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The Forgotten Fruits: A Review of Underutilized Fruit Crops and Their Potential

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Abstract
India is known for its huge diversity of fruits. Global diversity in fruits and vegetable crops is estimated to be 3400 species. The Hindustan center has 344 species of fruits. There are 17 mega-biodiversity hotspots in the world, and India is one of them. Apart from a few cultivated fruits, most of these species are rarely cultivated and primarily grow in the wild. Fruit crops that can withstand biotic and abiotic stress conditions are well-suited for cultivation in drought-prone areas. The diverse climatic conditions of the country create a favorable environment for cultivating a wide range of fruits. However, these species possess untapped potential to contribute to food security, nutrition, health, income generation, and environmental sustainability. Most underutilized indigenous fruit crops are regarded as protective foods across India due to their rich medicinal properties, abundance of phytochemicals, and essential minerals. A strategic and targeted approach is essential to promote the value-added products of these fruits in both national and international market Consequently, a strong emphasis on the rigorous study of these crops' conservation and nutritional characterization is vital for expanding the future food basket and boosting its functional and nutritional benefits. Indian government policies and international organizations are actively promoting these crops by raising awareness about the importance of underutilized fruit species which will lead to increase in Indian economy, food security, nutrition, health and income generation. Therefore, a comprehensive approach is recommended, incorporating both *ex-situ* and *in-situ* conservation methods.

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INTRODUCTION

Underutilized crops have the potential to significantly enhance agrobiodiversity and bolster climate resilience. The term "underutilized species" has been defined in various ways, one of which refers to species, whether cultivated or wild, that hold substantial promise for agricultural development and the diversification of production systems. These species play a vital role in ensuring food security, preserving cultural diversity and traditions, and providing income opportunities for communities living in harsh, marginal

environments (Murthy *et al.,* 2020). Hence, it is difficult to define what qualifies as an 'underutilized species. Various terms, including "underutilized", "neglected", and "orphan", are commonly used to describe plant species that have untapped potential to enhance food security, provide health benefits, generate income, and support environmental sustainability (Knez *et al.,* 2023).

Underutilized fruits are those fruits that are not grown commercially on a large scale, cultivated and traded but consumed locally. Efforts have been made to describe underutilized fruits systematically and comprehensively (Singh *et al.,* 2021). Latest information and technologies used in the current scenario for the production of underutilized fruits, whether cultivated or growing wild, are traded and consumed locally as well as globally. These crops are abundant in both macronutrients and micronutrients, offering a vital source of essential food components. The consumption of wild fruits has been associated with a reduced risk of several chronic diseases, including diabetes, cancer, coronary heart disease, and neurodegenerative disorders (Peduruhewa *et al.,* 2021). These fruits are not only integral to traditional diets but also possess significant medicinal properties. Elephant Apple (*Dillenia indica*), commonly known as Chalta, is rich in bioactive compounds with potential applications in disease prevention and management (Ahamed and Borah, 2022). Hence, their consumption holds significant potential to combat hidden hunger, ensuring that communities receive adequate nutrition (Chacha *et al.,* 2022). Although underutilized plant species hold significant value at the local or regional level, they often remain overlooked and underappreciated at the national level. The underutilized crops are the plant species traditionally used for their food, fiber, fodder, oil, or medicinal properties (Kumaresan *et al.,* 2024).

Underutilized fruits are of equal significance and nutritional value when compared to commercially cultivated fruit crops in the current context. The word "underutilized" has been defined in several ways across global literature, with a common focus on ethnobotanical characteristics. These definitions emphasize the ancient cultural heritage of local communities, the multifaceted uses of these crops, and their status as traditional varieties in specific regions, which have often been overlooked or neglected by agricultural research and development organizations (Singh and Bhatnagar, 2019). Since time immemorial, edible wild fruits have played a very crucial role in supplementing the diet of the people of the Indian Subcontinent (Shirsat and Koche, 2020). The long history of traditional use has fostered widespread acceptance of these species, resulting in established, informal networks for sharing and propagating their genetic material. Long familiarity means poor farmers hold extensive germplasm and knowledge of these species (Yesuph *et al.,* 2025).

