

Potential of Underutilized and Neglected Local Fruits of Uttarakhand: A Review

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ABSTRACT

Uttarakhand – the goldmine of fauna and flora diversity, has a large number of wild edible fruits with medicinal and nutritive properties which are used by the locals since ages. The utilization of Himalayan plant species for food and medication has been known for quite a long time and it has been very much exploited from ages by Ayurveda, UNANI and Homeopathy. Nature has distributed the Wild Plants in many parts of the earth especially in the Indian Himalayas and Forest regions where anthropogenic activities are less or not much significant. Underutilized fruits are the ones that are neither grown on a commercial scale nor marketed widely around the world. These fruits are minimally acknowledged plant species with reference to research and marketing aspects but can be seen conforming to wild and stress-like conditions. Wild edible plant products are vital for the livelihood and holds a great importance for survival and well-being of the rural populations living in the local regions as they are not only used them as a source of supplemental food, nutritionally balanced diets, medicines, fodder, fuel, but also for the income generating potential provided by these fruits. Wild fruits like *Berberis asiatica*, *Myrica esculenta*, *Rubus ellipticus*, *Prunus domestica*, *Prunus persica* hold a great nutritional value and quality, thus local people use them for various edible products. Such wild plants need to be explored for their nutritional and potential nutraceutical properties and benefits and need to be conserved for the maintenance of biodiversity. The popular processed products that can be easily made from these underutilized fruits are jams, RTS beverages, fruit-based drinks, chutneys, candied fruit, preserves, pickles, squashes, concentrate, nectars, etc. There is a need to develop high yielding varieties, value added products, protection technologies, and post-harvest management practices for these crops. This can only be achieved by establishing research and development, and promotion that will help disseminate these fruit crops.

Keywords: *Underutilized, Medicinal, Wild Fruits, Entrepreneurship*

1. Introduction

Uttarakhand, the land of gods is known for its snowy peaks, breath-taking valleys and majestic beauty all over the world. The himalayan range is the abode to the indispensable number of plants that have medicinal uses. It is among all those places which are suitable for wild edible fruiting

plants because of its climatic conditions and topography (Sharma *et al.*, 2017). The astounding taste of the local untrapped fruits which is very much liked by the population is actually a rich source of nutrition. All kinds of juicy, delectable and colorful fruits can be seen here seasonally which are not only mouth-watering but also have

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potential health benefits and nutraceutical properties. Strawberry, plum, hisalu, khumani, kafal, dadim, ghingarau are some of the popular fruits of the state. Wild fruits constitute an important place in the traditional diets of the local communities living in those areas. Many of these wild fruits are underutilized and rarely consumed by other people and they are not familiar with them. Fruit crops are considered as protective food because they contain plenty of various phytochemicals, bioactive compounds, such as flavonoids, antioxidants, pigments having nutraceutical properties, tannins, phenolics, carotenoids, etc, minerals and vitamins. The fruits can be successfully utilized in terms of being a rich source of carbohydrates, proteins, fats, fibers, etc (Patial *et al.*, 2020). Moreover, these fruits have bioactive potential and nutraceutical properties. They are substantial sources of certain soluble dietary fiber which reduces erratic bowel movements, aids in cholesterol and fat reduction from the body and helps in boosting the immune system. Wild plant products, particularly fruits, have been the major portion in the dietary traditions of the local communities since the beginning of human civilization. The consumption of locally grown species is acquiring interest day by day, which also gives an important contribution to the welfare of the local communities. Thus, these fruits could be better utilized in terms of value-added products and they can be utilized in the health promotion for the humans. They can be processed into some popular products like beverages, jams, nectars, chutneys and squashes, etc. for special markets where the unutilised and untrapped character of these fruits as well as the bioactive compounds capable of curing degenerative diseases could be appreciated and successfully utilized for the mankind.

Peaches (*Prunus persica*) have carotenoids, anthocyanins and phenolic acids and have some compounds which have antioxidant, anti-microbial and anti-inflammatory properties and can cure diabetes, hypertension, and CVD (Ragazzini and Rondelli, 2000). Plums (*Prunus domestica*) or Aloo Bukhara have high dietary

fiber, vitamin D, B6, B12 which boost the immunity, relieves constipation and maintains bone and cardiovascular health (Hussain T, *et al.*, 2014). Bay-Berry (*Myrica esculenta*) or Kafal has essential vitamins and minerals like riboflavin, thiamine, antioxidants (OPCs) which aid mental stress, anemia and lung disorders (Gusain and Khanduri, 2016). Hisalu (*Rubus ellipticus Sm.*) has phytochemicals like anthocyanin, phenolics which cure sore throats and coronary heart disease (Kumar and Arya, 2021). Kilmora (*Berberis asiatica*) has a high phenolic content, alkaloids which can prevent liver-related disorders (Pal *et al.*, 2014).

