



E-ISSN: 2278-4136

P-ISSN: 2349-8234

JPP 2018; 7(5): 1417-1420

Received: 02-07-2018

Accepted: 03-08-2018

Manju Yadav

Ph.D. Scholar, Dept. Foods and Nutrition, Professor

Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India

Srilekha K

M Sc., Dept. Foods and Nutrition, Professor

Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India

Barbhai Mrunal D

Ph.D. Scholar, Dept. Foods and Nutrition, Professor

Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India

K Uma Maheswari

Professor and Head, Dept. Foods and Nutrition, Professor

Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India

Correspondence**Manju Yadav**

Ph.D. Scholar, Dept. Foods and Nutrition, Professor

Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India

Potential health benefit of underutilized fruits: A review

Manju Yadav, Srilekha K, Barbhai Mrunal D and K Uma Maheswari

Abstract

The diet of the large group of population is deficient in many vital nutrients and bio active compounds posing a constraint to achieve nutritional security. So, to address this problem a large number of underutilized fruits can be used to fill the gap and achieve nutritional security. These underutilised foods also possess therapeutic potential which when used efficiently can prevent and manage large number of degenerative diseases. In this article some of the underutilized fruits and their potential health benefits are reviewed. The fruits reviewed are: Monkey Jack fruit, Jambura, Karonda, Jujube (Ber), Wood apple, Stone apple, Hog apple, Lasoda and Velvet apple.

Keywords: Potential health benefit, underutilized fruits

Introduction

Usage of plants having medicinal and nutritional properties in management of different diseases and disorders is an age-old practice. In the current scenario of increasing rate of degenerative diseases these plant materials can be used to manage them economically with fewer side effects when compared to modern medicines. It was reported that approximately 7200 plant species have medicinal properties and among them 3000 plant species were recognized by India (Jamkhane *et al.*, 2013) [13]. With the increasing awareness regarding health, nutrition and safety plant material having medicinal properties can be used to develop safe, and low-cost therapeutic food products. Fruits are one of the most important categories having medicinal and nutritional properties. There are a large number of fruits with these attributes which are often underutilized. Underutilised fruits crops can be defined as fruit crops which have value but not widely grown, rarely found in the market and not cultivated commercially (Agent, 1994) [1]. These underutilized fruit crops do not require additional resources like irrigation or fertilizers thus it can be economic to integrate underutilized crops into farming system (Vino *et al.*, 2016) [33]. These underutilized fruit crops can be low cost nutritious foods when understood and utilized effectively. In this review we are highlighting few underutilized fruits available in India and their nutritional and potential health benefits to manage different diseases and disorders.

Monkey Jack Fruit (*Artocarpus lakoocha* Roxb., *Moraceae*)

Monkey Jack fruit (*Artocarpus lakoocha* Roxb., *Moraceae*) an underutilized fruit, is a tropical fruit originated in India available in countries like Bangladesh, Bhutan, Nepal, Myanmar, Sri Lanka, Thailand, Malaysia, Singapore, Vietnam, Cambodia and Laos (Hossain *et al.*, 2016) [9]. As reported by Jahan *et al.* (2011) [12] monkey jack fruit is excellent source of ascorbic acid (171.07mg /100g), Beta-carotene (3718.16 µg/100g), and also a good source of sodium (46 mg/100g), potassium (785 mg/100g), iron (15.09 mg/100g), copper (1.31mg/100), Manganese (3.76mg/100) and Phosphorus (66.06 mg/100). In several studies it is revealed that *A. lakoocha* has many medicinal uses. Some pharmacological activities found into this plant are anti-inflammatory, antiviral, anticancer and anti-HIV properties (Kirtikar and Basu, 2007) [15]. This ripen sweet and sour fruit can be eaten fresh and unripen fruits can be used to prepare curries, pickles and sauces.

Jambura (*Citrus maxima*)

Citrus maxima or *Citrus grandis* belonging to the family of *Rutaceae* is an edible fruit. Its flesh is juicy, soft in texture and wealthy in nutrients (Sirisomboon and Theamprateep, 2012) [29]. The fruit flesh is normally consumed which is renowned for its good flavour and juicy texture and reported to contain important nutrients including vitamin C, para-insulin, potassium, pectin, natural folic acid and chromium (Magazin, *et al.*, 2010) [17]. This fruit is popular throughout Asia, Europe and America.

This plant has been used for the treatment of fatigue, diabetes, fever, insomnia, pharyngitis, carcinoma, coughs, and internal organ disorders in Philippines and surrounding geographic region (Ibrahim, *et al.*, 2018) [11].