Micronutrient deficiency, often termed "hidden hunger," is a significant global health issue, affecting over two billion people worldwide (Weffort and Lamounier, 2024). This condition arises when individuals consume sufficient calories but lack essential vitamins and minerals necessary for proper growth and development (Peduruhewa *et al.,* 2021). Underutilized fruit crops possess exceptional nutritional profiles, rich in proteins, vitamins, minerals, and bioactive compounds, making them valuable in addressing malnutrition and "hidden hunger." These crops often exhibit significant morphological diversity and a broad genetic base, offering potential for breeding programs aimed at enhancing stress tolerance, yield, and nutritional quality (Nandal and Bhardwaj, 2014). Furthermore, this diverse gene pool enables the improvement of related major crops (Barua *et al.,* 2019). The growing recognition of lesser-known fruits is attributed to their unique attributes such as caloric sweetness, natural insecticidal compounds, and medicinal properties. These underutilized fruits are rich in essential nutrients, including vitamins, minerals, and bioactive compounds, making them valuable for both nutrition and health (Murthy and Bapat, 2020). Many underutilized fruits are densely packed with essential nutrients, including a broad spectrum of vitamins such as ascorbic acid, thiamine, niacin, pyridoxine, and folacin, along with vital minerals, healthy fats, proteins, and dietary fiber (Gopalan *et al*., 2004).

Despite their relatively low yields, underutilized fruits have been overlooked by a broad range of stakeholders, including scientists, extension agents, farmers, policymakers, donors, technology providers, and consumers, each for their own reasons. As a result, there is limited knowledge regarding their agronomy, cultivar selection, yield enhancement, postharvest handling, potential market opportunities, and commercialization strategies. Underutilized fruit crops encompass species with significant potential for various applications, including commercial development, home gardening, and nutraceutical purposes such as medicine and cosmetics. These plants offer a multitude of benefits, including the production of biopesticides and natural growth regulators (Donno *et al.,* 2018). Additionally, these crops offer industrial resources such as timber, fuel, oils, gums, and waxes, provide feed for livestock, and hold intrinsic value as genetic resources (Knez *et al.,* 2023).

Table 1, Different underutilized fruit crops and their botanical description

Botanical name	Common name	Family
Salacca edulis	Salak	Arecaceae
Spondias purpurea	Jamaica plum	Anacardiaceae
Spondias mombin	Hog plum/ciruela/yellow mombin	Anacardiaceae
Semecarpus anacardium	Marking nut/ Bibba/ bhilawa	Anacardiaceae
Capparis decidua	Ker	Capparidaceae
Canarium ovatum	Pilinut	Burseraccae
Berberis aristata	Indian barberry/Kingoda/Kilmora	Berberidaceae
Garcinia cambogia	Gamboge tree	Clusiaceae
Mammea americana	Manney apple	Clusiaceae
Garcinia cowa	Cowphal	Clusiaceae
Opuntia ficus-indica	Indian fig	Cactaceae
Dillenia indica	Elephant apple	Dilleniaceae
Elaeagnus latifolia	Gewain/silver berry	Elaegnaceae
Diospyros melanoxylon	Tendu	Ebenaceae
Diospyrous digyra	Black sapote (not true sapote)	Ebenaceae
Baccaurea samiflora	Latka	Euphorbiaceae
Elaeocarpus serratus	Ceylon olive	Elaeocarpaceae
Pterocarya pterocarpa	Wing nut	Juglandaceae
Bertholletia excelsa	Para nut/ Brazil nut	Lecythidaceae
Lansium domesticum	Langsat	Meliaceae
Ficus auriculata	Timla	Moraceae
Ficus palmata	Wild Himalayan fig/ bedu	
Eugenia uniflora	Surinam cherry/Brazil cherry	Myrtaceae
Myrciaria cauliflorasyn	Jaboticaba	
Passiflora quadrangularis	Giant granadilla	Passifloraceae
Pinus gerardiana	Chilgoza nut (not belong to angiosperms)	Pinaceae
Prunus nepalensis	Sohiong khasi cherry	Rosaceae
Rubes ellipticus	Yellow Himalayan raspberry	Rosaceae
Rubus idaeus	European raspberry	Rosaceae
Prunus spinosa	Black thorn sloe	Rosaceae
Pyracantha crenulata	Indian hawthorn or Nepalese firrthorn or Ghingharu	Rosaceae
Citrus maderaspatana	Kichili	Rutaceae