Fruits play an important role in elevating the economy of a country especially India, moreover providing food security to the local communities residing there (Kamboj *et al.*, 2020). The tribal population has an extensive knowledge of utilization of local plants as food and other intended uses (Rao, 2021). Uttarakhand has very rich biodiversity and its diversified geographical conditions attracts many people towards it. Wild edible fruit plants have traditionally inhabited supreme positions in the social, economic, cultural, spiritual and health sectors of rural and tribal lives as they acquire medicinal importance and are a source of income for some.

According to the Ministry of Agriculture & Farmers Welfare, Government of India, the total estimated production of fruits in India in the year 2021 is about 102.76 million tonnes, but a substantial quantity is wasted. One of the main difficulties in the growth of the fruit and vegetable preservation industry is the inadequacy of knowledge of the modern methods and techniques of successful utilization and preservation.

Using the state's underutilized fruits to make jams, chutneys, and nectars will enhance its popularity and use all over the world. As the leading fruit-cultivating state of India, it will not only pave the way for startups in agri-food processing for the youth but also provide employment opportunities in the rural sector hence, increasing the economy of the state.

2. Local fruits of Uttarakhand

Kilmora (Berberis asiatica)

Kilmora or Kingoda is a treasured palatable fruit growing in Himalayan ranges from Himachal Pradesh to Bhutan and Assam, Prasanth hills in Bihar, Pachmarhi in Madhya Pradesh, and Mount Abu in Rajasthan. Basically, it is found in rocky zones of Almora, Champawat, Devidhura, Sheharphatak, and Lohaghat of Uttarakhand. It is an attractive shrub furnished with trifid spines, oblivate, acute, mucronate, long-petiole leaves, with arisato-dentate margin, yellow flowers in umbellate racemes and oblong-ovoid edible berries and also grown in hedges. It is popularly known as Indian Barberry or Daru Haldi in the Nilgiri Hills of Southern India and Sri Lanka.



Figure 1: Kilmora (Source: Uttarakhand Foods)

Berberine and Palmatine are the alkaloids in the plant which are present in the form of chlorides. The total alkaloid content in the roots is 4% and in the stems is 1.95% of which berberine forms 2.09 and 1.29%. The roots have anti-cancer properties, cures diabetes and jaundice. Stems are recommended for the treatment of rheumatism. The berries are mildly laxative and given to children. Kilmora has high phenolics which produce a notable increase in plasma antioxidant capacity and protect the oxidation of lipoproteins.

A study was conducted in ICAR- Vivekananda Institute of Hill Agriculture, Almora; Uttarakhand, India concluded that Kilmora is a

good source of nutrients as well as for health-promoting properties (Free radical scavenging activities and antioxidant potential). This fruit can prove to be a cheaper alternative and an excellent potential food supplement across the hilly regions of Uttarakhand and other parts of India. Kilmora protects the liver cells against free radical damage and prevents liver-related disorders (Pal *et al.*, 2014).

Peach (Prunus persica)

Popularly known as Aadoo, Peach (*Prunus persica*) is a dessert fruit belonging to the family Rosaceae grown all-round the warmer temperate regions of both the Northern and Southern hemispheres. The peach develops from a single ovary which ripens into a fleshy & juicy exterior edible part of the fruit called endocarp and a hard interior that encloses a seed(s) called the stone or pit. From the two ovules in the ovary, only one becomes fertilized and develops into a seed resulting in one half of the fruit being slightly larger than the other. Flesh can be yellow, white or red.



Figure 2: Peach (Source: The spruce)

Flavour of peaches depends on an exquisite equity of sugars, acids, phenolics and aromatic compounds. Sweetness and its sageness are corresponded to Soluble Solid Concentration (SSC) and acidity (Ragazzini and Rondelli, 2000). Peaches have carotenoids, anthocyanins and phenolic acids as the major phytochemicals. According to a study, the widespread quantity of total phenolics amidst red fleshed peaches is

more than found in yellow and white fleshed peach varieties. Phenolic compounds in peaches like quercetin, catechins and cyanidin derivatives have antioxidant, anti-microbial and anti-inflammatory properties. They can prevent the onset of multiple chronic and age-related diseases like diabetes, obesity, hypertension, inflammation, cardiovascular, neuro degenerative and oncologic studies.

