

Exploring the Nutritional and Medicinal Significance of Underutilized Fruits: A Review

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Abstract— Underutilized fruit crops encompass plant species traditionally utilized for various purposes such as food, fodder, fiber, oil, and their extensive medicinal attributes. Despite their multifaceted potential in ensuring food security, nutrition, health, income generation, and ecological benefits, these species remain underexplored. While commercially cultivated fruits like Mango, Banana, Papaya, Litchi, Guava, among others, dominate the market, wild edible fruits remain largely uncultivated and undomesticated. Many of these underutilized indigenous fruit crops serve as integral components of traditional medicine systems across India. Their value-added products present an opportunity for focused efforts to tap into both domestic and international markets. This overview primarily centers on elucidating the food, nutritional, and medicinal significance of these minor fruits. In India, prevalent underutilized fruits include Bael (*Aegle marmelos*), Jamun (*Syzygium cumini*), Karonda (*Carissa carandas*), Ber (*Ziziphus mauritiana*), Lasora (*Cordia myxa* L), Phalsa (*Grewia subinaequalis*), among others. Hence, this review paper primarily emphasizes the nutritional, therapeutic, and various other values associated with these diverse fruit crops.

Keywords— Blood pressure, Cholesterol level and fats, Vitamins, Minerals, Antioxidants.

I. INTRODUCTION

India boasts diverse and favorable agro-climatic conditions, giving rise to a vast array of tropical and temperate fruits. These fruits are often referred to as "protective foods" due to their abundant reserves of vitamins, minerals, antioxidants, and phytochemicals. They are predominantly composed of water, typically ranging from 80 to 90 percent, with relatively low levels of protein, fat, salt, and sugar. Fruits also serve as a valuable source of soluble dietary fiber. In addition to forming an integral part of a well-balanced diet and a healthy, active lifestyle, a substantial intake of fruits and vegetables has been associated with several health benefits. This includes the reduction of blood pressure, cholesterol levels, and body fat, facilitating the maintenance of a healthy weight. Moreover, fruits contribute to regular bowel movements and bolstering the immune system. Their potent antioxidant properties aid in eliminating harmful free radicals from the body, offering protection against various chronic and infectious diseases Beluhan S and Ranogajec A 2010. Within India's fruit cultivation landscape, major crops such as Mango, Banana, Papaya, Litchi, Guava, and others are commercially cultivated, encompassing a significant portion, approximately 75 percent, of the total fruit cultivation area. In contrast, wild edible fruits comprise species that have not been subjected to cultivation or domestication. These underutilized indigenous fruit crops, such as Jamun (*Syzygium cumini*), Bael (*Aegle marmelos*), Karonda (*Carissa carandas*), Ber (*Ziziphus mauritiana*), Lasora (*Cordia myxa* L), and Phalsa (*Grewia subinaequalis*), originate from their wild natural habitats and have long served as a vital source of sustenance. They hold significant importance in traditional Indian medicinal systems like Unani, Ayurveda, and Homoeopathy, where they are recognized for their therapeutic properties.

Furthermore, it is well-established that a diet rich in fruits and vegetables can effectively reduce the risk of various non-communicable diseases, including cardiovascular diseases, type II diabetes, and certain types of cancer (4). These indigenous and underutilized fruit crops play a crucial role in the diets of many local inhabitants, serving as the primary source of essential vitamins and minerals in their otherwise modest diets, particularly in rural villages. In India, some of the most commonly underutilized fruits include Jamun, Bael, Karonda, Ber, Lasora, and Phalsa. Therefore, the focus of this review paper is

primarily directed toward highlighting the nutritional, therapeutic, and other valuable attributes of these underutilized fruit crops, shedding light on their significance in both traditional medicine and local diets.