Karonda (*Carissa carandas*)

Commonly known as karonda, *Carissa carandas* belonging to family *Apocynaceae* are edible underutilized fruits. The plant is native and common throughout India (Kirtikar and Basu, 2003) [14]. As reported by Pewlong *et al.* (2014) [24] the leaf extract of *Carrisa carandas* showed the highest DPPH-scavenging activity (65.24±0.69 mgAAE/g), followed by the fully-ripe fruit extract (2.42±0.21 mgAAE/g) and the unripe fruit extract (0.85±0.03 mgAAE/g). Ripe karonda fruit contains high amount of pectin therefore it is also used in making jelly, jam, squash, syrup, tarts and chutney, which are of great demand in international market (Wani *et al.*, 2013) [34]. Fruits of *Carissa carandas* being rich source of iron and vitamin C are used for curing anaemia. Decoction of its leaves is also used against fever, diarrhoea and ear ache, and the roots are used for stomachic, vermifuge, remedy for itches, and insect repellent (Malik *et al.*, 2010 [18]; Singh and Uppal, 2015) [28].

Jujube (*Ziziphus jujube*)

Jujube is a plant of great nutritional and medicinal value that grows readily in many countries worldwide (Hasan *et al.* 2014) [8]. *Ziziphus jujube* is a plant native to Asia and Southern Europe and has very delicious edible fruits. *Z. jujube* has medicinal properties because of it is secondary metabolites and phenolic compounds such as alkaloids, flavonoids, terpenoids, saponin, pectin, triterpenoic acids and lipids and are reported to have hemolytic, sedative, anxiolytic and sweetness inhibiting properties (Goyal *et al.*, 2012) [7]. There are lot of studies which support that this fruit has anti-diabetic, hypocholesterolaemic, anti-cancer activity. *Z. jujube* powder was reported to have hypolipidemic and anti-obesity properties (Mostafa and Labban, 2013) [21].

Wood Apple (*Limonia acidissima*)

Wood apple a tropical fruit which is native to India and Srilanka belongs to the genus *Limonia acidissima* L. (synonyms: *Feronia limonia* syns, *Feronia elephantum* Correa; *Schinus limonia* L.) and *Rutaceae* family. (Rodrigues *et al.* 2018) [26]. every part of the fruit has medicinal values, unripe fruits were used to treat diarrhea and dysentery and ripe fruit were used as cardiac and liver tonic. Jams, jellies, preserves, dates and fruit bars and chutneys were prepared as by products (Vidhya *et al.* 2011) [32]. The average chemical composition was reported as 6.3 g of protein, 15.6 g of total carbohydrates, 72% moisture, 4.16% titratable acidity, 2.6 mg/100g of vitamin-C, 235 mg/100g total phenol and 1412.55µg/g total antioxidant capacity, TSS ranged 9.40–16.00 °Brix, acidity from 0.83 to 2.76%, vitamin-C from 1.68 to 3.40 mg/ 100g pulp and total sugars from 3.46 to 5.64%. (Kumar *et al.* 2017) [16].

Hog Apple (*Spondias mombin*)

Hog plum, (*Spondias mombin*), also called yellow mombin, ornamental tree belongs to family *Anacardiaceae*. Plant is commonly grown in Nigeria, Brazil and several other tropical forests. It is commonly used in folk medicine. Fruits are widely used as cattle and pig feeds. Fruits can be eaten along with sugar and can be used in the preparation of ice-cream, cool beverages, jelly and chutneys (Ayok *et al.* 2008) [4]. Physico-chemical analysis revealed the presence of Moisture (g/100 g) 83.66; Fat (g/100 g) 0.62; Protein (g/100 g) 1.06; Ash (g/100 g) 0.76; Carbohydrate (g/100 g) 13.90; Fiber (g/100 g) 1.87; Energy (Kcal/100 g) 65.42; Total acidity 20.85; pH 2.83; Soluble solids (°brix) 14.9; Brix/acidity (Ratio) 10.2 (Tiburski *et al.* 2011) [31].

Lasoda (*Cordia dichotoma*)

Lasoda commonly called as Indian cherry, gonda belonging to family *Boraginaceae*, is grown in all over India except in high hills. Immature fruits are used as vegetable, pickled, dried for off season use. 65% of total fruit is pulp and chemical analysis revealed the presence of ash 6.7 g, crude protein 8.32g, lipid 2.2 g, crude fibre 25.7g and carbohydrates 57.08 g and 281.4 Kcal, ascorbic acid 40 mg per 100grams of dry weight. (Meghwal *et al.* 2015) [19].

