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# Review on indigenous fruits of Indian origin with antioxidant activity

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**Abstract**
As plants produce significant amount of antioxidants to prevent the oxidative stress caused by photons and oxygen, they represent a potential source of new compounds with antioxidant activity. Traditional herbal medicines form an important part of the health care system of India. Ayurveda, supposed to be the oldest medical system in the world, provides potential leads to find active and therapeutically useful compounds from plants. Considering the growing interest in assessing the antioxidant capacity of herbal medicine in this review we discuss about the rarely reviewed 10 indigenous fruits of Indian origin reported to have antioxidant properties. Some of the fruits reviewed are part of multi-herbal preparations while others are used singly. Certain fruits like *Syzygium cumini, Ziziphus mauritiana, Emblica officinalis*, indicating that these fruits could be source of dietary antioxidant supplies, which is another emerging area of research.

**Keywords:** Indigenous fruit, antioxidant properties, phytochemicals, vitamins and minerals

## Introduction
Fruits are also known as protective food as they are rich sources of vitamins, phytochemicals and minerals. Fruits are potential source of soluble dietary fiber, which helps in reducing the cholesterol level and fats from the body, helps in smooth bowel movements and helps in boosting the immune system.

Commercially, when fruits are compared with vegetables, pulses and cereals, fruits have rich anti-oxidant values. An antioxidant property helps in removal of free radicals from the body, and thus provides protection against many chronic and infectious diseases [1].

Antioxidants are the defense system of the body against the damage of reactive oxygen species that are normally produced during the physiological process in the body. Antioxidants play an important role in biological systems by preventing the formation of reactive oxygen species by reducing hydroperoxides ($ROO^-$) and $H_2O_2$, and by scavenging free radicals. Normally, antioxidant system occurring in human body can scavenge these radicals, which would keep the balance between oxidation and anti-oxidation. Nonetheless, the exposure of cigarette smoking, alcohol, radiation, or environmental toxins induces the production of excessive ROS and RNS, which disrupt the balance between oxidation and anti-oxidation and result in some chronic and degenerative diseases.

Most of the underutilized indigenous fruit crops are being utilized as medicinal plants throughout India and popular in various indigenous system of medicine like Unani, Ayurveda and Homoeopathy. Most of the important underutilized fruits are local and easily obtained in the natural niche of the forest. So, this review paper is mainly emphasizing on insights of indigenous fruits of Indian origin having antioxidant activity. List of indigenous fruits are shown in fig. 1

**Table 1:** List of indigenous fruits of Indian origin

| S. No | Common names | Botanical name | Family |
|---|---|---|---|
| 1. | Jamun | *Syzygium cumini* | Myrtaceae |
| 2. | Ber | *Ziziphus jujube* | Rhamnaceae |
| 3. | Karonda | *Carissa carandas* | Apocynaceae |
| 4. | Mangosteen | *Garcinia mangostana* | Clusiaceae |
| 5. | Blue berries | *Vaccinium corymbosum* | Ericaceae |
| 6. | Amla | *Phyllanthus emblica* | Phyllanthaceae |
| 7. | Banana | *Musa acuminata* | Musaceae |
| 8. | Kiwi | *Actinidia deliciosa* | Actinidiaceae |
| 9. | Guava | *Psidium guajava* | Myrtaceae |
| 10. | Pomegranate | *Punica granatum* | Lythraceae |

**Fruits with antioxidant activity**

**1. Jamun (*Syzygium cumini*)**

*Syzygium cumini* L., commonly known as jamun or Indian mulberry, is native to India [2]. Jamun (*Syzygium cumini* skeels) belongs to the Myrtaceae family. It is an important known underutilized fruit crop and an important native fruit with commercial value [3].

Jamun (*Syzygium cumini*) is one of the underutilized fruits [4]. The scientific name of Jamun is *Eugenia jambolana* Lam or *Syzygium cumini* Linn [5]. The fruit is an oblong berry, dark purple or blue in color, and the pulp is pink. It is widely consumed raw and is used to treat various diseases, such as astringency, ascorbic, antidiabetic, antidiuresis, chronic diarrhea, and splenomegaly [6].