II. JAMUN:

Jamun (*Syzygium cumini*) is a notable indigenous underutilized fruit crop with commercial value in India. It belongs to the Myrtaceae family and goes by various names such as Ram jamun, Indian black cherry, and black plum in different regions. This evergreen tree is commonly grown for shade in neglected areas, forest niches, marshy lands, and as staggered trees along roadsides. Although its original home is India and the East Indies, it can also be found in countries like Thailand, the Philippines, Madagascar, and others. Efforts have been made to introduce jamun into subtropical regions like Florida, California, Algeria, and Israel. Jamun trees are abundant in tropical and subtropical regions of India, extending from the Indo-Gangetic plains in the north to Tamil Nadu in the south. They can also be found in the lower range of the Himalayas, up to altitudes of 1,300 meters, and in the Kumaon hills, up to 1,600 meters. The importance of jamun fruit lies in its high nutritive value. It is not only a source of minerals, sugars, and proteins but also a good source of iron. Jamun is considered a medicinal plant in various conventional systems of medicine, and it is particularly celebrated for its potential benefits for diabetic patients. Additionally, it has proven effective in treating conditions such as diarrhea, ulcers, and inflammation. The fruit is rich in compounds like anthocyanins, glucoside, ellagic acid, isoquercetin, kaempferol, and myricetin, all of which contribute to its therapeutic properties. Jamun fruits also contain a variety of antioxidant compounds, including flavonoids, phenolics, carotenoids, and vitamins. These antioxidants are known for their ability to reduce oxidative stress and prevent macromolecular oxidation, making them beneficial for human health. The various parts of the jamun tree, including the seeds, are used in traditional medicine to treat a range of ailments, with a particular emphasis on diabetes mellitus. The gallic acid and ellagic acid found in the seeds play a crucial role in reducing blood glucose levels. The fruit pulp, with its high anthocyanin content, can serve as a natural food colorant for the food processing industry. The leaves and bark of the jamun tree are used to control blood pressure and address issues like bleeding gums. The seed powder is effective in reducing sugar content in urine. Consumption of jamun is considered a cost-effective way to manage diabetes because the glucosides in jamun inhibit the conversion of starch into glucose, helping to reduce blood sugar levels. The seeds are used to treat various ailments, including diabetes mellitus. Jamun pulp can lower blood sugar levels within about 30 minutes, while its seeds have a longer-lasting effect, lowering blood sugar levels within about 24 hours. Over time, jamun consumption can reduce thirst associated with diabetes and decrease urine output, sometimes reducing the need for insulin (Chandra, A *et al* 1995). Furthermore, jamun seeds have gastro-protective properties and are effective in promoting mucosal defensive factors, reducing lipid peroxidation, and even exhibiting anti-cancer and anti-viral properties. Jamun fruit extract has been found to control the growth and increase apoptosis of breast cancer cells. Jamun juice has carminative, mild astringent, stomachic, and diuretic properties, offering a soothing effect on the human digestive system. The seeds of the jamun fruit also have hypoglycemic, anti-inflammatory, antibacterial, anti-HIV, and anti-diarrhea effects. Lastly, the high anthocyanin content in jamun fruit pulp makes it a potential source of natural food colorants for the food processing industry. These pigments are known for their strong antioxidant capacity and health-protecting effects, reducing the risk of various diseases. Chaudhary B and Mukhopadhyay K 2012.

III. BAEL

Bael (*Aegle marmelos*) is a significant member of the Rutaceae family and is native to India. It holds a special place in various indigenous systems of medicine not only in India but also in China, Burma, and Sri Lanka. Bael is unique in that it is the only member of the monotypic genus *Aegle*. This tree is of moderate size and is known for its aromatic properties. It typically reaches a height of 6.0 to 7.5 meters with a girth ranging from 90 to 120 cm. Bael trees grow in scattered forest niches throughout India and are recognized by various names such as Bengal quince, golden apple, Japanese bitter orange, and stone apple. In different regions of India, it is also known as Kaitha, Maredu Pandu, Vilam Palam, Belada Hannu, Koovalam, Kothu, Koth Bel, and so on. The importance of bael fruit lies in its nutritional composition. Bael fruit contains approximately 29.07 grams of carbohydrates, 2.13 grams of protein, 0.3 grams of fat, 75 milligrams of ascorbic acid (vitamin C), 54.5 milligrams of carotene, 1.03 milligrams of riboflavin (Mala, R.2009) (vitamin B2), and various minerals including calcium, phosphorus, and iron. Notably, it is considered one of the richest sources of riboflavin among fruits. Bael fruit is processed into various products, such as dried slices of green bael fruit, pulp for making sherbet and syrup, marmalade for treating diarrhea and dysentery, and powders, preserves, nectar, and toffees. In addition to its nutritional value, bael is highly regarded for its medicinal properties. Different parts of the bael plant, including the leaves, roots, seeds, bark, and fruit, contain a variety of bioactive compounds such as coumarins, alkaloids, sterols, and essential oils. These compounds contribute to its wide range of therapeutic uses, including analgesic (pain-relieving), anti-inflammatory, antipyretic (fever-reducing), anti-microfilarial (against parasitic worms), antifungal, hypoglycemic (blood sugar-lowering), antidyslipidemic (regulating lipid levels),

