Chapter 8
The Impact of Wild Fruits to a Better Life Worldwide

Suzy Munir Salama

Abbreviations

Ca	Calcium
Cu	Copper
Fe	Iron
K	Potassium
Mg	Magnesium
Mn	Manganese
P	Phosphorus
WHO	World Health Organization
Zn	Zinc

8.1 Introduction

Plant foods especially wild edible fruits and vegetables contain plenty of health-promoting nutrients such as vitamins and minerals, and biologically active compounds that are sufficient enough to reduce the incidence of chronic diseases (Phillips et al. 2014). Based on United States Dietary Guidelines Advisory Committee 2015, one of the dietary patterns recommended for reducing cardiovascular disease is the intake of meals containing less saturated trans-fats, sodium and red meat, and high vegetables and fruits (Jenkins et al. 2018; Millen et al. 2016). In rural regions, wild fruits play crucial role in preventing diseases and maintain the health of indigenous tribes (Borek 2017). Healthy diet should contain the right proportions of nutrients to lower the incidence of health disorders and mortality related to malnutrition (Bvenura and Sivakumar 2017). The regular intake of fruits, vegetables and fibre-rich food stuffs significantly lower the risk of many health ailments

S. M. Salama (✉)
Department of Molecular Medicine and Biomedical Science, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia
e-mail: suzymunir@um.edu.my

A. A. Mariod (ed.), *Wild Fruits: Composition, Nutritional Value and Products*,
https://doi.org/10.1007/978-3-030-31885-7_8

(Wilson et al. 2017). Based on recent report from World Health Organization (WHO), many people changed their lifestyle shifting to processed fatty food that is rich in energy and sugars/salts (Fernández-Ruiz et al. 2017). Allen et al. (2006) published that about 80% of people from both sexes and many developing countries utilize less than ½ kg of the daily suggested amount of fruits and vegetables (Allen et al. 2006).

Medical Scientists defined dietary fibre as indigestible oligosaccharides and polysaccharides that are found plenty in fruits and vegetables. Recent studies published that dietary fibre plays important role in maintaining health of the human body particularly gut and heart (Slavin 2013). Due to the role of dietary fibre in preventing the risk of many diseases such as colon cancer and cardiovascular diseases, Nutritionalists suggest adults to have daily consumption of 25 g dietary fibers *via* the intake of whole grain meals, wild edible fruits and vegetables (Bvenura and Sivakumar 2017).

Many studies showed that oxidative stress and the imbalance between oxidants and antioxidant machinery of the body play key role in initiating many health problems such as autoimmune, neurodegenerative and heart diseases, liver cirrhosis and cancer (Kumagai et al. 2003; Mohanty and Cock 2012; Na et al. 2014). Borek, 2017 reported that vitamins E and C as natural dietary antioxidants are considered as immunity-enhancing factors in cancer therapy via relieving the side effects caused by chemotherapy and radiotherapy in some patients (Borek 2017). The longevity of Mediterranean people compared to Europeans and Americans may be referred to their high intake of dietary antioxidant-rich vegetables and fruits (Wilson et al. 2017). Dietary antioxidants from fruits and vegetables e.g. Phenolic compounds, flavonoids, anthocyanins and carotenoids have attracted the attention of many researches for their pivotal role in preventing and treating many diseases as indicated by the outcomes of their pre-clinical and clinical studies (Bvenura and Sivakumar 2017).

In this chapter, we present some of the nutritional and phytochemical profiling of selected wild fruits together with their impact on the health of human worldwide. Figure 8.1 illustrates schematic diagram for the wild fruits selected from each continent.

8.2 Wild Fruits from Africa

Rural Africans depend mainly on wild fruits as their main food source. In dry African regions where cultivation is difficult and poverty is problematic, people consider wild fruits very important for maintaining their health (Fernández-Ruiz et al. 2017). Poor nutrition is one of the biggest problems in Africa where people records the highest incidence of protein, iron, vitamin A and micronutrients deficiencies in the world manifesting many health disorders such as anemia and heart diseases (Allen et al. 2006). Recently, researchers started to focus on the nutritional and pharmacological activities of wild fruits in Africa analyzing their chemical

