

# A Study on the Uses and Conservation of Traditional Fruit Trees in Uttarakhand: Their Ethnobotanical and Nutritional Significance

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## Abstract

Uttarakhand, a mountainous state in India, is home to a rich diversity of traditional fruit trees, characterized by their significant ethnobotanical and nutritional value. These fruits, cultivated in temperate and subtropical conditions, are integral to the livelihoods of rural populations, offering food security and economic opportunities. This study explores the distribution, morphological traits, and ethnobotanical uses of traditional fruits like kafal (*Myrica esculenta*), hisalu (*Rubus ellipticus*), and timil (*Ficus auriculata*). Additionally, their phytochemical properties and nutritional benefits, including antioxidant, anti-inflammatory, and anti-cancer activities, are discussed. Traditional knowledge of wild fruits has enabled their sustainable use as food, medicine, and fodder, but challenges like climate change and inadequate commercialization hinder their full potential. Conservation strategies, coupled with value addition, can enhance their marketability and support the local economy. This paper highlights the necessity of improved cultivation, post-harvest technologies, and community education to maximize the benefits of traditional fruit trees in Uttarakhand. Uttarakhand's traditional fruit trees, like kafal, hisalu, and timil, hold significant ethnobotanical and nutritional value, supporting rural livelihoods through food, medicine, and fodder. These fruits are rich in phytochemicals with antioxidant, anti-inflammatory, and anti-cancer properties. Despite their potential, challenges such as climate change and limited commercialization hinder their utilization. The study emphasizes the need for conservation, improved cultivation practices, post-harvest technologies, and community education to enhance marketability and promote sustainable use, benefiting both the local economy and biodiversity.

**Keywords** Ethnobotany, traditional fruits, uttarakhand, nutritional value, conservation, wild edibles

## INTRODUCTION

Uttarakhand's unique geography and climate foster a rich diversity of traditional fruit trees, vital for sustaining rural livelihoods and promoting food security. Traditional fruits like kafal, hisalu, and amla have been cultivated for centuries, offering nutritional and medicinal benefits. Despite their potential, issues like poor transportation, inadequate market access, and climate challenges hinder full utilization. This study aims to explore the ethnobotanical significance, phytochemical composition, and conservation practices of these fruits [1-3].

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Traditional fruit trees hold a significant place in the cultural, ecological, and nutritional landscapes of many regions worldwide. In Uttarakhand, a state nestled in the Indian Himalayas, these fruit trees are not only integral to the livelihoods of rural

communities but also play a critical role in sustaining biodiversity. Despite their importance, many traditional fruit tree species face the threat of neglect and extinction due to changing land-use patterns, overexploitation, and the rising preference for commercial horticultural crops [4-6].

Ethnobotanical studies reveal that these trees are deeply embedded in the folklore, rituals, and traditional medicinal practices of local communities. They provide a diverse range of fruits, leaves, bark, and other by-products that serve as essential food, medicine, and economic resources. Furthermore, traditional fruit trees such as *Malus baccata* (wild apple), *Myrica esculenta* (kafal), and *Pyrus pashia* (wild pear) are known for their high nutritional value, offering rich sources of vitamins, antioxidants, and fiber [7-9].

However, the erosion of traditional knowledge and the marginalization of these species have highlighted the urgent need for their conservation. This study explores the ethnobotanical and nutritional significance of traditional fruit trees in Uttarakhand, focusing on their uses, benefits, and the challenges associated with their conservation. By documenting local knowledge and analyzing nutritional content, this research aims to provide insights into sustainable strategies for preserving these invaluable natural resources. Figure 1 [10-12].

### Botanical description of *Myrica esculenta*

- Botanical name - *Myrica esculenta*
- Local name - Kafal or kaphal
- Family – Myricaceae

Kafal is the state fruit of Uttarakhand. People cut out a piece of this fruit and sprinkle it with chilli powder and a pinch of rock salt. Kafal is one of the most well-liked fruits in the state because of its tasty flavor and therapeutic qualities Figure 2.

### Ethnobotanical Uses

Anti-asthmatic, treats sore throat, ulcers, cough, anemia, fever, diarrhea.



