

## Research article

# Exploration of nutraceutical properties of *Rhododendron arboreum* and *Myrica esculenta* to fulfil market demand and socio-economic development of rural people of Chachiot and Thunag regions of Mandi (Himachal Pradesh)

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## ABSTRACT

Inhabitants of the hilly regions largely depend on wild herbs for medicine and food supplements. The indigenous knowledge and traditional use of these wild herbs are vanishing fast. Chachiot and Thunag Tehsils of Mandi District are rich repositories of wild medicinal herbs. Among them includes *Rhododendron arboreum* Sm. and *Myrica esculenta*. They have been long used for medicinal and edible purposes. Moreover, their flowers, fruits and other value-added products are sold in the domestic market by the local people. This study aimed to investigate nutritional, and medicinal and to access market demand for the socio-economic development of rural people of the study area. Local inhabitants of Chachiot and Thunag collect their flowers and fruits seasonally from March to May. These are good sources of food, medicine and income for local people. However, the recent upsurge in their use and demand has led to illicit harvesting for trade and habitat loss pushing these to the verge of extinction.

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## INTRODUCTION

Inhabitants of the hilly regions largely depend on medicinal plants for medicine, food, and for the economy. These two Tehsil are rich sources of medicinal plants. Geography and climatic conditions of the study area enable the growth of *Rhododendron arboreum* Sm. (Ericaceae) and *Myrica esculenta* Buch.-Ham. ex D. Don (Myricaceae) in these tehsils. The local populace largely depends on the products of these plants for their personal use as well as for trade purposes (Bhattacharyya and Sanjappa, 2008; Kumar et al., 2019). In view of this, an attempt has been made to assess these two valuable plant species.

Himachal Pradesh (300 22' 40" to 300 12' 40" N latitudes and 750 47' 55" to 790 04' 20" E longitudes) is a Northwestern Himalayan state of India which supports a variety of medicinal plants. In Himachal Pradesh, a large number of studies are available on medicinal plants of different areas (Samant et al., 2007; Rani et al., 2013) but information on medicinal plants of Tehsil Thunag and Tehsil Chaichot, their trade for the socioeconomic development of Himachal Pradesh is not listed.

The majority of rural communities living in hilly regions use floristic diversity for various purposes. However, there is still a scarcity of detailed information and documentation on these two medicinal plants Tehsil Chachiot and Tehsil Thunag of the district of Himachal Pradesh (Lata, 2019; 2020). So the present attempt has been made to assess the diversity and distribution pattern, documentation of the indigenous uses and traditional practices, trade purpose to fulfil market demand and to suggest management options.

## MATERIAL AND METHODS

### Study Area

The present study has been carried out in Tehsil Chachiot and Tehsil Thunag of Mandi district (31.552919 N and 77.1657636 E), Himachal Pradesh. Being a hilly area climate is cool and temperate with three distinct seasons; winter, summer and monsoon. The temperature varies from -7°C to 30°C. The vegetation comprises temperate and subalpine types which are dominated by conifers and broad leaves of the forest. The area supports

unique habitats and an immense number of medicinal, wild edibles and native plant species.

Tehsil Thunag covers approximately 313.57 Km<sup>2</sup> areas and comprises 22 Panchayats, 171 villages with 10,872 households and 50,308 human populations whereas Tehsil Chachiot covers approximately 359 Km<sup>2</sup> areas, 209 villages and 57723 human population (Statistical Department Mandi). The maps of both Tehsils are given in Fig. 2 and 3.

