

Diversity and Sustainability: The Role of Traditional Fruit Trees in Uttarakhand Agricultural Landscape

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Abstract

Uttarakhand state is characterized by a rich diversity of traditional fruit trees. Uttarakhand is largely a mountainous state, with only around 10% of its overall geographical area being plains, and more than three-quarters (78%) of its total people relying on agriculture for survival. The state's geographical features and climatic circumstances are suited for growing temperate and subtropical fruit crops. It provides a variety of agro-geoclimatic conditions that are ideal for fruit cultivation. In this context, the current study on traditional fruits of Uttarakhand was conducted with the goal of identifying and exploring the ethnobotanical knowledge of these fruits. Some fruit plants data have been collected and got the information about their Botanical name, Local name, and ethno botanical uses. Traditional fruits, as a significant forest product, enhance the human diet by providing critical vitamins, minerals, and fiber required for good health. As a result, these fruits could be better utilized in terms of value-added products, as well as for human health promotion. Traditional edible fruits were cultivated by the local people for own consumption or direct edible purpose, and livelihood improvements.

Keywords: Traditional, Nutritional value, Plant Species

INTRODUCTION

Fruits can be effectively used because they are high in carbohydrates, proteins, lipids, fiber, and other nutrients (Patial et al., 2020). Peaches (*Prunus persica*) include carotenoids, anthocyanin, and phenolic acids, as well as certain chemicals with antioxidant, antibacterial, and anti-inflammatory characteristics that can treat diabetes, hypertension, and CVD (Ragazzini and Rondelli 2000). Bay- Berry (*Myrica esculenta*) or Kafal includes critical vitamins and minerals like riboflavin, thiamine, antioxidants (OPCs) that help with mental stress, anaemia and pulmonary diseases (Gusain & Khanduri, 2016). Hisalu (*Rubus ellipticus* Sm.) contains phytochemicals such as anthocyanin and phenolics, which can treat sore throats and coronary heart disease (Kumar and Arya, 2021). Fruits have a crucial role in boosting a country's economy, particularly in India, while also ensuring food

security to local residents (Kamboj et al., 2020). The tribal community has significant knowledge of how to use native flora for food and other purposes (Rao, 2021). According to the Ministry of Agriculture & Farmers Welfare, Government of India, India's total expected fruit production in 2021 is approximately 102.76 million tons, yet a significant portion is lost. The principal grown fruits in this hill state include mango, apple, palm, and apricot, strawberry number.

The main fruits grown in this mountainous state include mango, apple, palm, and apricot, strawberry, a variety of citrus fruits, walnut, and so on. According to data from 1997-1999, total fruit

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production was 43.3 million hectares. The entire demand for fruit will be 93.6 million tons, with a 5.5% per capita GDP growth rate in 2020 (IARI research). Mango accounts for the majority of fruit farming in Uttarakhand (19%), followed by apples (15%). Various prominent fruits cultivated in the upper hills include walnut, malta, orange, and various citrus fruits. The important thing here is that while per hectare fruit and crop production is lower than the national average, land efficiency is higher. Here reported land under tree crops, although it does not.

The percentage of trees in the forest area is 4.75%, and 0.64 million tons of fruit were produced in 2005-06. Despite great prospects, farmers are still unable to reap the full benefits. Fruit consumption is connected with a reduced risk of cancer, hypertension, heart disease, and stroke (Wolfe et al., 2003). Uttarakhand leads in pear output (0.788 lakh MT), followed by peach (0.579 lakh MT) and plum (0.362 lakh MT) (www.shm.uk.gov.in). Uttarakhand is second in the country in walnut output (0.19 lakh MT), followed by Jammu and Kashmir (2.10 lakh MT) (www.shm.uk.gov.in). Uttarakhand is third in the country in apple production (0.62 lakh MT), after Jammu and Kashmir (13.68 lakh MT) and Himachal Pradesh (6.25 lakh MT) (www.shm.uk.gov.in).

Fruit juices sold by the street vendors are consumed regularly by the local owing to their fresh look, original nutritional and sensory attributes (Brackett, 2001; Thunberg et al., 2002; Suguna et al., 2011). It has been estimated that there are more than 3000 edible fruits and nuts in the tropics of both the hemispheres (Mahapatra and Panda, 2009). Uttarakhand's three-fourth population depends on agriculture (Mittal et al. 2008). In this context, the edible fleshy fruit has been chosen to refer to that component of the human diet that is typically taken as a dessert (Carini et al., 2001).

Many marginal farmers are facing food insecurity (Sharma & Sharma, 1993). Aonla is a rich source of vitamin C, Iron, Calcium, and many other minerals and anti-oxidant (Sampath Kumar et al., 2012). In the Uttarakhand, agriculture is the main occupation and the major source of livelihood (Wani, 2011).

They contain antioxidants and phytochemicals with various health benefits, such as preventing cancer, hypertension, heart diseases, and strokes.

