflects their **culture and traditions**

Cultural Importance

- Every year, during **spring**, a special celebration called the **Buransh Mahotsav** is held in **Katsina (Uttarakhand)**.
- This festival showcases the **beauty of the Burans flower**, its **uses**, and promotes **eco-friendly tourism**.
- It is a way to celebrate the **mountains**, **nature**, and **local heritage**

Medicinal and Seasonal Value

- Burans is known for its **strong medicinal properties**:
  - **Antioxidant**
  - **Anti-inflammatory**
  - **Anti-diabetic**
- Local people prepare **Buran's chutney and juice**, which are especially helpful during the **seasonal change from winter to spring**. These help **soothe the stomach** and **refresh the body**.

- **Spring in Uttarakhand** is often recognized by the **vibrant blooming** of the Rhododendron — it's a **symbol of the season**

Economic and Agricultural Importance

- Rhododendron arboreum provides **fruits and vegetables** throughout the year.
- It supports **local livelihoods** by offering products that can be **sold in local markets**.
- Farmers often grow **different varieties of Rhododendron** using a **mixed cropping system**. This approach:
  - Enhances **food security**
  - Supports **sustainable farming**
  - Helps **farmers meet household needs**
- According to a study by **Mehta et al.**, growing Burans is both **a necessity** and of **great importance** for survival in hilly areas

Fuel and Firewood Value

- Buran's wood has the **highest calorific value** (19.7 kJ/g), which means it produces **more heat** when burned.
- Locals consider it an **ideal firewood** because:
  - It gives **long-lasting heat**
  - It is **heavy**
  - It produces **very little ash**
  - It has **low moisture** and **high wood density**
- Due to these qualities, Burans has the **highest Fuel Wood Value Index (FVI)**, making it one of the **most preferred firewood species**.

Sustainable and Practical Uses

- Around **75% of local people** use **Buran's wood** for **cooking** and **heating homes**.
- It is also used to make:
  - **Charcoal**
  - **Wooden utensils**
  - **Fodder** from leaves for animals
- Interestingly, **immature leaves** are sometimes used to prepare a **traditional fish poison** (a common practice in remote forest-based communities [56-65].

Product of *Rhododendron arboretum* and their benefits

1. There are many products of burans that locals make. The products are renowned for their uses and their distinctive flavor. Being rich in potassium, calcium, iron, and vitamin C, product of burans is consumed as appetizers which relieve mountain sickness and seasonal sickness.
2. Buran's juice and burans squash – burans juice and burans squash is made from Buransh flower and is considered as the welcome drink of Uttarakhand. The drink has a calming effect on the body and soothes the gut. It is also used to stop excessive bleeding in the female during mensuration.
3. Buran's chutney– burans chutney is also made from the petals of the flower and has a sweet-sour taste. Taken alongside rice, rotis, or parathas, burans chutney and burans juice etc.
4. Buran's tea – made from burans flower petals, burans tea is a light herbal drink that is used for treating body inflammation. along with above – mentioned products, locals in Uttarakhand also prepared other delicacies like burans pakoda and burans parathas which are relished by the entire family [66].