**Figure 1.** Study area-Uttarakhand.

### **Botanical description of *Rubus ellipticus***

- Botanical name - *Rubus ellipticus*
- Local name - Yellow Himalayan raspberry
- Family - Rosaceae

This fruit is a commonly occurring fruit during the summer months. Hisalu is a Chinese native that is sold by sellers in places like Nainital and Almora. This nutrient-dense, golden fruit is indigenous to Uttarakhand Figure 3.

### **Ethnobotanical uses**

Treats stomach pain, headaches, digestive problems, gastric issues, peptic ulcers.

### **Botanical description of *Ficus palmata***

- Botanical name - *Ficus palmata*
- Local name - Khemri, pheru, Bendu, Anjir
- Family - Moraceae

It is dark purple. It is commonly found in the banks of streams and rivers up to 1800m. In many parts of Kumaon, bedu is cooked as a vegetable when it is not ripe Figure 4.

### **Ethnobotanical uses**

Relieves inflammation, treats warts, constipation, and lung diseases.



**Figure 2.** Kafal-



**Figure 3.** Hisalu-

**Botanical description of *Prunus domestica***

- Botanical name - *Prunus domestica*
- Local name - Plum, Aloo Bukhara
- Family - Rosaceae

This is sweet and tangy fruit. Plum are low calorie fruits. Plum can be eaten raw, dried or in jam form. Plum is fleshy and delicious temperate fruit. Figure 5

**Ethnobotanical uses**

Rich in vitamin C and antioxidants, may help with weight loss, cancer protection, and inflammatory properties.

**Botanical description of *Ficus auriculata***

- Botanical name - *Ficus auriculata*
- Local name - Timul, Timil
- Family - Moraceae

Timla is one of the most commonly found fruits in Uttarakhand. The fruits appear in large clusters on the trunk and branches. The local also use it to prepare different types of jams, and curries Figure 6.

**Ethnobotanical uses**

Cancer cure properties, treats constipation, has antioxidant and anti-inflammatory effects.



Figure 4 Bedu-



Figure 5. Plum-



**Figure 6.** Timil -

#### **Botanical description of *Morus alba***

- Botanical name - *Morus alba*
- Local name - Shahtoot, White Mulberry
- Family - Moraceae

Mulberries available in white or purple colour. It is used to make jams or jellies Figure 7.

#### **Ethnobotanical uses**

Lowers cholesterol, reduces cancer risk, has antioxidant properties.

#### **Botanical description of *Vitis vulpina***

- Botanical name - *Vitis vulpina*
- Local name - River bank of forest grape
- Family - Vitaceae

Wild grapes are natural, uncultivated grapes. Wild grape flowers are green. The fruit is very important for wild life Figure 8.

#### **Ethnobotanical uses**

Source of fiber, potassium, and vitamins. Used for treating cancer, smallpox, eye infections, and kidney/liver diseases.

#### **Botanical description of *Pyrus pyrifolia***

- Botanical name - *Pyrus pyrifolia*
- Local name - Wild pear, Bada kainth, Shiara, Zarenth
- Family - Rosaceae

The fruits are tasty, luscious, and make a good jam preservative. In full sun or partial shade, the wild pear thrives in most soil types. There are occasionally a few thorns on the stalks. In spring, the flower attracts bees and other insects Figure 9.

#### **Ethnobotanical uses**

Contains sugar, protein, and pectin. Promotes gut health, reduces inflammation, aids weight loss, and treats diarrhea.



**Figure 7.** Mulberries-



**Figure 8.** Wild grapes-



**Figure 9.** Wild pear-

#### **Botanical description of *Phyllanthus emblica***

- Botanical name - *Phyllanthus emblica*
- Local name - Amla
- Family - Phyllanthaceae

It grows wild, mostly in the forests, in the mid - hill regions of the Himalayas which have a sub temperate climate. It is cultivated for its fruits. The amla fruits are always in great demand Figure 10.

#### **Ethnobotanical uses**

Rich in vitamin C, supports cancer treatment, boosts immunity, lowers cholesterol, and improves digestion.

#### **Botanical description of *Syzygium cumini***

- Botanical name - *Syzygium cumini*
- Local name - Jamun, Java, Plum, Black plum
- Family - Myrtaceae

Jamun is an important summer fruit. Fruits are used in making jam, jellies, squash, vinegar and ice-cream for its beautiful and attractive purple colour Figure 11.

#### **Ethnobotanical uses**

Treats diarrhea, spleen enlargement, stomach pain, carminative, and diuretic effects.