Stone Apple (*Aegle marmelos*)

Aegle marmelos commonly called as Bael is native to India. It belongs to family *Rutaceae*. It was used in indigenous medicine owing to its medicinal properties. (Patkar *et al.*, 2012) [23]. It was identified that edible portion of Bael fruit contains water, protein, sugar, starch, fat, fiber, phosphorus, potassium, calcium, iron and mineral salts, carotene, niacin, vitamin A, vitamin B1, vitamin B2 (Riboflavin) and vitamin C, usually half ripe fruits are used in traditional medicine. 100 g of fruit juice contain moisture (61.0g), protein (1.6g), mineral (1.9g), fiber (2.9g), calcium (80mg), phosphorus (52mg), carotene (55 g) and potassium (610 mg). (Bhardwaj, 2015) [5].

Velvet Apple (*Diospyros blancoi*)

Diospyros blancoi commonly called as velvet apple or mabolo tree is indigenous to Philippines and is distributed in tropical and warmer temperate regions of the world. (Setu *et al.*, 2017) [27]. Nutrient analysis of Mabolo fruit (Hung, *et al.*, 2016) [10] revealed the presence of moisture: 84.4 grams/100grams; Ash: 0.8 grams, calories:62 kilocalories/100 grams, Carbohydrate (g/100 g): 13.8; Dietary fiber:(g/100g) 3.2; Crude protein (g/100 g):0.4; Calories from fat:(kcal/100 g)5.4; Crude fat:(g/100g) 0.6; Glucose:(g/100 g)1.9; Fructose:(g/100 g) 2.4; Vitamin C(mg/100 g):2.2; Vitamin E (mg/100 g):0.59; Vitamin B2(mg/100 g):0.075; Vitamin B3(mg/100 g):0.157; Folic acid (mg/100 g):0.623; Pantothenic acid (mg/100 g):0.19; Choline chloride (mg/100 g):62.52; Malic acid (mg/100 g):227.1; Fumaric acid (mg/100 g):4.5; Zinc (mg/100 g):3.6; Tannin acid (mg/100 g):69.2. (Akter *et al.*, 2015) [2]. Following table describes potential health benefits of all the underutilised fruits described in this review.

Table 1: Potential health benefits underutilised fruits

Common name	Scientific name	Health benefits	References
Monkey Jack fruit	<i>Artocarpus lakoocha</i> Roxb., <i>Moraceae</i>	An <i>in vitro</i> study revealed that 25 µg / ml of phytooxyresveratrol (POV) extracted from <i>Artocarpus lakoocha</i> had antioxidant activity, preventing cellular aging and anti-aging activity. It was revealed that POV can prevent DNA damage and was nontoxic to cell.	Suwannalert <i>et al.</i> , 2012. [30]
Jambura	<i>Citrus maxima</i>	Methanolic extracts of <i>Citrus maxima</i> peel at 500 mg/kg, showed higher analgesic activity (73.34%) against acetic acid induced pain in mice while the standard reference drug Diclofenac sodium exhibited 87.13% activity at 10 mg/kg dose. Methanolic extract of peel of <i>Citrus maxima</i> fruits has CNS depressant effect with moderate analgesic and anti-inflammatory properties.	Ibrahim, <i>et al.</i> , 2018. [11]
Karonda	<i>Carrisa caronda</i>	Different <i>C. carandas</i> extracts, administered orally with the dose of 500 mg/kg on different models of gastric ulcer, such as acetic acid induced chronic gastric ulcer, pylorus ligation and ethanol induce acute gastric ulcer, the extracts increased healing of acetic acid-induced chronic gastric ulcers. It was concluded that the alcoholic extract of <i>C. carandas</i> exhibited highly significant anti-ulcer activity.	Merai and Jadhav, 2014. [20]
Jujube (Ber)	<i>Ziziphus jujube</i>	Methanolic extract of dried bark of <i>Ziziphus jujube</i> was found to cause a significant decrease in the levels of total cholesterol, triglycerides and LDL-cholesterol, and glucose levels in streptozotocin-induced diabetes in rats.	Anbarasi and Brindha, 2013. [3]
Wood Apple	<i>Limonia acidissima</i>	It was reported that fruit pulp has antioxidant activity (42.95 µg BHTE/ mg), Antimicrobial activity against <i>Staphylococcus epidermidis</i> followed by <i>Staphylococcus aureus</i> and <i>Bacillus subtilis</i> at a concentration of 500 mg/ml.	Pandey, <i>et al.</i> , 2014. [22]
Stone Apple	<i>Aegle marmelos</i>	Fruit has anti-diarrheal activity, anti-microbial, radioprotective, antioxidant activity, anti-genotoxic, chemoprotective properties.	Rahman and Parvin, 2016. [25]
Hog Apple	<i>Spondias mombin</i>	<i>In vitro</i> studies revealed that Crude fruit juice had antioxidant activity (Ferric reducing power: FRAP : 11.8 ± 0.2 µmol)	Coolborn, <i>et al.</i> , 2016. [6]
Lasoda	<i>Cordia dichotoma</i>	It was reported that several bioactive compounds present in fruit showed Antidiabetic activity, Anthelmintic activity, Gastroprotective and antiulcer effect.	Jamkhane <i>et al.</i> , 2013. [13]
Velvet Apple	<i>Diospyros blancoi</i>	Traditionally used to treat diarrhea, dysentery, aphthous stomatitis, snakebites, heart problems, hypertension, spider bites, stomach aches, diabetes, and eczema.	Akter, <i>et al.</i> , 2015. [2]