This research focuses on extraction strategies and evaluation of the chemical characteristics of pulp and Jamun seeds, as well as related antioxidant and anti-proliferative properties [7].

**2. Ber Fruit (*Ziziphus jujube*)**

Jujube fruit is also called Indian date, Chinese date, red date, and Korean date. It is not a very common fruit in Indian shops, but if you are looking for it, it is easy to buy. Its botanical name is *Ziziphus jujuba*, which belongs to the seabuckthorn family. *Ziziphus mauritiana*, also known as Indian jujube, Indian plum, Chinese apple and mate is a tropical fruit tree belonging to the Rhamnaceae family [8].

Jujube leaves are used to relieve colds, relieve congestion and relieve symptoms of diabetes, and can be drunk as a tea. Jujube flowers have high-quality nectar. Jujube has anti-aging, immune regulation, anti-cancer, sedative and hypnotic effects in traditional Chinese medicine [9].

**3. Karonda (*Carissa carandas*)**

Carissa carandas is a flowering shrub in the Apocynaceae [10]. Grows naturally in the Himalayas 300 to 1800 meters above sea level, West Walik, Western Ghats, Nepal and Afghanistan. Karonda is considered a super food due to its many antioxidant properties. They protect cells from unstable molecules; called free radicals, they can exacerbate the signs of aging and reduce the effects of the skin. The separation of many terpenoids has been reported [11]. Especially the mixture of sesquiterpenes, namely carisson [12] and carindone as a new type of C31 terpenoids [13]. Other products include pentacyclic triterpenoid carysin.

**4. Mangosteen (*Garcinia mangostana*)**

Mangosteen (*Garcinia mangostana*), also known as purple Mangosteen [14]. It is round in shape, dark purple or reddish in color, and the pulp is white and juicy, and the taste is slightly bittersweet, it is called the "Queen of Fruits". For centuries, the Mangosteen peel has been used in traditional medicine in Southeast Asia to treat skin infections, wounds, inflammation, and diarrhea.

Mangosteen contains a variety of nutrients with antioxidant capacity, such as vitamin C, folic acid and xanthones. The antioxidant activity of xanthone (a unique plant compound known to have strong antioxidant properties) has anti-aging, anti-inflammatory, anti-cancer and anti-diabetic effects. Mangosteen is usually propagated through seedlings [15]. Vegetative propagation is difficult, and seedlings are more robust and bear fruit earlier than vegetatively propagated plants.

Numerous studies have confirmed that the intake of Mangosteen extract helps to improve oxidation-related diseases, such as diabetes, hyperlipidemia, diseases of the nervous system, skin aging, acne, etc.

**5. Blue Berry (*Vaccinium corymbosum*)**

Blueberry is a flowering plant of the genus Vaccinium with deep purple berries. Its anthocyanins are considered to be the most powerful antioxidants in nature and have properties far beyond the inhibition of free radicals [16]. Consumption of blueberries can alleviate the cognitive decline that occurs in Alzheimer's disease and other aging conditions [17]. Blueberries also help maintain healthy blood flow through a variety of mechanisms, including healthy low-density lipoprotein (LDL) oxidation, normal platelet aggregation, and maintenance of endothelial function [18].

*V. corymbosum* is one of the most commercially valuable blueberry varieties in the world [19]. Blueberries are used for aging, memory and thinking skills (cognitive function), and many other conditions [20].

**6. Amla (*Phyllanthus emblica*)**

Indian gooseberry has two scientific names, *Phyllanthus emblica* and *Emblica officinalis*. It is also commonly referred to as Amla. This small tree has yellow-green flowers and can develop into round edible fruits of the same color [21]. Aonla is one of the native fruit crops of the Indian subcontinent and is widely used in the Indian medical system [22].

It is native to tropical and subtropical regions of Southeast Asia, including India, China, Malaysia, Bangladesh, Sri Lanka, and Mascarin Island. Helps protect cells from free radical damage [23]. Amla fruit extract helps stimulate procollagen (the precursor of collagen in the skin) when applied to the skin [24].