Plum (*Prunus domestica*)

Aloo Bukhara, popularly called plum, belongs botanically to the family of Rosaceae and genus *Prunus domestica*. A very famous, nutritious and summer season fruit which is sweet and juicy in taste. They are rich in dietary fibre, vitamins A and C, potassium, magnesium and iron content but low in fat content. Significant amounts of Vitamin D, B6, B12 and calcium are also present. It contains antioxidants that can help boost the immunity of the body and prevent cancer. It also improves cardiovascular health, bone health, vision and blood circulation and also relieves constipation (Hussain T *et al.*, 2014).



Figure 3: Plum (Source: Chef's Mandala)

Plums contain polyphenolic compounds like lutein and cryptoxanthin which reduce oxidative stress on the cells. The compounds sorbitol and isatin in plums help maintain bowel movements and regulate smooth flow. It is a rich source of carotenoid zeaxanthin. In plums, Vitamin K helps to restore the bone loss in women during their menopause. It is generally quite low in the Glycemic Index (GI), which can control blood

sugar level and reduce the risk of Type 2 diabetes. Boron helps in ossification and protect the bone density. Iron in Aloo Bukhara leads to the formation of RBCs.

Kafal (*Myrica esculenta*)

Kafal trees are grown in the hills of Nepal and Northern India between the altitudes of 1000-2000 m asl. In scientific journals, also called *Myrica integrifolia* and *Myrica nagi*. In the prehistoric Sanskrit language, Kafal also known as *Kaiphala* or *Katphala* is stated to have medicinal property in its bark. Kafal changes to a reddish-purple color ellipsoid shape at its maturity. Fruit bears resemblance as deep-red coloured raspberries which do not have any pulp but a considerable circular seed in the centre. Ripe fruits are acidic whereas unripe ones are sour in taste. They are accessible for a short stretch of time. Fruit is a globose, succulent drupe with a hard endocarp. Kafal trees are mainly grown in Chir pine forests i.e., open canopy forests. The fruit possesses anti-asthmatic properties (Gusain and Khanduri, 2016).



Figure 4: Kafal (Source: Uttarakhandi)

The fruit is used for making squash, syrup and jam. Removes many types of stomach disorders like diarrhoea, ulcers, gas, constipation, acidity etc. Fruit flower oil is used in diarrhoea and paralysis. Kafal is loaded with many essential nutrients and minerals like riboflavin, thiamine, carotene, Vitamin C, Vitamin E, iron and antioxidants, mainly OPCs (Oligomeric Proanthocyanidins). It cures stomach problems,

headache and mental stress, treats anemia and lung problems. Effective against cancer-causing free radicals and diabetes.

Hisalu (Rubus ellipticus Sm.)

Hisalu, also known as iselu, hisalu, ashilo or aisayloo is a yellow hued little organic product which can be tracked down generally in summers in both Kumaon and Garhwal areas of Uttarakhand. Earlier hisalu used to mature in the period of May and June yet because of climatic variations the aging period of Hisalu changed to March and April. Hisalu are accessible in regions like Nainital, Bhimtal and Almora. *Rubus ellipticus* ordinarily known as brilliant Himalayan raspberry, is an Asian type of prickly fruiting bush in the rose family. It is local to China, Nepal, the Indian subcontinent, Indochina and the Philippines. It is sweet to the taste and can perish rapidly subsequent to culling from the prickly hedge.



Figure 5: Hisalu (Source: Uttarakhandi)

Hisalu is among the main ten wild edible restorative plants and furthermore known as Yellow Himalayan raspberry. Hisalu natural products contain different phytochemicals, for example, anthocyanin, ascorbic corrosive, phenolics, cell reinforcements, flavonoids, and minerals like phosphorus, calcium, magnesium, potassium. Accordingly, it has customarily been treated for hacks, fevers, sore throats, and coronary heart issues (Kumar and Arya, 2021). The juice of Hisalu natural products is utilized to fix fever, hack, colic and sore throat. The

utilization of organic products is likewise advantageous to general wellbeing and prosperity, just as bringing down the danger of ongoing illnesses. Different pieces of Hisalu plants have been utilized to treat diabetes, epilepsy, the runs, absence of pain, and looseness of the bowels, and furthermore have cancer prevention & antimicrobial properties, and anti-fertility.