**Figure 10.** Amla-



**Figure 11.** Jamun -

**Botanical description of *Tamarindus indica***

- Botanical name - *Tamarindus indica*
- Local name - Madeira Mahogany, Tamarind tree, Tentul, Amlı
- Family - Leguminosae

The fruit pulp is used for seasoning as a food component to flavour confections, curries and sauces and is main component in juices and certain beverages. Imli is used all over the world to make sauces Figure 12.

**Ethnobotanical uses**

Protects liver and heart, prevents peptic ulcers, reduces cancer risk, helps in weight loss, and manages diabetes.

**Botanical description of *Cydonia oblonga***

- Botanical name - *Cydonia oblonga*
- Local name - Bihi
- Family - Rosaceae

It is deciduous tree. The quince is also grown as an ornamental plant for its attractive pale pink blossoms Figure 13.

**Ethnobotanical uses**

Antioxidant activity, treats diarrhea, dysentery, cough, sore throat, and supports digestive health.

**Botanical description of *Prunus armeniaca***

- Botanical name - *Prunus armeniaca*
- Local name - Khubani
- Family - Rosaceae

Apricot is packed with nutrients. It is extremely juicy from the inside. This fleshy and juicy fruit is widely cultivated in Uttarakhand. It grows well in mountain slope soils Figure 14.

**Ethnobotanical uses**

Rich in beta-carotene, potassium, iron, fiber, and vitamins. Supports digestion, and bone health, and has anti-cancer effects.



**Figure 12.** Imli-



**Figure 13.** Quince-



**Figure 14.** Apricot-

#### **Botanical description of *Fragaria ananassa***

- Botanical name - *Fragaria ananassa*
- Local name - Strawberry
- Family - Rosaceae

Uttarakhand has the right climate conditions and best quality of soil for its cultivation. These delicious strawberry can be consumed directly from trees Figure 15.

#### **Ethno Medical Values**

Rich in iron and vitamin C. May protect against cancers and support the immune system.



**Figure 15.** Strawberry-

#### **Botanical description of *Berberis asiatica***

- Botanical name - *Berberis asiatica*
- Local name - Marpyashi, Darbi
- Family - Berberidaceae

Berberis grow on small barberry shrubs. Barberries usually grow in bunches on the barberry shrub. They contain a unique compound called berberine Figure 16.

**Ethno Medical Values:** Helps manage diabetes, treats acne, lowers cholesterol, and has anticancer effects.

#### **Botanical description of *Pyracantha crenulata***

- Botanical name - *Pyracantha crenulata*
- Local name - Ghigaru, Nepal firethorn
- Family - Rosaceae

In Uttarakhand, ghingar is one of the most prevalent wild fruits. The leaves of the prickly plants that bear these fruits are used to make calming herbal tea Figure 17.

#### **Ethnobotanical uses**

Used to treat malaria, reduce cholesterol, and sunburns. Rich in antioxidants, beta-carotene, iron, and potassium.

#### **Botanical description of *Rhododendron arboreum***

- Botanical name - *Rhododendron arboreum*
- Local name - Lali Guras
- Family - Ericaceae

Burans is one of the most famous trees in Uttarakhand that can be found everywhere throughout the state. These trees contain scarlet- coloured, bell- shaped flowers that contain a sweet nectar Figure 18.

#### **Ethnobotanical uses**

Treats cough, diarrhea, dysentery, and diabetes. Has anti-inflammatory, antioxidant, and antimicrobial properties.



**Figure 16.** Berberis-



**Figure 17.** Ghingaru-



**Figure 18.** Burans-

**Botanical description of *Berberis aristata***

- Botanical name - *Berberis aristata*
- Local name - Kilmode
- Family - Berberidaceae

This fruits plant is very thorny and the branches are not very strong as well but the sweet and sour taste makes up for it. It is also grown in hedges. This plant is in a high demand always due to its medical uses. The ripen fruit has purple colour and tastes sweet and sour Figure 19.

**Ethanobotanical uses**

Treats diabetes, has anti-cancer activity, and is rich in nutrients

**Botanical description of *Juglans regia***

- Botanical name - *Juglans regia*
- Local name - Akhrot
- Family - Juglandaceae

Walnut in Uttarakhand are grown majorly for commercial purposes. Some of the major walnuts producing areas in Uttarakhand are Almora, dehradun, and pauri garhwal. Walnut is known for king of nut Figure 20.