**7. Banana (*Musa acuminata*)**

Bananas are one of the most consumed fruits in tropical and subtropical regions of the world [25]. Most banana varieties originated in South Asia. Musa acuminata is an evergreen perennial plant, not a tree. The trunk consists of a very compact leaf sheath. It belongs to the Musaceae family.

Bananas contain high levels of antioxidants, which act like nature's botulinum to prevent the formation of fine lines and wrinkles [26]. Rubbing banana peel on your face can remove blemishes and also help treat acne [27].

Antioxidant compounds found in bananas include ascorbic acid, tocopherols, beta-carotene, phenolic groups, dopamine, and gallocatechin [28]. *M. acuminata* includes antioxidant, antidiabetic, immunomodulatory, hypolipidemic, anticancer, and antimicrobial activity, especially anti-HIV [29].

**8. Kiwi (*Actinidia deliciosa*)**

(*Actinidia deliciosa*) is delicious, hairy kiwi fruit. Kiwifruit is a vibrant, woody, twisted climbing vine or shrub that is 9 m [30] tall. Kiwi is an edible fruit the size of a large grape. It resembles a hairy kiwi in flavor and internal appearance, but the thin, smooth green skin and lack of fluff make the whole fruit more pleasant to eat [31].

It has spread to Zhongshan in Himachal Pradesh, Jammu Kashmir, and Arunachal Pradesh. Kiwi is generally eaten as fresh fruit [32]. The potential antioxidant properties of kiwis are generally attributed to the fact that they are rich in potential antioxidant polyphenols and flavonoids [33]. Through phenolic substances to eliminate free radicals, phenolic substances can provide electrons to H2O2, neutralizing it in water [34, 35].

**9. Guava (*Psidium guajava*)**

Guava (Psidium guajava) belongs to the Myrtaceae family [36], including about 130 genera and 3000 species of trees and shrubs, mainly distributed in tropical and subtropical regions [37]. Psidium guajava (guava) is a famous tropical tree that is widely planted to produce fruits [38]. Its fruits are rich in vitamins A, C, iron, phosphorus, calcium and minerals [39]. It contains high content of organic and inorganic compounds as secondary metabolites, for example. For example, antioxidants, polyphenols, antiviral compounds, anti-inflammatory compounds.

*Psidium guajava* is an evergreen shrub-like tree that can reach 6 to 25 feet in height. The content of flavonoids in the methanolic guava extract is relatively high. Lycopene and flavonoids are important antioxidants. They help heal cancer cells [40] and help prevent premature skin aging [41].

**10. Pomegranate (*Punica granatum*)**

The pomegranate, or Punica granatum, is a shrub that produces red fruits [42]. It is classified as a berry and is about 5-12 cm (2-5 inches) in diameter. It is red, round, and looks a bit like a red apple with a flower-shaped stem [43]. The pomegranate fruit can be eaten fresh or transformed into juice, oil, wine and jam. It is well known that fruits and their peel contain many phytochemicals, including phenolic acids, flavonoids, and tannins [44].

*Punica granatum* L. (Granada) is a long-lived and drought-tolerant plant. Arid and semi-arid areas are very suitable for planting pomegranates. They are widely cultivated in Iran, India, and Mediterranean countries such as Turkey, Egypt, Tunisia, Spain, and Morocco [45]. However, the pomegranate is classified as a berry, but it belongs to its own family of plants, the pomegranate family. We found that pomegranate peel had the highest antioxidant activity among the peel, pulp and seed fractions of 28 kinds of fruits commonly consumed in China, as determined by FRAP (ferric reducing anti- oxidant power) assay (Guo *et al*., 2003). We found that pomegranate peel had the highest antioxidant activity among the peel, pulp and seed fractions of 28 kinds of fruits commonly consumed in China, as determined by FRAP (ferric reducing anti- oxidant power) assay (Guo *et al*., 2003). We found that pomegranate peel had the highest antioxidant activity among the peel, pulp and seed fractions of 28 kinds of fruits commonly consumed in China, as determined by FRAP (ferric reducing anti- oxidant power) assay (Guo *et al*., 2003).