VII. UTILIZATION OF *RHODODENDRON ARBORETUM* AS FOOD AND DRINK

Many valuable food products are developed from Rhododendron arboreum. Different parts of this small tree possess valuable therapeutic activities. The flowers of this plant have sweet and sourish taste so many food products are prepared which includes jam, jelly, juice, preserve, squash, chutney and local brew. Rhododendron is widely popular for its juice which is manufactured from flowers and therefore they have gained high market value and popularity. The juice prepared from Rhododendron is refreshing, pleasant, summer and common drink and has significance during headache, fever, nose bleeding and stomach. It has anti-inflammatory, antinonceptive activity, hepatoprotective activity and antidiarrhea activity. In hilly areas, fresh petals are used for making chutney with mint and other local spices which is commonly known as 'Buransh Ki chutney'. The aroma and flavors of this chutney is really refreshing. As there are many health benefits of this chutney, rich in antioxidants, rich in vitamin C, good for heart, pains and aches. The dried powder of these flowers used as a drug to cure 'blood dysentery'. The herbal tree referred as a 'Labrador Tea' manufactured by three closely related species of Rhododendron. Squash manufactured from Rhododendron is used for the treatment of mental retardation. The dye manufactured from dried leaves of Rhododendron has been used in treatment of gout and rheumatism. The nectar is brewed to make wine made from flower known as 'Guranse'is commonly drunk in parts of Himalayas and is effective against diarrhea and dysentery [67].

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Fig.3: Product Of Rhododendron Arboreum

Functional foods can be defined as dietary items that, besides providing nutrients and energy, beneficially modulate one or more targeted functions in the body, by enhancing a certain physiological response and/or by reducing the risk of disease (Clare, 2002). According to Institute of Food and Information Council (IFIC) states that functional foods "provide health benefits beyond basic nutrition. Functional food can be fruits, vegetables, herbs and flowers and they have its own medicinal and beneficial effect. Burans, belong from Ericaceae family. It consists of 1200 species among which China has the highest number of species that is 571 species. It is a national flower of Nepal and state tree of Uttarakhand. Moringa, the genus moringa belong to the Moringaceae family, the genus comprisesof13 species and it is commonly known as "drumstick", "horseradish". Mallow, this flower consists of 250 genera and 4230 species and it belong to the malvaceaea family Pansy, it is a genus Viola and it belong to the Violaceaea family. It is short lived plant. Artichokes, this flower is also called French or globe artichoke, it is belonging to the Asteraceae family. It is one of the ancient plants i.e., herbaceous and perennial which is originate from the Mediterranean area. Agave, it is a genus which belong to the Asparagaceae family. There are 300 species of agave, but only few of them are recognized. Many of the species of the agave ae bat pollinated. Rose, commonly known as the queen of the flowers and it belongs to the Rosaceae family. It is also considering as a national flower of England. There are about 150 species of the roses. Pumpkin belongs to the genus Cucurbita and family Cucurbitaceae. The flowers are bright yellow too range in color and have sweet scent and nectar inside [68-70].

VIII. CONCLUSION

Nature is rich in countless plants that serve a variety of purposes. The use of plants for **medicinal purposes** dates back to ancient times. Today, the search for new treatments from herbs and natural sources is growing rapidly, especially for managing different diseases and health conditions. Plants found in **hilly and mountainous regions** have always attracted the attention of **botanists and scientists**, who continue to explore their potential in medicine. There are still many plants around the world that have not been fully studied for their **healing properties**. Among these, **Rhododendron arboreum** stands out as a valuable plant from the Himalayan regions. It has **significant medicinal and commercial importance**. Scientific studies and traditional knowledge show that this plant has:

- **Anti-inflammatory**
- **Liver-protective (hepatoprotective)**
- **Antidiarrheal**
- **Antidiabetic**
- **Antioxidant** properties

These benefits are due to the presence of natural compounds like **flavonoids, saponins, tannins**, and other phytochemicals. The **fresh petals** of the flower are used to make **jelly, squash, and sharbat**, which are popular products in local markets. However, it's important to note that the **young leaves** can be **poisonous** and may cause **intoxication** if consumed in large amounts. Urans also holds a **special place in the cultural and economic life** of people in the region. The flowers are used in **temples** and **religious ceremonies** for decoration. The **wood** is used for making **tool handles, boxes, posts**, and is suitable for making **plywood**. During the blooming season, the **bright red flowers covering the trees** become a breathtaking sight that draws the attention of visitors and tourists. In conclusion, **Rhododendron arboreum** is a plant of **great medicinal, cultural, and economic value**, deserving protection and sustainable use for the benefit of both people and the environment.

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