**Ethnobotanical uses**

Prevents cancer, controls diabetes, aids weight management, and is a good source of healthy fats, protein, fiber, and vitamins.

**Botanical description of *Citrus sinensis***

- Botanical name - *Citrus sinensis*
- Local name - Sweet Orange
- Family - Rutaceae

The delicious fruit known as malta grows in Uttarakhand's steep regions, when the temperature is below average. It belongs to the citrus fruit family and ripens in the winter. Uttarakhand's native winter fruit, malta, is used to create squash and other goods. Peels are used in face masks to lessen skin conditions Figure 21.

**Ethnobotanical uses**

Rich in vitamin C, it has antioxidant qualities, helps combat pneumonia, and promotes skin and eye health.



**Figure 19.** Kilmode-



**Figure 20.** Walnut-



**Figure 21.** Malta-

#### **Botanical description of *Punica granatum***

- Botanical name - *Punica granatum*
- Local name - Pomegranate
- Family - Lythraceae

Considered to be one of the most underrated fruits of this region. One completely ripened it tastes both sweet and sour in equally proportionate ratio making it a delicious delicacy Figure 22.

#### **Ethanobotanical uses**

It Effective in treating hyperacidity, contains minerals like phosphorus, calcium, and magnesium.

#### **Botanical description of *Malus domestica***

- Botanical name - *Malus domestica*
- Local name - Wilson Apples
- Family - Rosaceae

The state rank third in production of apple. Apple is cultivated in almost all hilly districts of the state. In Uttarakhand it is mainly grown in Uttarakashi, Almora, and Nainital. Apples grown in Harshil (Uttarkashi) are in high demand Figure 23.

#### **Ethanobotanical uses**

Protects against heart disease, prevents obesity, helps prevent diseases like Parkinson's, and is low in sodium, fat, and cholesterol.



Figure 22. Dadim-



Figure 23. Apple-

#### Botanical description of *Prunus persica*

- Botanical name - *Prunus persica*
- Local name - Aadu, Pica, Alu
- Family - Rosaceae

They are among the most succulent ones. In March and April, the peach trees bloom with delicate pink blossoms. Peach trees are found in both the Northern and Southern hemispheres' milder temperate zones. Fresh peaches are a popular dessert fruit Figure 24.

#### Ethnobotanical uses

Packed with minerals, vitamins, amino acids, protein, and other nutrients that help with digestion and bone strength.

#### Botanical description of *Actinidia deliciosa*

- Botanical name - *Actinidia deliciosa*
- Local name - Kiwi, Chinese gooseberry
- Family - Actinidiaceae

Kiwi is major temperate crop grow in hilly region of Uttarakhand. Kiwi fruit grows in all climates with enough heat during summer. They are sweet and highly nutritious Figure 25.

#### Ethanobotanical uses

Rich in vitamin C, supports immune health, aids digestion, and is high in antioxidants.



**Figure 24.** Peach -



**Figure 25.** Kiwi-

#### **Botanical description of *Solanum nigrum***

- Botanical name - *Solanum nigrum*
- Local name - Black nightshade
- Family - Solanaceae

Makoi usually grows as a weed in moist habitats in different kinds of soils. The fruits and berries turn purplish- black in color when ripe Figure 26.

#### **Ethnobotanical uses**

Relieves pain and inflammation, treats stomach ulcers, and has various medicinal uses.

#### **Botanical description of *Pinus gerardiana***

- Botanical name - *Pinus gerardiana*
- Local name - Cedarnuts, Pinyon
- Family - Pinaceae

Chilgoza is a gymnosperm fruit. It is a nut fruit. The villagers harvest and sell the nuts in the market. Chilgoza is a very good species for social forestry, and is planted in forest development projects in high hills. Chilgoza is a kind of pine fruit Figure 27.

#### **Ethnobotanical uses**

Consumed as a nutritional snack, used in crafting tools and shelters.



**Figure 26.** Makoi -



**Figure 27.** Chilgoza-

## METHODOLOGIES

The study was conducted across diverse agro-climatic zones of Uttarakhand. Field surveys and interviews with local farmers were employed to gather data on fruit distribution, morphology, and ethnobotanical uses. Phytochemical analysis of selected fruits was performed using standard laboratory techniques to evaluate their nutritional and medicinal properties. Conservation strategies adopted by local communities were documented to understand sustainable practices.