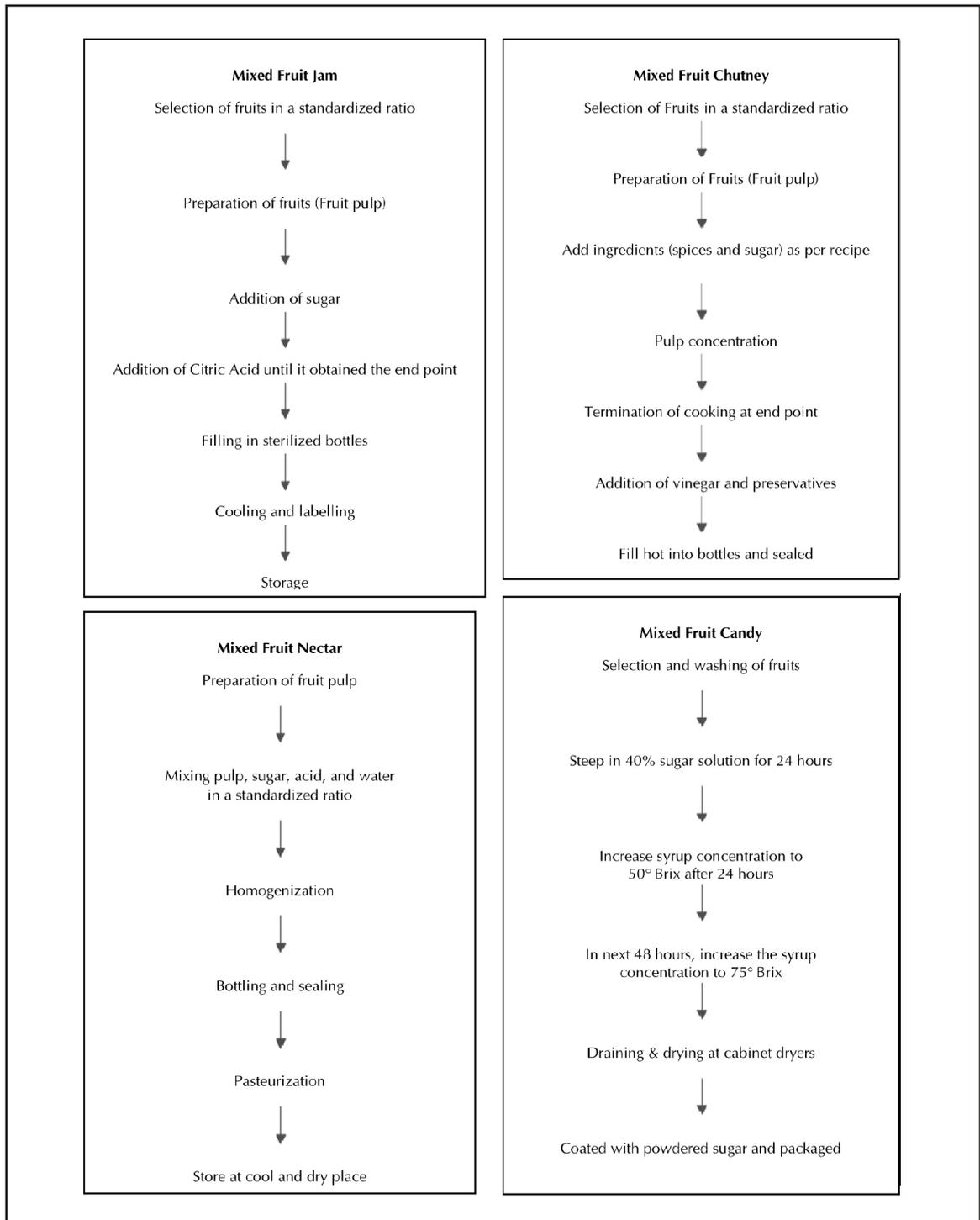
3. Value-added Products

Variety of traditional and value-added products can be prepared using these locally available fruits.

1. **Jam** - It can be prepared from single or mixed fruit pulp and with pulp replaced practically by aloe-vera gel.
2. **Chutney** - Pure fruit or mixed fruit chutney of good sweet and sour ratio can be prepared.
3. **Nectar** - Pure fruit or mixed fruit nectar would be a delight in summers.
4. **Fruit Candy** - Pure fruit candy would make a good snack for all age group people.