Salvadora oleoides	Grape of the desert/ Tooth brush tree	Salvadoraceae
Melicoccus bijugatus	Spanish lime	Sapindaceae
Diploknema butyracea	Indian butter tree	Sapotaceae
Chrysophyllum cainito	Star apple	Sapotaceae
Calocarpum virideae	Green sapota	Sapotaceae
Ribes nigrum	Blackcurrants	Saxifragaceae
Ribes rubrum	Red currants	Saxifragaceae

FEATURES AND POSSIBLE APPLICATIONS OF VARIOUS UNDERUTILIZED FRUIT CROPS,

Lasora (*Cordia myxa* L.),

Also known as Lehsua, Gonda, Cherry of the Desert, Bird's Nest Tree, Assyrian Plum, or Bhokar, belongs to the Boraginaceae family and is cultivated throughout India, excluding high-altitude and temperate regions. (Meena *et al.,* 2022). Quick growing used as a windbreak, dioecious, broad leaved, less acidic fruit three having xerophytic characters. The fruit of *Cordia myxa*, commonly known as Lasora, is recognized for its medicinal properties, including anti-helminthic, diuretic, demulcent, and expectorant effects. It is rich in essential nutrients such as crude fiber, protein, ascorbic acid (vitamin C), ash, and various vitamins and minerals, making it a valuable component of the human diet (Tak *et al.,* 2024). Tender fruit is used as vegetable and also as pickles. *Cordia alliodora,* a related species, is good source of timber and biomass production in forests.

Kair (*Capparis decidua*),

Capparis decidua Forsk belongs to the Capparidaceae family and it is locally known as Kair, Ker, Karil Teent, Della, and Neptiin (Maurya *et al.,* 2020). This is small, woody, perennial shrub native to arid and semi-arid regions and low-maintenance, versatile plant commonly found on farm borders, communal lands, and wastelands. Its adaptations to drought, including a deep root system, minimal foliage, and protective spines, enable it to thrive in harsh conditions, making it an effective natural solution for stabilizing sand dunes and preventing wind-driven soil erosion in areas like the Thar Desert in western Rajasthan (Meghwal and Tiwari, 2002). The fruit is exceptionally nutritious, containing high levels of protein, carbohydrates, dietary fiber, and essential minerals such as calcium, phosphorus, and iron. It is also used in traditional medicine for its sedative, anticonvulsant, anti-asthmatic, anti-inflammatory, and antitussive (cough-relieving) properties due to the presence of compounds such as isocodonocarpine, amyrin, taraxasterol, erythrodiol, and various alkaloids found in different parts of the plant (de Carvalho *et al.,* 2020).

Tendu (*Diospyros melanoxylon* Roxb.),

Tendu, also known as Timroo, is a native Indian and Sri Lankan species belonging to the Ebenaceae family. It is primarily found in certain regions of Jharkhand, Bihar, Chhattisgarh, Gujarat, Madhya Pradesh, Rajasthan and Tamil Nadu. This long-lived, dioecious tree produces seedless, parthenocarpic berry fruits and has commercially valuable leaves, which are utilized to produce bidis, agricultural tools, and furniture. Notably, timroo serves as a biological indicator for high sulfur dioxide concentrations (Singh *et al.,* 2007). The fresh fruit is exceptionally rich in antioxidants, exhibiting elevated levels of total phenolic compounds, flavonoids, and beta-carotene comparable to, or even surpassing, those found in guava, plum, star fruit, mango, kiwi, and apple (Guo *et al.,* 2003). Additionally, bark extracts are traditionally employed by ethnomedicine practitioners in the treatment of dyspepsia, diarrhea, and smallpox (using burnt bark) (Goyal *et al.,* 2009).

Khirni (*Manilkara hexendra* L.),

Khirni (Rayan), a member of the Sapotaceae family and native to India, is an evergreen, medium-sized, slow-growing fruit-bearing tree characterized by a broad, spreading canopy. Naturally occurring in arid and semi-arid tropical regions, it is often found as an avenue tree and holds potential for bonsai cultivation due to its dense evergreen foliage and compact

growth habit (Chadha, 2013). The tree flowers during February–March, with its fruits maturing by May–June. It is commercially utilized as a rootstock for sapota cultivation, owing to its notable tolerance to salinity and drought stress (Bose, 1985). Furthermore, its bark, seeds, and fruits serve as valuable sources of tannins, oil, and vitamin A, respectively (Xian-Zi, 1996). The bark and fruit are employed in folk remedies for their potential therapeutic effects against fevers, flatulence, gastrointestinal disorders, leprosy, ulcers, eye problems, digestive disturbances, urethral issues, and bronchial inflammation (Raju and Reddy, 2005).