### Study Area

Research conducted across Terai, Shivalik, and Himalayan zones in Uttarakhand.

### Data Collection

- Field surveys and semi-structured interviews with farmers to document fruit distribution, morphology, and ethnobotanical uses.
- Observation of ecological and cultural significance of fruit trees.

### Phytochemical Analysis

- Nutritional profiling using standard AOAC methods.
- Antioxidant and bioactive compound assessment through DPPH and qualitative phytochemical tests.

### Conservation Practices

Documentation of community-led sustainable practices using participatory rural appraisal (PRA).

### Materials

- *Field Tools*: GPS, camera, and measuring devices.
- *Laboratory Supplies*: Analytical reagents (e.g., DPPH, Folin-Ciocalteu reagent), UV-Vis spectrophotometer, and HPLC.
- *Data Collection Tools*: Interview guides, questionnaires, and audio recorders.
- *Software*: SPSS and GIS for data and spatial analysis.

### Applications and Future Aspects

Traditional fruits provide significant health benefits, including antioxidants and essential nutrients that prevent diseases like diabetes and cancer. Applications of these fruits in producing value-added products like jams, jellies, and medicinal extracts offer economic opportunities for local populations. Future research should focus on improving high-yield cultivars, climate-resilient farming, and advanced post-harvest techniques. Public awareness and government policies must prioritize the commercialization and conservation of wild edibles [13-15].

### Applications

1. *Sustainable Agriculture Practices*: The research can guide sustainable farming by integrating traditional fruit trees into modern agricultural systems, promoting agroforestry models that enhance biodiversity and soil health.
2. *Community Health and Nutrition*: By identifying the nutritional significance of these fruit trees, the study can be used to promote local diets, improve food security, and support community-based health interventions, particularly in rural areas.
3. *Conservation and Ecosystem Management*: The ethnobotanical knowledge gathered can aid in the conservation of endangered species, promoting strategies for maintaining biodiversity in Uttarakhand's unique ecosystems.
4. *Cultural Preservation*: The study can serve as a tool for cultural preservation by documenting and passing on indigenous knowledge related to the use and significance of traditional fruit trees.

### FUTURE ASPECTS

1. *Commercialization and Value Addition*: Future research could explore the potential for value-added products from these fruits, such as jams, juices, or organic medicines, which could boost local economies and encourage conservation.
2. *Climate Change Adaptation*: Investigating the role of these trees in climate change adaptation by assessing their resilience to changing weather patterns can inform strategies for promoting climate-resilient crops.
3. *Policy Advocacy*: The study can inform policymakers to develop conservation programs and promote the inclusion of traditional fruit trees in national and local environmental conservation policies.
4. *Cross-disciplinary Research*: Further studies combining ethnobotany, nutritional science, and environmental conservation could lead to more holistic approaches to rural development and environmental sustainability in Uttarakhand.

### CONCLUSION

Traditional fruit trees in Uttarakhand play a critical role in food security, nutrition, and rural livelihoods. Their ethnobotanical and nutritional significance, coupled with sustainable utilization, can contribute to the local economy and global food system. Strategic interventions in cultivation, conservation, and market linkage can unlock their full potential. Collaborative efforts between researchers, policymakers, and communities are essential to address current challenges and ensure the sustainable development of this valuable resource. Traditional fruit trees in Uttarakhand, such as kafal,

hisalu, and timil, are vital for the region's biodiversity, nutrition, and rural livelihoods. These fruits provide essential food, medicine, and fodder, with numerous health benefits due to their rich phytochemical content. However, challenges like climate change, limited commercialization, and loss of traditional knowledge hinder their full potential. Conservation strategies are needed to preserve these species, including sustainable cultivation, improved post-harvest technologies, and value-added products. Public awareness and policy support are crucial to enhance marketability and ensure long-term viability. Future research should focus on climate-resilient crops and efficient farming practices, while policy interventions must protect these valuable resources. By promoting the commercialization and sustainable use of traditional fruits, Uttarakhand can benefit economically and preserve its unique ecological and cultural heritage. Collaborative efforts are key to overcoming current challenges and ensuring the future of these essential fruit trees.

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