Conclusion

Awareness can be created regarding the underutilized fruits as they are not commercially cultivated but have good nutritional profile and bioactive compounds. Studies can be carried on these underutilized fruits to test their therapeutic properties. Increasing awareness regarding usage of underutilized fruits would provide a sustainable and long-lasting solution to address the nutrition related diseases and disorders to some extent.

References

- Agent. A survey of the market for fruits and vegetables in the hotel and restaurant industry, Agent's business production, processing and marketing information centre. Colombo. 1994; 19:25.
- Akter S, Majumder T, Karim R, Ferdous Z, Sikder M. Analgesic activities of *Geodorum densiflorum*, *Diospyros blancoi*, *Baccaurea ramiflora* and *Trichosanthes dioica*. *Journal of Pharmacognosy and Phytochemistry*. 2015; 4(3):209-214.
- Anbarasi B, Brindha P. Hypoglycemic and Hypolipidemic Effects of *Zizyphus jujuba* Lam in Streptozotocin-Induced Diabetic Rats Research. *Journal of Pharmaceutical, Biological and Chemical Sciences*. 2013; 4 (2): 611.
- Ayoka AO, Akomolafe RO, Akinsomisoye OS, Ukponmwan OE. Medicinal and Economic Value of *Spondias mombin*. *African Journal of Biomedical Research*. 2008; 11:129-136.
- Bhardwaj RL. Nutritional and therapeutic potential of bael (*Aegle marmelos* Corr.) fruit juice: a review. *Nutrition and Food Science*. 2015; 45(6):895-919.
- Coolborn AFC, Esther BB, Akinsola AF and Afolabi OB. Antioxidant, physicochemical and mineral evaluations of *Spondias mombin* crude fruit juice. *Acta Biologica Szegediensis*. 2016; 60(2):171-176.
- Goyal M, Sasmal D, Nagori BP. Review on Ethnomedicinal uses, Pharmacological activity and phytochemical constituents of *Ziziphus mauritiana* (*Z. jujuba* Lam., non Mill). *Spatula DD*. 2012; 2(2):107-116.
- Hassan N, Sorkhy MA, Albattah F. *Ziziphus jujuba* of the Middle East, Food and Medicine. *Unique Journal of Ayurvedic and Herbal Medicines*. 2014; 02: (06) 7-11.
- Hossain MF, Islam MA, Akhtar S, Numan SM. Nutritional value and medicinal uses of Monkey Jack fruit (*Artocarpus lakoocha*). *International Research Journal of Biological Sciences*. 2016; 5:60-63.
- Hung SF, Roan SF, Chang TL, King HB, Chen IZ. Analysis of aroma compounds and nutrient contents of mabolo (*Diospyros blancoi* A. DC.), an ethnobotanical fruit of Austronesian Taiwan. *Journal of Food and Drug Analysis*. 2016; 24:83-89.
- Ibrahim M, Amin MN, Millat S, Raju JA, Hussain S, Sultana F *et al.* Methanolic Extract of Peel of *Citrus maxima* Fruits Exhibit Analgesic, CNS Depressant and Anti-inflammatory Activities in Swiss Albino Mice. *BEMS Reports*. 2018; 4(1):7-11.
- Jahan S, Gosh T, Begum M, Saha BK. Nutritional Profile of Some Tropical Fruits in Bangladesh: Specially Anti-Oxidant Vitamins and Minerals. *Bangladesh Journal of Medical Science*. 2011; 10(2):95-103.
- Jamkhane PG, Barde SRB, Patwekar SL, Tidke PS. Plant profile, phytochemistry and pharmacology of *Cordia dichotoma* (Indian cherry). *Asian Pacific Journal of Tropical Biomedicine*. 2013; 3(12):1009-1012.
- Kirtikar KR, Basu BD. *Indian Medicinal Plants*. Lalit Mohan Basu, Allahabad, 2003.

15. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2007; 10:3232.
16. Kumar A, Deen B. Studies in biochemical changes in Wood apple fruits growth and development. International journal of current microbiology and applied sciences. 2017; 6(8):2552-2560.
17. Magazin N, Gvozdenovic D, Keserovic Z, Milic B. Fruit quality of Granny smith apples picked at different harvest times and treated with 1-MCP, Fruits. 2010; 65(3):191-197.
18. Malik SK, Chaudhury R, Dhariwaln OP, Bhandari DC. Genetic Resources of Tropical Underutilized Fruits in India. New Delhi. NBPGR. 2010, 178p.
19. Meghwal PR, Singh A. Lasoda or Gonda. Breeding of Underutilized Fruit Crops. Jaya Publishing House New Delhi, 2015, 247-253.
20. Merai AH, Jadhav AG. Antiulcer activity of *Carissa carandas* using root extract in albino rats. World J Pharmcy and Pharmaceutical Sci. 2014; 3(4):1314-26.
21. Mostafa U, Labban L. The Effect of *Ziziphus jujube* on Serum Lipid Profile and Some Anthropometric Measurements. Pakistan Journal of Nutrition. 2013; 12(6):538-543.
22. Pandey S, Satpathy G, Gupta RK. Evaluation of nutritional, phytochemical, antioxidant and antibacterial activity of exotic fruit "*Limonia acidissima*". Journal of Pharmacognosy and phyto chemistry. 2014; 3(2):81-88.
23. Patkar AN, Desai NV, Ranage AA, Kalekar KS. A Review on Angle Marmelos: Potential medicinal tree. International Research Journal of Pharmacy. 2012; 3(8)86-90.
24. Pewlong W, Sajjabut S, Eamsiri J, Chookaew. Special Issue on Food and Applied Bioscience. 2014; 13(1):509-517.
25. Rahman S, Parvin R. Therapeutic potential of *Aegle marmelos* (L.). Asian Pacific Journal of Tropical Disease. 2014; 4(1):71-7.
26. Rodrigues S, Brito ESD, Silva EDO. Wood Apple—*Limonia acidissima*. Exotic Fruits, 2018, 443-446.
27. Setu JK, Akhter A, Rahman R, Moriam Islam M, Koly MN, Amran MS *et al.* Study on Antioxidant and Cytotoxic Activities of Methanolic and Ethyl Acetate Extracts of Peel and Seed of *Diospyros blancoi*. Annual Research & Review in Biology. 2017; 21(5):1-9.
28. Singh A, Uppal GK. A review on Carissa Carandas-Phytochemistry, Ethno-pharmacology and Micropropagation as conservation strategy. Asian Journal of Pharmaceutical and Clinical Research. 2015; 8(3):26-30.
29. Sirisomboon P, Theamprateep C. Physicochemical and Textural Properties of Pomelo (*Citrus maxima* Merr. cv. Kao Nam Pueng) Fruit at Preharvest, Postharvest and During the Commercial Harvest Period. Philippine Argiculture. 2012; 95(1):43-52.
30. Suwannalert P, Povichit N, Puchadapirom P, Junking M. Anti-Aging Activity and Non-Toxic Dose of Phytooxyresveratrol from *Artocarpus lakoocha* Roxb, Tropical Journal of Pharmaceutical Research. 2012; 11(1):69-74.
31. Tiburski JH, Rosentha A, Deliza R, Godoy RLO, Pacheco S. Nutritional properties of yellow mombin (*Spondias mombin* L.) pulp. Food Research International. 2011; 44:2326-2331.
32. Vidhya R, Narain A. Development of Preserved Products Using under Exploited Fruit, Wood Apple (*Limonia acidissima*). American Journal of Food Technology. 2011; 6(4):279-288.
33. Vino SA, Harshita, Sinija VR. Underutilized fruits in India. Indian Food Industry Magazine. 2016; 35(2):45-46.
34. Wani RA, Prasad VM, Hakeem SA, Sheema S, Angchuk S, Dixit A. Shelf life of Karonda jams (*Carissa carandas* L.) under ambient temperature. African Journal of Agricultural Research. 2013; 8(21):2447-2449.