The FRAP (Iron Reduction Antioxidant Ability) test shows that among the 28 common fruits in China, in the peel, pulp, and seed parts, pomegranate peel has the highest antioxidant activity [46]. The largest category includes tannins and flavonoids, which indicate that pomegranate has unusual antioxidant and antiseptic activities and therefore has pharmacological potential [47].

**Conclusion**

According to this review, a variety of antioxidants or other phytochemicals, including lycopene, coenzyme Q, glutathione, carnosine, selenium, zinc, bioflavonoids, green tea polyphenols, grape seed proanthocyanidins, resveratrol, silymarin, Genistein, etc. protects against skin inflammation, oxidative stress and DNA damage caused by ultraviolet rays.

To determine the oxidative stress of an individual, antioxidant elements and ROS potential are required. There are a variety of *in vitro* antioxidant potential assays that are easy to perform and widely used for screening. It is important to recognize the individual's oxidative imbalance as early as possible to prevent oxidation and long-term antioxidant stress. These requirements must be taken into account when determining an individual's "oxidation state" prior to initiating or terminating antioxidant therapy.

Hence clinical trials of cosmeceuticals are important to know the interaction between skin and cosmeceuticals which could even be influenced by environmental fact.


**Fig 1:** List of indigenous fruits of Indian origin 1. Jamun 2. Ber 3. Karonda 4. Mangosteen 5. Blue berries 6. Amla 7. Banana 8. Kiwi 9. Guava 10. Pomegranate