Khejri (*Prosopis cineraria*),

Khejri also known as Jand or Shami, is a remarkable tree belonging to the Leguminosae (Fabaceae) family. Often referred to as the "wonder tree," "golden tree," "king of the desert," and "nature's gift," the trees have mono layered canopy and deep root system with multipurpose utility as wood yielding; fodder, food and medicinal uses along with improve fertility of poor soils (Sarolia *et al.,* 2019). Every part of this desert-adapted tree plays a significant role in enhancing the socio-economic wellbeing of local communities (Kumar and Deroliya, 2024). This multipurpose tree offers a variety of resources, including vegetable pods, flour, cattle fodder, fuel, timber, gum, resin, and medicinal products (Khasgiwal and Mithal, 1970). The tree serves multiple purposes, including acting as a barrier against wind and intrusion, lining roadsides, defining farm borders in dry regions, and lending itself to ornamental uses like topiary and bonsai. It also plays a role in home garden screening and the restoration of arid forests. It is a high litter-accumulating tree that enhances soil fertility by fixing atmospheric nitrogen. This process increases soil organic matter, soluble calcium, and available phosphorus, while reducing soil pH (Mann and Shankarnarayan, 1980). Due to its ability to improve productivity in intercropped and companion planted fields, the Khejri tree is well-adapted for agroforestry systems within arid and semi-arid landscapes.

Pilu (*Salvadora persica*),

The Pilu tree, scientifically classified under Salvadoraeceae and known by various local names including kharijal, meetajal, mustard bush, salt bush, and toothbrush tree, is a perennial evergreen that can grow as a large, branching shrub or tree. It is commonly found in Gujarat, Rajasthan, Haryana, and Punjab. Due to its robust, drought-resistant qualities, it is well-suited for reforestation efforts in challenging environments like ravines and saline or alkaline lands, as well as for creating windbreaks. Traditionally, its fibrous branches are used as a natural toothbrush, known as Miswak, to promote oral health. Additionally, they are utilized in various medicinal applications, such as antiseptics, abrasives, detergents, astringents, fluorides, enzyme inhibitors, and treatments for dental diseases, as well as anti-tumor, anti-leprosy, anti-ulcer, anti-gonorrhea, and anti-scorbutic products (Khatak *et al.,* 2010). Moreover, the fruit is a source of sweeteners and is used for producing fermented drinks; the tender shoots are eaten as a salad (Bohra *et al.,* 2021).

Chironji (*Buchanania lanzan*),

Chironji a member of the Anacardiaceae family, is an important non-wood forest tree species. It has been extensively studied for its nutritional, phytochemical, and antioxidant properties, highlighting its potential as a nutraceutical. The plant is a rich source of phenolics, natural antioxidants, and essential minerals. Various parts of the plant, including the roots, rhizome, leaves, fruits, seeds, and gum, are traditionally used in the treatment of numerous ailments, such as wounds, diarrhea, ulcers, inflammation, and pain (Jambutkar *et al.,* 2021). This fruit holds significant socioeconomic value, serving as a vital source of livelihood for the tribal population of Baran district in the Hadoti region, and possesses strong potential as a commercially viable fruit species (Singh and Bhatnagar, 2019). Chironji found culinary uses both in sweet acid as a delicacy. Chironji (*Buchanania lanzan*) is relatively low in calories yet rich in protein and dietary fiber, contributing to prolonged satiety and reduced hunger, aiding in appetite control. Additionally, chironji has a long-standing history in traditional medicine, particularly Ayurveda, where various parts of the plant, including seeds, oil, and gum are utilized to treat ailments such as digestive issues, skin conditions, respiratory disorders, and general weakness (Neeraj *et al.,* 2020). According to Banerjee and Bandyopadhyay

(2015), a sweet bolus made from Chironji kernels, Madhuka (*Glycyrrhiza glabra),* honey, parched paddy, and sugar candy is recommended for a child who has been weaned off breast milk. The kernels are ground into a powder and consumed with milk for their aphrodisiac properties, as well as for the treatment of fever and burning sensations. Additionally, bark powder mixed with honey is reported to be effective against blood dysentery (Warokar *et al.,* 2010).