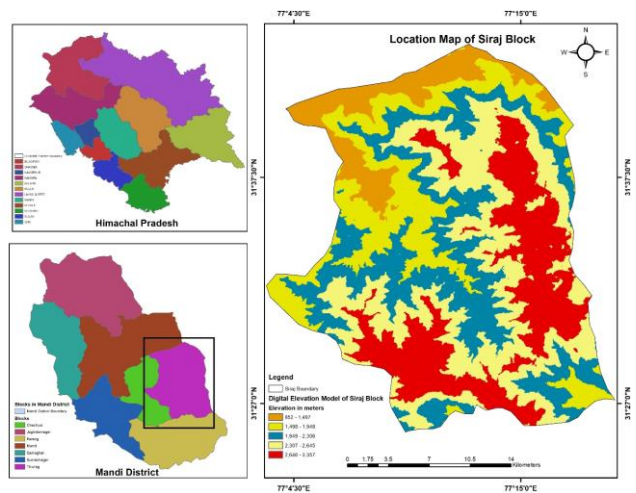


Fig. 1. Map of Tehsil Thunag

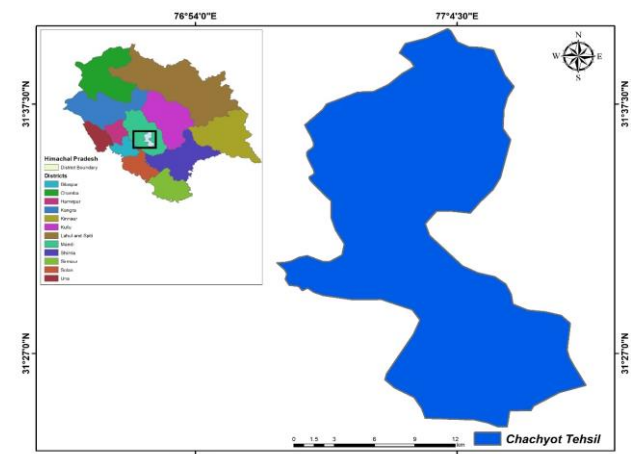


Fig. 2. Map of Tehsil Chachiot

Methodology

For the assessment of these two plant species, surveys were conducted in different villages of Tehsil Chachiot and Tehsil Thunag. The areas covered in the Tehsil Chachiot were Burahтта, Piplagalu, Marhot, Shala, Chailchowk, Maviseri, Trouur, Mandogloo, Salahar, Kharshi, Devdhar. In Tehsil Thunag, Kandha, Muragh, Bagsaid, Shillh, Taladhar, Thunag, Chendi, Shilli jundhi

areas were surveyed. For the collection of data and information, local people were interviewed and information on these plants was gathered for their personal as well as commercial use. The interviews were mostly individual.

RESULTS

Local people were interviewed and information on the medicinal, nutritional and trade purposes of *Rhododendron arboreum* and *Myrica esculenta* was gathered. The language used while interacting with the informants was the local dialect of the study area viz. Mandyali, Pahari and in certain cases, Hindi also. People use the fruits of *M. esculenta* for their own use as well as few are involved to trade them in a local market (Fig. 3). Different value-added products are made from *R. arboreum* flowers. A large number of people are involved in their trade (Fig. 4). Profiles of local people from the study area who were involved in the trade of *R. arboreum* and *M. esculenta* are given in Table 1. The data was collected during the summer season of 2022 (March-May).

Factors affecting the production of *Rhododendron arboreum* and *Myrica esculenta*

Soil

Rhododendrons, in general, grow in well-drained acidic soils, which are rich in organic matter and low in elements. Most species grow on slopes where there is no water logging. In alpine pastures, plants are buried under snow during winter, and when the snow melts in summer, the soil is exposed for a period of 3-4 months and the plants start sprouting and flowering. The soil of the temperate regions is exposed a little earlier than that of subalpine and alpine areas and the sprouting starts at lower elevations and gradually proceeds upward.

Climate

Being a hilly valley, the climate is cool and temperate with three distinct seasons; winter, summer and monsoon. The temperature varies from -7°C to 30°C. The vegetation comprises temperate and subalpine types which are dominated by conifers and broad-leave forests. The valley supports unique habitats and an immense number of medicinal, wild edibles and native plant species. However, the recent upsurge in *R. arboreum* use and demand has led to its harvesting for commercial purposes and its habitat loss, pushing the plant to the brink of extinction. Excessive and unskilled harvesting of the flowers of *R. arboreum* will lead this tree towards extinction.

Table 1. Profiles of local people from the study area involved in the trade of *Rhododendron arboreum* and *Myrica esculenta*

Name	Age	Village	Plant products sold	Benefit earned (Rs)
Het Ram	44	Chappar	Flower	20,000
Leela Devi	50	Burahтта	Fruits and flower	15,000
Naina	51	Devdhar	Fruits	12,000
Kishori Lal	53	Haleen	Flowers	16,000

Chet Ram	48	Jughand	Flowers	20,000
Bodh raj	43	Shala	Fruits	21,000
Daya	51	Marhot	Fruits and flowers	25,000
Meena	50	Chendi	Flowers /juice	18,000
Sher singh	48	Devdhar	Fruits and flowers	25,000
Jaggu	32	Dhanshali	Juice	6,000
Kala Devi	61	Dhanshali	Juice	4,000



**Fig. 3.** Selected pictures of *Myrica esculenta* at the study site and local people involved in its trade

*M. esculenta* is a popular medicinal plant most commonly found in the sub-tropical Himalayas. It is widely used in folk medicine to treat several ailments such as asthma, cough, chronic bronchitis, ulcers, inflammation, anaemia, fever, diarrhoea, and ear, nose, and throat disorders. However, the recent upsurge in *M. esculenta* use and demand has led to its harvesting for commercial

purposes by the horticultural trade and habitat loss, pushing the plant to the brink of extinction.

