Provisioning Ecosystem Services of Rhododendron rich forests in Western Himalayas

Researcher Name- Sanchi Singh
Correspondence-Dr. Sudipto Chatterjee

Department of Natural Resources
TERI School of Advanced Studies

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Introduction

- The word rhododendron comes from the Greek words "rhodon", or rose, and "dendron", or tree. Rhododendron arboreum is the national flower of Nepal. The Rhododendron arboreum also known as burans or gurans, belonging to ericaceae. It is an evergreen shrub or small tree with a showy display of bright red flowers. Lali Gurans are found at altitudes as low as 1200 meters and as high as 3,600 meters.

Introduction

- Rhododendron rich forests are widespread in the Indian Himalayan region and are utilized for providing various provisioning services to the communities. The Western Himalaya has six rhododendron species viz., *Rhododendron arboreum*, *R. anthopogon*, *R. barbatum*, *R. campanulatum*, *R. lepidotum* and *R. nivale*. which are present at different altitudinal range.

R. arboreum

R. anthopogon

R. barbatum

R. campanulatum

R. lepidotum

R. nivale

Habitat

- Altitude: 1200 - 3600 m
- Mean annual temperature: 12 - 17ºC
- Mean annual rainfall: 200 - 1800 mm
- Soil type: The plant prefers light (sandy) and medium (loamy) soils

Nomenclature

Kingdom: Plantae

Divison: Angiosperms

Order: Ericales

Family: Ericaceae

Genus: Rhododendron

What is the Importance for studying Rhododendron species?

Important keystone species for the Himalayan ecosystem

Important source of NTFP in the Western Himalayas

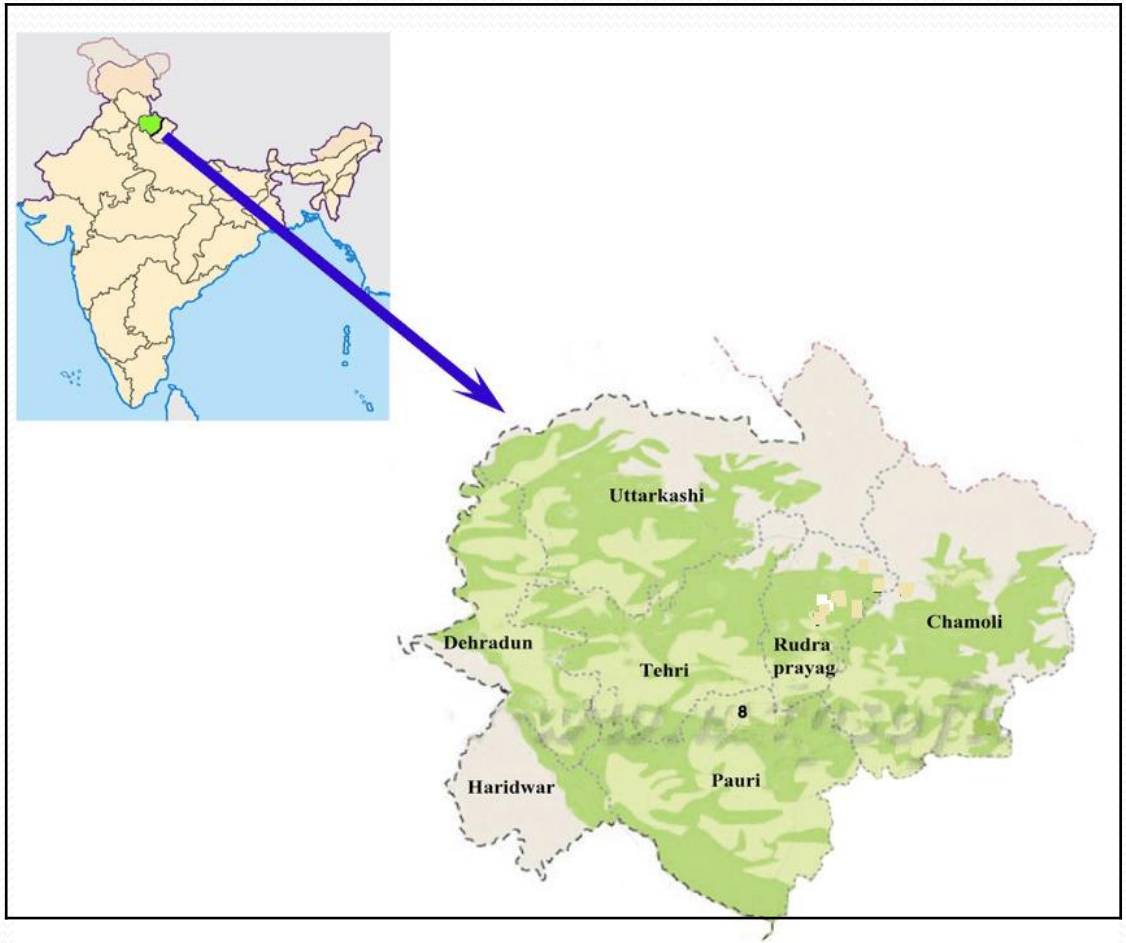
Valuable source of Provisioning Ecosystem Services

Helps in Livelihood generation for the locals

Reference : Tewari, A.; Bhatt, J. and Mittal, A. (2016). Ecological influences potential of *Rhododendron sp.* in the Western Himalayas.