Seabuckthorn (*Hippophae salicifolia*),
Eulogized as Bragmphal and called by different names Amil, Tarwar, Gold mine of wasteland in the cold desert, storehouse of vitamins, or Holly plant of hilly region belong to the family Elaegnaceae. It is a typical dry temperate plant, thorny and dioecious and suitable for pharmaceutical, cosmetic and food industries. Oil is rich in vitamin E and β- carotene and is used as folk medicine in China, Tibet and India. Seabuckthorn can fix atmospheric nitrogen through *Frankia* symbiosis. Vitamin C content is 3-4 times higher than aonla and 10-15 times higher than kiwi (Ravani and Joshi, 2014).

Noni (*Morinda citrifolia*),
Eulogized as 'Hog apple or Indian mulberry'. Thise underutilized medicinal fruit plant belongs to the family Rubiaceae. A sacred plant in Ayurveda and mentioned in ancient texts as Ashyaki meaning longevity in the Sanskrit language. It is highly useful from therapeutic and nutraceutical perspectives. Chemical constituents of fruits are useful against high blood pressure, respiratory problems and immune deficiencies. The active ingredients in their fruits are Xeronines and Proxeronine (Ali *et al.,* 2016). The crops grow well in tropical and deciduous forest and is found in the Western Ghats. It is tolerant to wet, dry, acidic, alkaline and saline soils. It is costliest drink among non-alcoholic beverages sold as Health amrut, Beverage of noni fruit extracts with pure honey (Brand name- Dancing Heart).

Miracle fruit (*Synsepalum dulcificum*),
Fruit belongs to the family Sapotaceae. This plant is notable for its berries, which, after consumption, induce a temporary sweet taste when sour foods like lemons or limes are eaten. This effect is due to Miraculin is a glycoprotein present in the plant responsible for the sweet taste (Joghee *et al.,* 2020). The berry of *Synsepalum dulcificum*, commonly known as miracle fruit, miracle berry, or sweet berry, is renowned for its unique taste-modifying properties. When consumed, it causes sour foods to taste sweet due to the presence of a glycoprotein called miraculin. Miraculin binds to the tongue's taste buds and, in acidic environments, activates sweet receptors, leading to the perception of sweetness in sour foods like lemons and vinegar (Brouwer *et al.,* 1968). It is used in the treatment of hemorrhoids, male infertility and obesity, dysgeusia, hyperuricaemia, hyperlipidemia and anti-tyrosinase.

Elephant apple (*Dillenia indica*),
The elephant apple (*Dillenia indica*) is a tropical tree native to the South Asian region, including India. Belonging to the Dilleniaceae family, this plant is recognized as a significant medicinal resource, particularly abundant in Northeast India (Kala, 2005). The immature fruits of the elephant apple (*Dillenia indica*) are indeed used for seasoning and sauces due to their acidic taste. The mature fruits find their use in making sauces, jam, and pickle (Hossain *et al.,* 2013). *Dillenia indica* is rich in medicinal and phytochemical properties which can reduce free redical and other types of cancer like breast cancer in women, cure stomach related problems, protects kidney, maintain higher energy levels, delayed aging, fight infections, improve eye health, and reduces blood pressure and control hypertension (Rai *et al.,* 2020).

FUNCTIONAL PROPERTIES OF NEGLECTED FRUITS CROPS AND IMPORTANCE

Underexploited fruits for nutritional security,
Organic compounds known as vitamins are required in trace amounts and are found in a variety of foods. Underutilized fruits play a crucial role in maintaining various vital bodily functions. Many of these fruits are essential for the proper utilization of major nutrients such as proteins, fats, and carbohydrates. For instance, Vitamin C, also known as ascorbic acid, is abundant in many underutilized fresh fruits and