**References**


1. Singh Y, Bhatnagar P. An Overview on Inherent Potential of Underutilized Fruits.
2. Antioxidant and antiproliferative activities of anthocyanin/ellagitannin-enriched extracts from *Syzygium cumini* L. (‘jamun’, the Indian Blackberry). Farrukh Aqil, Akash Gupta, Radha Munagala, Jeyaprakash Jeyabalan, Hina Kausar, Ramjee Sharma, Inder Pal Singh, and Ramesh C Gupta, HHS public access 2012, 18.
3. An Overview on Inherent Potential of Underutilized Fruits. Bhatnagar, Yogendra Singh, Prerak. International journal of pure and applied bioscience 2019, 18.
4. Bhatnagar, Yogendra Singh, Prerak. Kota: international journal of pure and applied bioscience 2019, 1. ISSN: 2320-7051.
5. Role of *Syzygium cumini* (Jamun) In Cosmetic. Mayuri Parate A, Dr. Nibha Bajpai D, Dipalini Walke D. Maharastra: International Journal of Scientific Development and Research (IJSDR) 2019, 1. IJSDR1906039.
6. Sphinxsai, Venkatasubramanian, Menaka M, Chandra. Coimbatore and Chennai: International Journal of ChemTech Research, 2017, 10. ISSN: 0974-4290.
7. Antioxidant and antiproliferative activities of anthocyanin/ellagitannin-enriched extracts from *Syzygium cumini* L. (‘jamun’, the Indian Blackberry). Farrukh Aqil, Akash Gupta, Radha Munagala, Jeyaprakash Jeyabalan, Hina Kausar, Ramjee Sharma, Inder Pal Singh, and Ramesh C Gupta, India: HHS public access 2012, 1. PMID: 22420901.
8. Wikipedia. *Ziziphus mauritiana.* [Document] India: Wikipedia 2017. Wikidata: Q327859Wikispecies: Ziziphus mauritianaAoFP:255APDB: 83592APNI: 56033ATRF: Ziziphus_mauritianaEcocrop: 17633EPPO:ZIPMAFloraBase:4847FNA:200013471FoAO2:ZiziphusmauritianaFoC:200013471GBIF:3039424GRIN:42285iNaturalist: 123697IPNI: 719349-
9. Antioxidant Capacities of Jujube Fruit Seeds and Peel Pulp. Yung-Sheng Lin, Wen-Shin Lin. Taiwan: MDPI applied sciences 2020;10:6007. Doi:10.3390/app10176007.
10. Wikipedia. *Carissa carandas.* [Document] India: Wikipedia 2021. Wikidata: Q1036374Wikispecies: Carissa carandas Ecocrop: 4223EoL:581122EPPO: CISCAFoC: 200018362GBIF: 5414419GRIN: 9159iNaturalist: 430784IPNI: 77691-1IRMNG: 10200741ITIS: 30164NCBI: 141541Plant List: kew-34145PLANTS: CACA74POWO: urn:lsid:ipni.org:names:7.
11. https://en.wikipedia.org/wiki/Carissa_carandas#cite_note-4.
12. https://en.wikipedia.org/wiki/Carissa_carandas#cite_note-5. India: S.N.
13. https://en.wikipedia.org/wiki/Carissa_carandas#cite_note-6.
14. https://en.wikipedia.org/wiki/Mangosteen#cite_note-stone-1.
15. https://en.wikipedia.org/wiki/Mangosteen#cite_note-morton-2.
16. Srivastava *et al*., 2007.
17. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3274736/#B15.
18. Kalt *et al*., Shaughnessy *et al*., 2008-2009.
19. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6864474/.
20. https://www.webmd.com/vitamins/ai/ingredientmono-1013/blueberry.
21. https://www.healthline.com/nutrition/indian-gooseberry#what-it-is.
22. An Overview on Inherent Potential of Underutilized Fruits. Bhatnagar, Yogendra Singh, Prerak. Rajastan: International journal of pure and applied bioscience 2019, 1. ISSN: 2320-7051.
23. https://www.naturesvelvet.in/products/amla-antioxidant-antiaging-500-mg-60-veggie-caps.
24. https://pubmed.ncbi.nlm.nih.gov/18588964/.
25. Alkarkhi *et al*. SL: Alkarkhi AFM, Ramli S, Yeoh SY, Easa AM. Physiochemical properties of banana peel flour as influenced by variety and stage of ripeness: multivariate statistical analysis, Asian Journal of Food Agro-Industry 2010;3:349-362.
26. https://indianexpress.com/article/lifestyle/life-style/benefits-of-banana-for-hair-skin-5958559/.
27. Qusti *et al*. Someya *et al*. 2002-2010.
28. Traditional uses, phytochemistry and pharmacology of wild banana (*Musa acuminata*). Nimisha Sarah Mathew, Pradeep Singh Negi. India: National library of medicine 2017, 1. PMID: 27988402.
29. https://en.wikipedia.org/wiki/Actinidia_deliciosa#cite_note-Kiwifruit-1.
30. https://en.wikipedia.org/wiki/Kiwifruit#cite_note-penn-13.
31. Atkinson and Macrae 2007.
32. Iwasawa *et al*., Lim 2011-2012.
33. Ebrahimzadeh *et al*., 2009.
34. Bekhradnia *et al*., 2011.
35. https://clinphytoscience.springeropen.com/articles/10.1186/s40816-018-0093-8#ref-CR1.
36. https://clinphytoscience.springeropen.com/articles/10.1186/s40816-018-0093-8#ref-CR2.
37. https://clinphytoscience.springeropen.com/articles/10.1186/s40816-018-0093-8#ref-CR1.
38. https://clinphytoscience.springeropen.com/articles/10.1186/s40816-018-0093-8#ref-CR15.
39. https://www.ncbi.nlm.nih.gov/pubmed/22280146.
40. https://www.ncbi.nlm.nih.gov/pubmed/20399614.
41. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4007340/.
42. http://nutritiondata.self.com/facts/fruits-and-fruit-juices/2038/2.
43. Kahramanoglu I, Usanmaz S. Pomegranate Production and Marketing, CRC Press Taylor & Francis Group, Boca Raton, FL, USA 2016.
44. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4007340/#ref1.
45. Guo *et al*., 2003.
46. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4007340/#ref3.