Study area

Uttarakhand region of Indian Western Himalayas which is located between 30°17’N-30°41’N latitude and 79°40’E-80°5’E . It is bounded on the north by Tibet and has divisions of Kumaon and Garhwal. It includes the districts of Chamoli Dehradun Haridwar Pauri Garhwal Rudraprayag Tehri Garhwal and Uttarkashi.



Methodology

Preliminary approach

- Review of literature
- Ethno-botanical survey
- Stakeholders identification

Methods

- Key informants interview of the stakeholders
- Focused Group Discussion of the villagers for the utilization and the use of Rhododendron species.
- Structured questionnaire interview for the provisioning ecosystem services of the Rhododendron species

Analytical methods

- Value index calculation on the provisioning ecosystem services of the Rhododendron species.

Data Collection Pictures

Collection of the Rhododendron flowers by the native communities for local utilization

Interview with the stakeholders for listing the provisioning services of rhododendron species.

Commercial utilization of the Rhododendron products and services for economic benefits

Results and Discussion

Parts of the *Rhododendron forests* utilized for the provisioning services

The flowers range in color from a deep scarlet, to red with white markings, to pink to white.

Leaves: Leaves glossy,green, oblong-lanceolate,. Crowded towards the ends of branches.

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

Fruit a capsule, oblong, longitudinally ribbed, up to 3.8 cm long and 1.25 cm wide.

Results---(Table 1). Provisioning services of Rhododendron species in the study area

Species	Part Used	List of Provisioning Services
R.arboreum	Flowers (dry)	• Diarrhea • Blood dysentery
R.arboreum	Flowers(fresh)	• Preparation of Rhododendron juice/squash • Appetizers , jams and jellies • Prevent high altitude sickness • Headache (paste) • Nasal bleeding • Local tea • Local use and religious purpose
R.campanulatum	Bark	• Medicinal use in Jaundice, piles, liver disorder and worms
R.campanulatum ***R.anthopogon***	Stem/Wood	• Fuel wood • Agricultural implements
R.barbatum ***R.anthopogon***	Leaves	• Prevent headache • Resting Bed for animals
R. lepidotum	Corolla	• To get rid of the fish bones struck in the gullet used in Homeopathic medicinal system

TABLE 1. Provisioning services of Rhododendron species in the study area

Results-Fig 1 Category wise-Usage of the Provisioning Services of Rhododendron sp.