vegetables, particularly green varieties. A deficiency in Vitamin C leads to scurvy, a condition marked by weakness, bleeding gums, and impaired bone development (Barua *et al.,* 2019). Riboflavin's role as a coenzyme is critical for numerous oxidation reactions within cells. This vitamin plays a vital role in energy and protein metabolism. A deficiency in dietary intake can lead to several clinical symptoms, including soreness of the tongue (glossitis), cracks at the corners of the mouth (angular stomatitis), redness and a burning sensation in the eyes, as well as scaly skin between the nose and the corners of the lips (Nandal and Bhardwaj, 2014). The human body contains a wide array of minerals and trace elements, many of which serve as essential components of structural tissues or function as catalytic agents in metabolic processes. Calcium, magnesium, and phosphorus are key constituents of bones and the skeletal system, while iron is a crucial component of hemoglobin in blood. Other minerals such as zinc, molybdenum, copper, manganese, and magnesium play critical roles either as structural elements or as activators of numerous enzyme systems (Singh *et al.,* 2020). Fruits are rich sources of antioxidants, which play a vital role in reducing the risk of degenerative diseases such as cancer, arthritis, atherosclerosis, cardiovascular disease, inflammation, neurodegenerative disorders, and premature aging. Antioxidants are bioactive compounds that protect essential biomolecules lipids, proteins, and nucleic acids from oxidative damage induced by reactive oxygen species (ROS). These ROS include both reactive free radicals such as superoxide, hydroxyl, peroxyl, and alkoxyl radicals and non-radical species like hydrogen peroxide and hypochlorous acid (Barua *et al.,* 2019).

Medicinal Properties,

There are significant deficiencies in the diets of our population, especially among tribal communities (Nandal and Bhardwaj, 2014). As a result of these dietary inadequacies, various nutritional deficiencies often presenting with clinical symptoms and disabilities—are prevalent in our country. Underutilized fruits represent a valuable source of raw materials for pharmaceuticals and traditional medicine (Naik and Sinha, 2019). Several underutilized fruits are a source of valuable remedies for dreaded modern ailments such as cancer, diabetes, jaundice, asthama, and nutritional deficiencies. In India, the fruit of aonla, bahera, and hard are the most common entering into 219 patented drugs. Bael is also used in 60 patented drugs (Barua *et al.,* 2019). Aonla (*Emblica officinalis*) is a key ingredient in the renowned Ayurvedic formulation Chyawanprash, known for its rejuvenating and immune-boosting properties. Ber (*Ziziphus mauritiana*) is traditionally included in herbal preparations like Joshanda for treating respiratory ailments. Jamun (*Syzygium cumini*) seeds are widely used in managing diabetes, while black mulberry (*Morus nigra*) has shown potential in inhibiting the docking of HIV to human cells. Regular consumption of fruits, nuts, and vegetables has been strongly associated with a reduced risk of chronic diseases such as cancer, cardiovascular disease, stroke, and other non-communicable conditions (Boeing *et al.,* 2012).

Ecological and environmental conservation,

Several underutilized fruit crop species demonstrate resilience to environmental stressors such as drought, shallow soils, and extreme temperatures, making them well-suited for cultivation on marginal and wasteland areas. In regions like the Western Ghats, Maharashtra, and Northeast India, tribal communities have traditionally depended on non-timber forest products and have integrated indigenous fruit trees such as tamarind (*Tamarindus indica*), jackfruit (*Artocarpus heterophyllus*), Indian gooseberry (*Emblica officinalis*), and ber (*Ziziphus mauritiana*) into their agri-horti-forestry systems. These communities often prioritize such species over conventional arable crops, with the notable inclusion of commercially important fruits like mango and cashew (Mahapatra *et al.,* 2012). Various underutilized fruit species contribute significantly to the biodiversity and nutritional landscape of different regions across India. Despite the country's rich germplasm resources, the development and release of standardized, high-performing varieties have remained limited. Owing to their broad adaptability and high tolerance to adverse climatic and edaphic conditions, these species possess immense potential for cultivation in challenging environments. Therefore, adequate attention

should be given to research and development, raising farmers awareness, and assessing the feasibility of cultivating these lesser-known fruits (Diengngan and Hasan, 2015).