immunomodulatory (modulating the immune system), antiproliferative (inhibiting cell growth), wound healing, antifertility, and insecticidal properties (Morton JF1987). Bael has been used in Ayurvedic medicine for a long time to treat specific disorders, including respiratory disorders, constipation, ulcers, diarrhea, dysentery, and more. Marmelosin, a therapeutically active compound found in bael fruit, is known for its stomach ailment remedies. The fresh leaf juice of bael fruit is considered beneficial, especially when taken in doses of 8 to 16 grams with honey. It acts as a mild laxative and is used in the treatment of fever and asthma. Fresh leaves and fruits are also used as a remedy for beriberi, a nutritional deficiency disorder. In summary, bael is a versatile fruit with both nutritional and medicinal value, and it has a rich history of use in traditional medicine systems for various health-related purposes.

IV. KARONDA

Karonda (*Carissa carandas* L.) is a short-stature evergreen shrub or tree that belongs to the family Apocynaceae. It is native to regions such as the Western Ghats and the Himalayas, where it grows at elevations ranging from 300 to 1800 meters. Karonda is also found cultivated in India, Malaysia, South Africa, and other regions. In India, it grows naturally in states like Bihar, West Bengal, Maharashtra, and Karnataka, and it is cultivated in Uttar Pradesh, Rajasthan, and Gujarat. Karonda is well-suited to arid climates and thrives in higher temperatures. The importance of karonda fruit lies in its nutritional content. Although the taste of karonda is sour and astringent, its nutritional quality is remarkable. Karonda fruits are a rich source of iron, B vitamins, and vitamin C. Vitamin C is known for its antioxidant properties and its ability to help flush out free radicals from the body. Karonda fruits also contain significant amounts of protein, carbohydrates, fat, dietary fiber, and calcium. Various products can be prepared from karonda fruits. These include pickles, chutney, sauces, jelly, carissa cream, and jellied salads. During the summer, ripe karonda fruit is used to make a refreshing cooling drink. Despite emitting sticky latex while being cooked, the fruit yields a rich red juice that becomes clear when cooled. In terms of medicinal uses, karonda fruits are used in many Ayurvedic formulations due to their nutritional value. Unripe karonda fruit is considered a good appetizer. The root extract is used for chest pain, while the leaves are used for fever. Leaf extract can also be applied externally for the treatment of leprosy. Additionally, two drops of plant oil can be given with half a cup of honey to control minor worm infestations. Karonda fruits contain antioxidants such as flavonoids, alkaloids, and tannins, which offer various health benefits, including analgesic (pain-relieving), anti-inflammatory, antipyretic (fever-reducing), and cardiogenic properties. Traditionally, karonda fruits have been used for medicinal treatments of conditions such as malaria, epilepsy, leprosy, nerve disorders, fever, pain relief, headaches, and as a blood purifier. Rahmatullah M. *et al* (2009) Reshu, V. *et al.* (2017). The major bioactive constituents in karonda fruits include alkaloids, flavonoids, saponins, cardiac glycosides, triterpenoids, phenolic compounds, and tannins. These chemicals make karonda effective in the treatment of conditions like scabies, intestinal worms, pruritus (itching), biliousness, and as an antiscorbutic (preventing scurvy) and anthelmintic. Sagawat H., *et al.*, (2006) Singh Jashbir. *et al.*, (2013) (expelling parasitic worms). In summary, karonda is a versatile fruit with nutritional, culinary, and medicinal value. It has been traditionally used in various forms for the treatment of a range of ailments, and its nutritional richness makes it a valuable addition to diets in regions where it grows.