1. **Economic Importance:** Fruits play a crucial role in the economy of Uttarakhand and India as a whole. They contribute to food security and provide income opportunities for farmers. However, despite the substantial production, a significant amount of fruits go to waste.
2. **Types of Fruits Grown:** The passage mentions several fruits grown in Uttarakhand, including mango, apple, peach, plum, walnut, malta, orange, and other citrus fruits. Uttarakhand ranks prominently in the production of certain fruits like pears, peaches, plums, walnuts, and apples.
3. **Challenges Faced by Farmers:** Farmers face challenges in maximizing the benefits from fruit cultivation despite the high potential. Issues such as wastage, low crop productivity compared to national averages, and the need for commercialization are highlighted.
4. **Health Benefits and Indigenous Knowledge:** Traditional knowledge among local communities plays a significant role in utilizing wild edible fruits for nutritional and health benefits. Indigenous fruits are said to be more nutritious than developed kinds.
5. **Environmental Concerns:** The passage briefly touches upon environmental concerns such as habitat destruction leading to the degradation of wild edible plant resources and associated indigenous knowledge.
6. **Agriculture as Livelihood:** Agriculture is identified as the primary occupation and major source of livelihood in Uttarakhand, emphasizing the importance of fruit cultivation in sustaining rural livelihoods.

A fruit is a mature ripened ovary. It includes the ovaries and ovule. During the early days, man survived by hunting and gathering natural fruits. Fruits, as a significant forest product, enrich the human diet by providing critical vitamins, minerals, and fiber needed for good health. Once

established, fruit trees require minimal maintenance and can produce for many years. Fruit trees can also provide other benefits such as medicine, shade, and reforestation.

The stunning hill state is divided into Garhwal and Kumaon regions Uttarkashi, Chamoli, Pauri, Rudraprayag, Tehri, Dehradun, and Haridwar are Garhwal districts, whereas the remaining six are in Kumaon: Udham Singh Nagar, Nainital, Almora, Pithoragarh, Champawat, and Bageshwar.

The state's main source of riches is its forests, which are rich in biodiversity. In terms of proportion of documented forest area, the state ranks sixth among all states. The majority of Uttarakhand is mountainous, with distinct natural diversity ranging from high alpine to subtropical and tropical regions. Uttarakhand is also home to some rare and endangered species. The weather in Uttarakhand is ideal for fruit crops and orchards.

Uttarakhand has various fruit garden and orchards spread all over the region. Traditional fruit trees are very important for the wellbeing of rural populations. Farmers cultivate fruits for economic purposes. Uttarakhand is known for its diverse range of traditional fruit plants. Uttarakhand is largely a mountainous state, with only around 10% of its overall geographical area being plains, and more than three-quarters (78%) of its total people relying on agriculture for survival. The state's geographical features and climatic circumstances are suited for growing temperate and subtropical fruit crops. It provides a variety of agro-geoclimatic conditions that are ideal for fruit cultivation. Uttarakhand has numerous fruit growing opportunities due to its pleasant climate.

The topography, elevation, geographical features, diversity of flora and fauna, ethnic diversity and socio-economic conditions are diverse in Uttarakhand. In 2012-13, the area under fruits was 200851 ha with production of 805668 tonnes. Fruits are classified according to their growth habitat. Tree fruits include pome fruits and stone fruits, the former being fleshy and the latter having a rocky pit.

Fruits play crucial role during the acute and chronic food shortage that occur during extreme survival situations like natural calamities. Fruits is much significant for the people reside in the remote areas where there is poor access to healthy food. Due to the affluent plant diversity of Uttarakhand state, most of the population depended on the traditional fruit trees for meeting their requirement of food. Uttarakhand fruits sector is a very growing sector and presents a huge opportunity for the development of the rural areas.

1. *Ecological Significance of Traditional Fruits:* Traditional fruit trees play a crucial role in the agro-biodiversity of Uttarakhand. According to Singh et al. (2015), these trees contribute to soil conservation, carbon sequestration, and the maintenance of local microclimates. The diversity of fruit species supports a range of wildlife, promoting ecological balance (Chaudhary & Kumar, 2018).
2. *Cultural Importance:* The cultural significance of traditional fruits in Uttarakhand cannot be overstated. As highlighted by Joshi (2017), these fruits are integral to local customs and festivals, often used in traditional dishes and rituals. Ethnobotanical studies by Rawat et al. (2016) document the knowledge systems of local communities, emphasizing the deep-rooted connection between indigenous peoples and their traditional fruit varieties.
3. *Nutritional Value:* Research indicates that traditional fruits are vital sources of nutrition. Gupta et al. (2019) discovered that several of these fruits are high in vitamins, minerals, and antioxidants, which adds to dietary diversity. The incorporation of traditional fruits into daily diets is linked to improved health outcomes, particularly in rural populations where access to other food sources may be limited (Nair et al., 2020).
4. *Economic Aspects:* The economic potential of traditional fruits is significant. Singh and Singh (2021) emphasize the role of these fruits in enhancing local economies through value-added products such as jams, jellies, and juices. The promotion of traditional fruit cultivation can

support sustainable livelihoods, reduce poverty, and enhance food security in rural areas (Kumar et al., 2022).

5. *Conservation Efforts*: The preservation of traditional fruit species is critical for biodiversity and cultural heritage. Studies by Negi et al. (2023) advocate for sustainable harvesting practices and the establishment of community orchards. These efforts not only safeguard genetic diversity but also empower local communities by providing economic incentives.
6. *Challenges and Opportunities*: Despite their importance, traditional fruits face numerous challenges, including climate change, land-use changes, and market access issues (Bhandari et al., 2024). However, there are opportunities for promoting these fruits through organic farming practices, agro-tourism, and community-based conservation initiatives (Sharma & Arya, 2024).

CONCLUSION

The literature underscores the multifaceted significance of traditional fruits in Uttarakhand, highlighting their ecological, cultural, nutritional, and economic roles. Further research is essential to explore sustainable practices and promote the cultivation of these fruits, ultimately enhancing the well-being of local communities and preserving biodiversity.

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