Sustainable income source for tribals,

Underutilized fruits serve as a significant source of sustainable income in tribal areas, with various plant products (such as roots, leaves, fruits, and gum) holding substantial economic value in the market (Meena *et al.,* 2022). Numerous economically valuable fruits, vegetables, and medicinal plants, such as Amla, Ber, Custard Apple, Jamun, Tamarind, Bael, Ker (*Capparis aphylla*), Lasoda (*Cordia mixa*), Sangari (*Prosopis cineraria*), Karanda, Dates, Tumba (*Citrullus colocynthis*), Kumia (*Acacia senegal*), Kachari (*Cucumis melo*), and Timru, are either propagated or naturally found in the tribal areas of Rajasthan (Bhati and Jain, 2016). Tribal women, children, and marginalized groups gather these fruits and useful plant parts from the widely dispersed trees and bushes in the region throughout the season. A portion of the collection is kept for personal consumption, either raw or in dried form, while the surplus is sold to local traders or roadside markets (Jain, 2003). Several factors shape the market for underutilized fruits, including consumer preferences, processing capabilities, value-added opportunities, export potential, domestic consumption, and international demand. These factors, in turn, are driven by awareness of the health benefits and nutritional content of these crops (Chundawat, 2003).

The process of adding value to underutilized fruits.

Accurate statistics on the quantity produced and processed for underutilized fruits are unavailable, as a significant portion is consumed locally, exchanged, or sold in nearby markets. Most of these fruit species are not cultivated on a commercial scale but are instead found in the wild or grown in home gardens and along field boundaries. Typically, underutilized fruits are harvested from wild forests and sold fresh during their respective seasons, with minimal processing. There is great scope for processing and value addition to the underutilized fruits into various products like jam, jelly, preserve, candy, confectionery, pickle, fruit drinks, dried products *etc.* (Ravani and Joshi, 2014). Enhancing value addition of these fruits presents a significant opportunity to improve the socioeconomic status of rural families (Nandal and Bhardwaj, 2014).

Table 2: Value-added products made from underutilized fruits

S. No.	Name of fruits	Name of processed products
1	Jamun, tamarind, sitaphal, bael, ber, karonda, aonla, jackfruit, mulberry, wood apple, etc.	Jam
2	Ber, aonla, jamun, ker, etc.	Canning
3	Aonla, tamarind, immature mango, etc.	Confectionary
4	Bael, jackfruit, karonda, lasoda, tamarind, aonla, ker, phalsa, ber, kachari, sangari, khimp, mulberry, date palm, custard apple, etc.	Dehydration
5	Tamarind, karonda, ker, phalsa, tamarind, bael, custard apple, etc	Frozen puree
6	Mahua, karonda,wild apricot, datepalm, ber, Indian fig, etc.	Wine
7	Karonda, tamarind, ker, aonla, wood apple, etc.	Chutney
8	Tamarind, jamun, karonda, barbados cherry, etc.	Jelly
9	Ber, aonla, bael, ker, sangari, karonda, etc.	Preserved
10	Aonla, ber, karonda, datepalm, tamarind, etc.	Candy
11	Tamarind, bael, jamun, karonda, phalsa, ber, aonla, pomegranate, mulberry, wood apple, etc.	Juice/beverage/squash
12	Karonda, wood apple, tamarind, pomegranate	Sauce
13	Aonla, karonda, immature mango, ber,ker, lasoda, sangari, kachri, khimp, tamarind, etc.	Pickle

Source, Rawat and Das (2020), Singh *et al.,* (2008) and Pareek and Sharma (1993)

CONSTRAINTS

The cultivation, utilization, and improvement of underutilized fruit crops face several constraints, which include the following-

- Non-availability of improved varieties
- Lack of suitable Agro-techniques
- Low yield
- Unavailability of suitable post-harvest management practices
- Low awareness of nutritive and medicinal values
- Available at local markets only
- Unavailability of standardized propagation methods
- Highly perishable nature
- Limited and inadequate marketing support

CONCLUSION

Horticulture is one of the fastest-growing sectors in India, playing a significant role in poverty alleviation and ensuring nutritional security. Although often referred to as 'lesser-known fruits', minor fruits are rich sources of essential nutrients, vitamins, minerals, and bioactive compounds. They hold considerable nutritional and medicinal value, with their consumption showing strong potential to combat hidden hunger and promote well-nourished communities. Furthermore, they have the potential to alleviate various deficiency disorders and boost immunity against diseases. Raising awareness among consumers will subsequently help combat various nutrition-related problems. There is a need to increase the cultivation area and production of these lesser-known fruits and their processed products. Government and non-governmental organizations must play a pivotal role in promoting the production, marketing, value addition, and popularization of these lesser-known fruits. Consequently, research and development, farmer education, and the economic feasibility of cultivating these underutilized fruits should receive focused attention.

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