V. BER

Ber (*Ziziphus mauritiana*) is an evergreen, spiny small tree or shrub native to Indo-China and India. It belongs to the family Rhamnaceae. The fruit of the ber tree varies in shape, which can be oval, oblong, or round, with sizes ranging from 2.5 to 6.25 cm long, (Spiller, G. A. 2007) depending on the variety of the plant. The flesh of ber fruit is white, crunchy, and juicy, with a pleasant aroma. The skin is tight, thin, smooth, and glossy. Ber is also known by various names, including Indian jujube, Indian plum, and poor man's fruit. The importance of ber fruit lies in its nutritional content. Ber fruits are a great source of energy and are easy to digest because they are rich in carbohydrates and dietary fibers. These properties help in curing constipation and are essential for boosting metabolism. Ber fruits also contain minerals such as iron, zinc, potassium, phosphorus, and manganese, making them highly nutritious. The combination of these minerals is required for maintaining a healthy heart and regulating blood circulation in the body. Various products can be prepared from ber fruit, including ber powder, ber candy, ber murabba (preserved ber), ber jam, ber preserve, ber pickle, ber beverages, ber wine, and ber ready-to-serve (RTS) items. In terms of medicinal uses, ber fruit has several health benefits:

- **Preventing Anemia:** The iron content in ber fruit helps prevent anemia by increasing hemoglobin levels in the blood.
- **Bone Health:** Dried ber fruits are rich in calcium and phosphorus, which are essential for developing and maintaining bone density.

- **Anti-Aging:** Ber fruits contain vitamin C and antioxidants, which help reverse the effects of aging by fighting free radicals and preventing cell damage.
- **Sedative Qualities:** Ber fruit contains antioxidants like flavonoids, phytochemicals, and saponins, which have sedative effects that help in treating anxiety by calming the nerves.

In summary, ber fruit is a nutritious and versatile fruit with various culinary uses and medicinal benefits. It is valued for its energy-boosting properties, role in digestion, and the array of essential minerals it provides. Additionally, its antioxidant content and potential sedative effects contribute to its importance in traditional medicine and wellness.

VI. LASORA

Lasora (*Cordia myxa L.*), also known as Gonda or lehsua, belongs to the family Boraginaceae. It can be found in moist and dry forests of India, except in high hills and temperate climates. Lasora is a medium-sized, perennial tree with a crooked stem, and it bears smooth, small cherry-sized fruits in bunches from March to August. The importance of lasora fruit lies in its significant nutrient content, providing essential components for human health. Lasora fruits are a probable source of vitamins, minerals, and fiber. These fruits contain various nutrients such as proteins, carbohydrates in the form of starch and free sugars, oils, ascorbic acid (vitamin C), minerals, and antioxidants. Fruits, in general, are rich sources of natural antioxidants like carotenoids, ascorbic acid, phenols, and more. *Lasora* is considered a multipurpose plant with associations to nutrition, health, and various uses in treating human ailments. The tree has a role in the rural economy of arid regions by providing food (in the form of pickles and vegetables), fuelwood, and timber. Products of lasora fruit include ripe fruits, which are eaten fresh. Unripe fresh fruits are often used as vegetables and for making pickles, especially when conventional vegetables are scarce (typically in April and May). Sometimes, fruits are blanched and dehydrated to be used as a vegetable during the off-season. The gummy crush obtained from ripe fruits is generally used to prepare glue. In terms of medicinal uses, various parts of the lasora tree are utilized both internally and externally for medicinal purposes. The tree has traditionally been used in the treatment of conditions such as fever, dyspepsia (indigestion), ulcers, ringworm, headaches, lung diseases, spleen-related issues, and more. Different parts of the tree, including the bark, leaves, fruits, and seeds, have reported medicinal properties, including antidiabetic, anti-ulcer, anti-inflammatory, diuretic, immune-modulator, laxative, antidote, astringent, analgesic, and expectorant activities. In summary, lasora is a versatile tree with nutritious fruits and various applications in both food and traditional medicine (Trivedi, P. C 2007). It plays a significant role in providing sustenance and addressing health concerns in the regions where it grows.