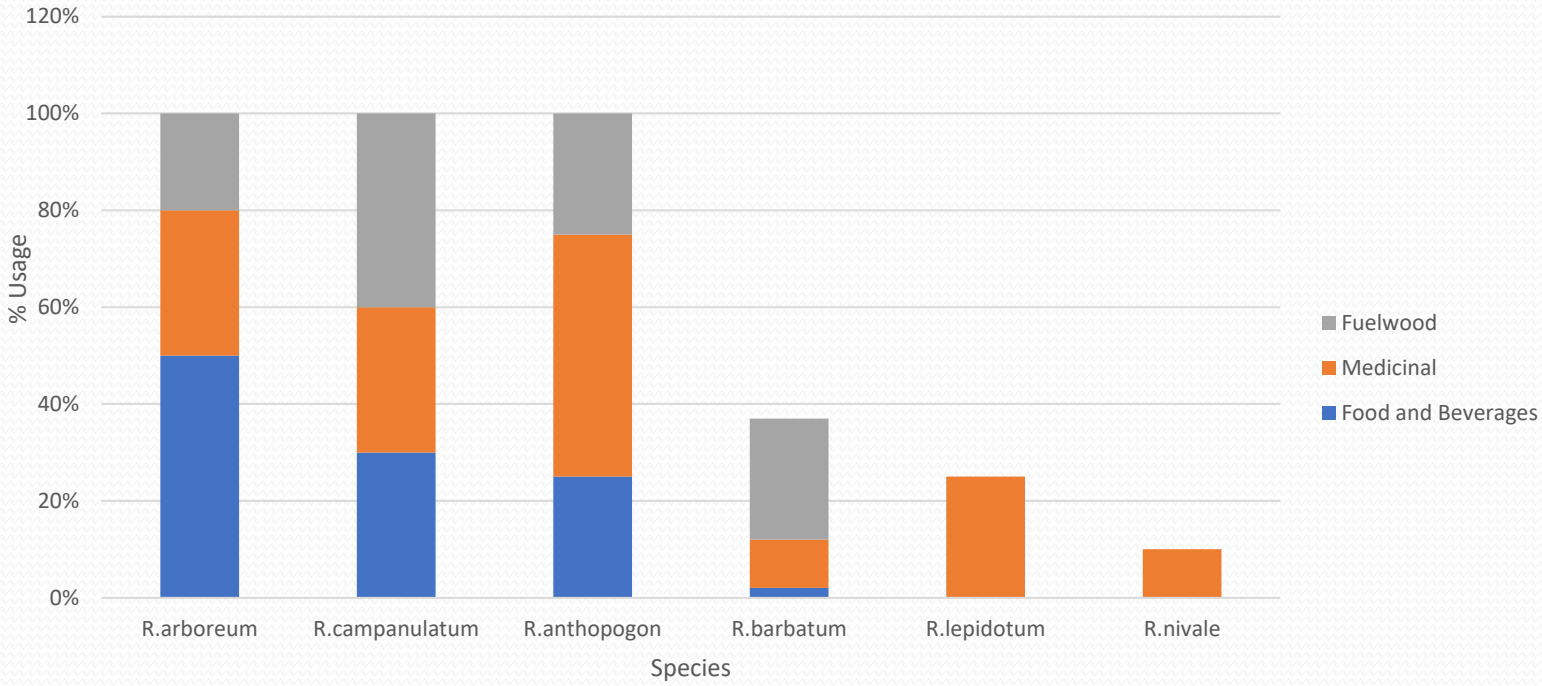


Fig 1. Usage of the Rhododendron species in the study area

Results : Table 2 : Use- Index Values for Rhododendron sp. in study area

Species	Use Value Index
R.arboreum	0.81
R. campanulatum,	0.54
R. anthopogon	0.45
R. barbatum	027
R. lepidotum	0.22
R. nivale	0.09

Table 2: Use- Index Values for Rhododendron sp. in study area

Index Reference :Phillips, O. & A.H. Gentry. The useful plants of Tambopata, Peru: I. Statistical hypotheses tests with a new quantitative technique. *Economic Botany*. **1993a**, 47(1),pp.15-32.

Discussion

The findings of the study reveals that Rhododendron species provides a variety of provisioning ecosystem services to the locals which is utilized both domestically and commercially in the study location. They are discussed briefly under the following categories :

FUELWOOD

Native people of the Himalayan community collect the dry tree logs and branches from the forests for cooking food and heating purposes and the bark of *R.arboreum* and *R.campanulatum* which are found at high altitudes of the Himalayan region and are widely utilized by the locals . It has also been reported that rhododendrons fuelwood has the quality and efficiency to burn even under raw conditions due to the presence of poly-flavonoids and other resinous substances

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FOOD AND BEVERAGES

The flowers of *Rhododendron arboreum* are used in the making of Rhododendron juice/squash locally called as ‘buransh’ which possess high medicinal properties. It also possess high anti-inflammatory properties which are a result of the presence of flavonoids, tannins, saponins and other phytochemicals present in the flower extract. The other food and beverages from these rhododendrons are utilized in the preparation of jams, jellies, appetizers and local brew. These products also offers a wide commercial market in the study area that aids to provide various economic benefits to the local communities.

MEDICINAL

From our study on the provisioning services of the rhododendron forests in Western Himalayas it has been found that the fresh flowers of *R.arboreum* are used as medicine in the treatment of hill diarrhoea, dysentery and curing of the high-altitude sickness. Other important uses of bark of *R.arboreum* and *R. campanulatum* are for the treatment of cough and diabetes. Leaves of *R.campanulatum* are used in treating of chronic rheumatism, syphilis and sciatica where as others like *R.anthopogon* are used in the treatment of cold, cough and chronic bronchitis.

Conclusion

- The Rhododendron forests in Western Himalayas provides a range of provisioning services to the communities and is being utilized for its various medicinal and economic benefits. As Rhododendrons are an important species for the Himalayan ecosystem it is vital to raise community awareness and engage the locals at the community level for maintaining the overall health of the Rhododendron forests. Some of the recommendations for the long term conservation and sustainable utilization of the rhododendron species in the study area are suggested as follows:

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Recommendation for the sustainable utilization of the Rhododendron species

To reduce the pressure, studies suggest industry-community partnership approach.

Strengthen the Community forestry groups or the van-samitis as they play a crucial role in the study area and have adopted various conservation methods like harvesting of the rhododendron species from a specific area yearly on rotational bases to reduce excessive pressure on the species.

Encouraging the plantations of the locally grown, adaptable and associative species like *Quercus sp.* which is found to increase the water holding capacity of soil, thus promoting the establishment of Rhododendron species

Plantation programmes , training and awareness programmes for the conservation of the rhododendron species are other methods which are recommended to encourage strong community participation.

Efficient government policies and management plans for the long term forest health of the Rhododendron forests.

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THANK YOU