**Important medicinal properties of *R. arboreum***

Rhododendron is used traditionally as a remedy for many diseases and is preferred for its diverse medicinal

properties with a low side-effect profile (Swamidasan et al., 2020). It majorly contains terpenoids and phenolic contents (Rawat et al., 2011). Phenolic acids obtained from its leaves and twigs have been reported to have anti-HIV, and anti-inflammatory, and also its leaves and flowers are utilized for treating illness, headache, diabetes, rheumatism, etc. (Bhandary and Kawabata, 2008). Flavonoids, isolated from the leaves of *R. arboreum* were found to have potent antioxidant properties (Prakash et al., 2007; Acharya et al., 2011). *R. arboreum* has also been reported as an anti-inflammatory plant.

*R. arboreum* ethanolic leaf extracts were evaluated for their hepatoprotective activity in the Wistar rat model by

assay of serum marker enzymes like SGOT, SGPT, ALP, direct and total bilirubin, triglycerides, cholesterol and estimation of ascorbic acid in urine. The results showed significant hepatoprotective activity (Prakash et al., 2008). The acetate fraction of *R. arboreum* flower extract is also shown efficient activity against hepatic damage (Verma et al., 2011).

The antimicrobial activity of aqueous and ethanolic extract of the flower of *R. arboreum* was studied against *Escherichia coli* and *Staphylococcus aureus*. The result showed that aqueous and ethanolic flower extracts are effective against both *E. coli* and *S. aureus* (Lal et al., 2017).



**Fig. 4.** Selected pictures of *Rhododendron arboreum* in the study area, people collecting its produce and drying flowers and local women extracting juice from *Rhododendron arboreum* flowers

### Important medicinal properties of *M. esculenta*

Various studies confirmed the pharmacological effect of *M. esculenta* (Seal, 2011; Chandra et al., 2012; Sood and Shri, 2018; Kumar et al., 2023). A significant hypoglycaemic effect was observed in a dose-dependent manner by methanol extracts of *M. esculenta* leaves in streptozotocin-induced diabetic rats as the results showed that oral administration of extract produced a significant reduction. It contains flavonoids and other phenolics as major constituents (Bamola et al., 2009).

Oral administration of ethanol extract of *M. esculenta* bark at the dose of 100 and 200 mg/kg showed protection against pylorus ligated ulcer in rats by a significant reduction in gastric secretions, acidity, lipid peroxidation and myeloperoxidase enzyme as compared to control. The antiulcerogenic potential of the bark could be related to the antioxidant mechanism as evident from the significant increase in the catalase activity, nitrite and glutathione levels (Swathi and Prasad, 2015). Thus, the study provided scientific evidence for the traditional use of *M. esculenta* in ulcer treatment.

### CONCLUSION

This study provides detailed information about the medicinal and nutritional use of *R. arboreum* and *M. esculenta* to fulfil market demand and socio-economic development of rural people of Tehsil Chachiot and Thunag.

Produces of these plants are in great demand in the market during the summer season. Local people use or collect these plant products during their day-to-day regular activities like farming, visiting forests for fuel wood and fodder collection or grazing their live stocks. These plants act as a supplement to their food requirement and marketing such plants can be helpful in raising the economy of the local communities living in the study area. Women of self-help groups, few men and women involved in the trade of these plants produce. Due to the introduction of horticultural plants like apples, plums, cherries, apricot, pears and almonds, the importance of these plants is decreasing, but they have high medicinal value and nutritional value. So efforts should be made to create awareness about medicinal value, nutritional value, economic value, and health benefits among the native communities for their sustainable utilization and conservation so that they can raise their economy and fulfil the market demand.

### RECOMMENDATION

*R. arboreum* and *M. esculenta* are harvested from natural habitats i.e. from forest floors or fields. People have to spend a lot of time first to reach at the difficult terrain of the forest and then to collect the flowers and fruits. It's not pretty sure that people will get a good amount of these products. Few may return empty-handed after spending their whole day. For those who can get flowers and seeds of *R. arboreum* and *M. esculenta*, mostly harvest them unprofessionally which may lead these plants to the brink of extinction. Professional training is very much necessary to guide people in the study area about the harvesting of

these plant products. As these trees grow wild in their natural habitat so the intervention of the department of the forest is needed essentially.

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### CONFLICTS OF INTEREST

The author(s) declare(s) no conflicts of interest.

### DECLARATION

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