VII. PHALSA

Phalsa (*Grewia subinaequalis*) is a large shrubby tree native to India and other parts of Southeast Asia, including Pakistan, Sri Lanka, and Bangladesh. It belongs to the Tiliaceae family and is cultivated for its edible fruits in India and many other tropical countries. Phalsa is also known as Indian Sherbet Berry. The ripe phalsa fruit is similar in appearance to grapes, with a thin layer of dark purple to black skin and greenish-white fleshy pulp surrounding the seeds. It has a sweet and sour taste and is typically found in branched clusters. Phalsa fruits have a very short shelf life, limiting their distribution mainly to local markets. They are primarily cultivated in the western and northern states of India for commercial purposes. The importance of phalsa fruit lies in its significant nutrient content. It is high in moisture and water content, making it a refreshing fruit. Phalsa consumption provides energy, as it is loaded with a good amount of carbohydrates and calories in the form of simple sugars, which are easily processed by the human body. Phalsa is also rich in vitamins, particularly Vitamin C, and contains abundant trace minerals, including iron. Iron is essential for the synthesis of hemoglobin, which is needed for circulating blood between tissues and organs. Adequate iron intake helps combat dizziness and fatigue. The seeds of phalsa contain approximately 5 percent oil, which is bright yellow in color and consists of 65 percent linoleic acid and 11 percent stearic acid. Phalsa fruits have a short shelf life and are best consumed quickly. In India, during the hot summer season, ripe phalsa fruits are enjoyed either fresh in desserts or processed into stimulating soft drinks like sherbet, squash, ready-to-serve beverages, and more. In terms of medicinal uses, phalsa fruit offers several health benefits:

- **Blood Pressure Regulation:** Phalsa fruits can help lower high blood pressure due to their potassium and phosphorus content, which play a role in maintaining healthy blood pressure levels.
- **Heart Health:** Phalsa consumption helps prevent cardiac ailments such as heart attacks, arrhythmia (irregular heartbeats), and atherosclerosis. Its anthocyanins, antioxidants, and tannins help prevent fat deposition and cholesterol accumulation in blood vessels.
- **Anti-Inflammatory:** Phalsa fruits have anti-inflammatory properties that can help reduce inflammation in the body.

- **Antioxidant Properties:** Phalsa is rich in antioxidants, which neutralize free radicals, alleviate bone pain (useful in conditions like arthritis and osteoporosis), and improve joint mobility.

In summary, phalsa is a nutritious fruit that provides energy, essential vitamins, and minerals. It also offers various health benefits, including blood pressure regulation, heart health support, anti-inflammatory effects, and antioxidant properties. Enjoyed during the hot summer months, phalsa is a refreshing and healthy addition to the diet.

The underutilized fruit crops or minor fruits discussed in the current investigations have been shown to possess significant value both in terms of medicinal and nutritional properties. These plant species have traditionally been used for their fruits, fiber, fodder, oil, or therapeutic properties, but they are considered underexploited resources with great potential for enhancing food security, nutrition, health, income generation, and environmental services. Despite being underutilized, these fruits also play a vital role in sustainable agriculture due to their adaptability and tolerance to unfavorable climatic conditions. Underutilized plants typically have local importance, but they often lack nationwide recognition. Therefore, it is crucial to prioritize research and development efforts aimed at the cultivation of underutilized fruit crops. This can help promote organized marketing systems for fresh fruits during surplus periods and encourage the processing of these fruits into value-added products. Such initiatives can have a positive impact on the nation's economy by diversifying agricultural production and providing new income opportunities for farmers. In summary, the cultivation and promotion of underutilized fruit crops hold promise for addressing various challenges related to food security, nutrition, and economic development. By recognizing the value of these lesser-known fruits and investing in their development, we can harness their potential benefits for both local communities and the broader agricultural sector.

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