4. Technology transfer

Uttarakhand can prove to be the future of agri-food processing industries as majority of its area is under forest cover. But uncertainty, it faces the provocation of migration from hills due to insufficient employment opportunities, hence it is necessary that all the stakeholders including government, industry, youth and society work together closely to pillar and reinforce the tradition of entrepreneurship in the state. The Land of Gods - **Devbhoomi** has immense potential herbs, plants, fruits and flowers which have proved to be the prime source of Ayurvedic medicines since ancient times to make people healthy and provide longevity. Now it's high time to make people aware about these "Gifts of God " which can not only become the part of their daily meal like chutney, jam, nectar but can also be a possible nutraceutical with proven health benefits. The topography and climatic conditions of Uttarakhand makes it an ideal place for the growth of innumerable fruits which are available



Source: Girdhari and Siddappa, 1960

year-long and promises the wholesome taste with the mark of organically grown fruit. People have been traveling this state since ages not only for its pristine natural beauty but also for its wide range of fruits which are refreshing, tasty and healthy. Entrepreneurship will not only promote the development of the state but will also lower emigration from the hills, giving rise to better employment opportunities and will reinforce in bringing the state's economy back on track. This idea can be taken as a startup or entrepreneurial venture of the local people of Uttarakhand. It can also be opted by the anganwadi workers for their livelihood.

According to Invest Uttarakhand, Directorate of Industries, Government of Uttarakhand, the state is consistently ranked among Top States in India by the Department for Promotion of Industry and Internal Trade (DPIIT) and World Bank. Uttarakhand is the 'Ideal Investment Destination' as it has clean & pollution-free environment, availability of cheap & reliable power, good water resources, skilled manpower availability, transparent land allotment with land availability at competitive prices and proximity to NCR and within the influence region of AKIC. Uttarakhand has become a leading fruit cultivating State of India. It is ranked no. 1 in production of peaches and plums. 'Uttarakhand Skill Development Mission' trains students for employment in the Food Processing Sector. The state has strong infrastructure including two Mega Food Parks and six Industrial Parks/ Growth Centers. The state government abodes the Investment Promotion & Facilitation Center (IPFC) which has a centralized one-stop-shop for the investors/business and provides complete handholding support in a structured, focused and comprehensive manner.

Uttarakhand has inaugurated a body called "Startup Council" led by members from the government. & Private backgrounds. The policy offers benefits and incentives across various areas of intervention to startups. Incentives include marketing assistance, monthly allowance, reimbursement of Intellectual Property Rights,

Stamp duty, & States Goods and Services Tax (SGST) and need-based assistance.

5. Conclusion

This review paper attempts to elucidate the preparation of some popular processed products made from underutilized seasonally and locally grown fruits of Uttarakhand like Mixed Fruit Jam, chutneys and nectars. Some acceptable and well-known products with the use of *Berberis asiatica* (Kilmora), *Myrica esculenta* (Hisalu), *Rubus ellipticus* (Kafal), *Prunus domestica* (Aloo Bukhara), *Prunus persica* (Peach). These fruit crops are a rich source of vitamin C which has been proved as a boon in enhancing immunity in the COVID-19 pandemic times. These crops can even cure insomnia, scurvy, constipation, CVD, diabetes, anaemia, stomach ache, and can be used as a cooling agent to reduce sun stroke's ill effects. It can prove to be nutritious and favorable for health, acting as a virtuous source of antioxidants, phytochemicals, minerals and dietary fiber. These fruits are opulent in bioactive compounds like phenolics, carotenoids, etc and have potent nutraceutical properties, so they can be utilized for the preparation of more shelf stable and value-added products with a defined and an elevated shelf-life. Additionally, different products of the underutilized fruits can be formulated like chutneys, and nectars.

Wild Fruits are an excellent source of essential antioxidants, vitamins and minerals loaded with dietary fiber and adding these to the daily diet will reduce the risk of inflammation, heart disease, cancer and diabetes. Jams, chutneys and nectars are the products with medicinal properties which can be eaten regularly with paranthas, chapattis, and breads. The seasonal fruits of Uttarakhand i.e., from timla to bael have influential nutraceutical properties and it is the high time to reveal their importance and benefits all over the world. The indigenous potential and Ethnobotanical data of these untrapped local fruits are well known to people, whereas their commercial importance and market value is still unknown to the public. The underutilized crops are the preferences for scaling-up of neglected

crops for large-scale agriculture that appear to be progressively exhausted; many species hold the potential to contribute to culinary diversification, nutrition, health and well-being of mankind. These multifold fruit crops are the treasures for India's golden future and have extraordinary prospects for food security, income generation, promoting startups, and environmental services.

6. References

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