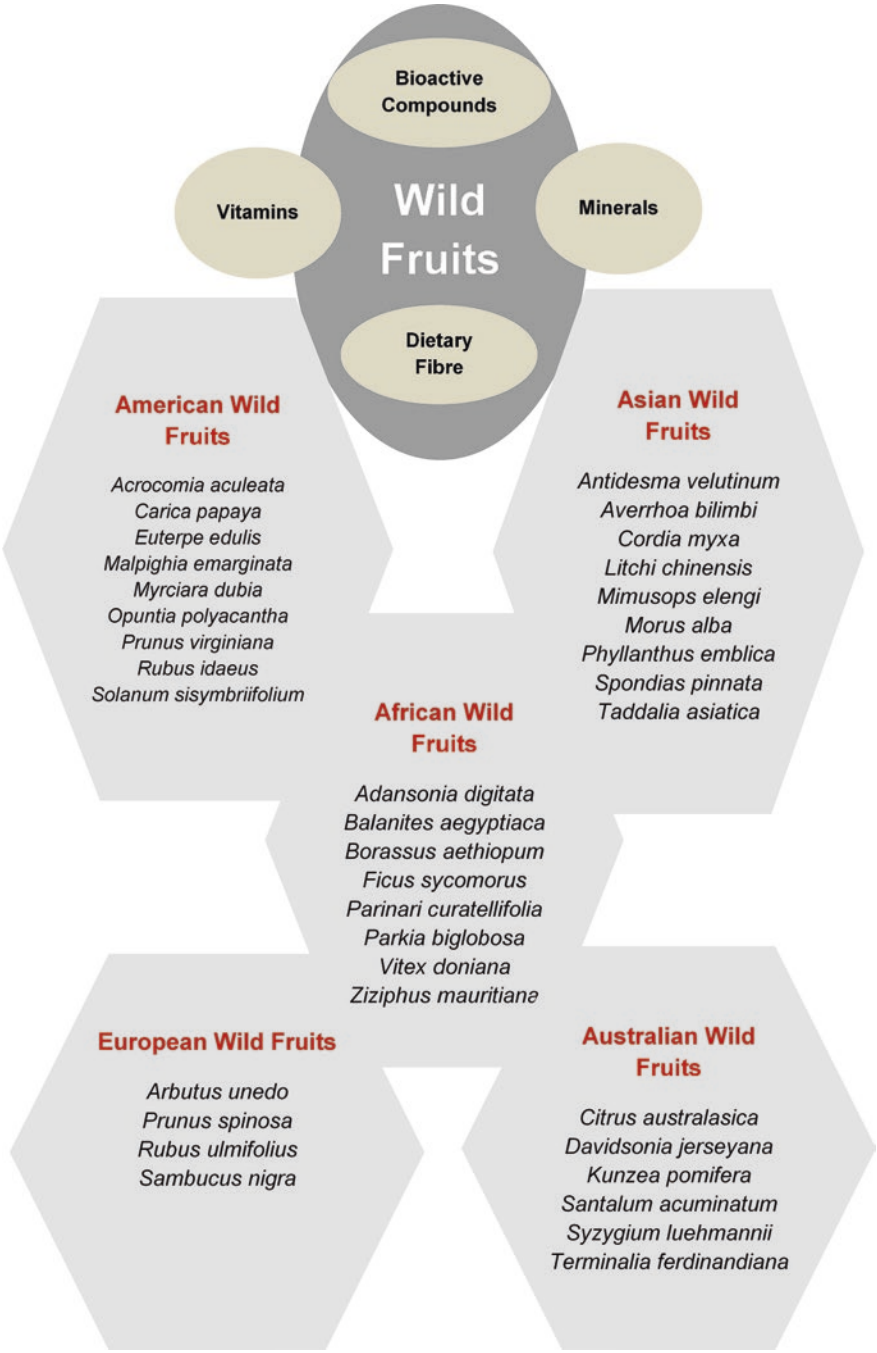

Fig. 8.1 Selected wild fruits from different continents

composition and clarifying their medicinal properties (Bvenura and Sivakumar 2017). Table 8.1 displays some important nutritional and bioactive compound constituents of commonly selected wild fruit species in Africa along with their health benefits.

8.3 Wild Fruits from America

The diversity of wild plant species is common in the American continent than other areas due to the wide climatic variation. The nutritional values and chemical composition of many wild fruit species were analyzed from American regions characterizing many biologically active compounds. Social and economic development of people allowed researchers to conduct many studies elucidating American wild fruits (Fernández-Ruiz et al. 2017). The prevalence of chronic health ailments has increased lately in many American generations due to shifting from consuming healthy traditional fruits and vegetables to fat-rich fast food (Phillips et al. 2014). In the last few years, Nutrition and Health Specialists started to encourage people to increase the consumption of wild fruits and vegetables for the efficacy of their active ingredients and high nutritive values that is enough to reduce the risk of many diseases (Schell and Gallo 2012). Table 8.2 presents the outcomes of many studies on the phytochemistry and nutrient contents of some American wild fruit species and their efficacies in alleviating the risk of many heath disorders.

8.4 Wild Fruits from Asia

Asian population varies in accepting and accessing wild fruits. For example, Philippian people consider the consumption of wild fruits and vegetables as part of their daily life. In addition they harvest and process wild fruits (Chua-Barcelo 2014). Tropical Asians utilize diversity of wild fruit species for their home use and industrial production as well (Udayanga et al. 2013). Table 8.3 shows some data about the nutritional and phytochemistry of selected wild fruits from Asia continent.

8.5 Wild Fruits from Europe

European wild fruits are affected by the geography, climate and the social development of the European countries. People of Europe use many wild fruits in making desserts and jams either for selling their products or family use such as *Sambucus nigara* and *Prunus spinosa* (Łuczaj et al. 2013) while other fruits are used in making liqueurs such as *Rubus ulmifolius* (Pardo-de-Santayana et al. 2007). Table 8.4 records some wild fruit species from Europe and the benefits of their phytochemistry in health.

Table 8.1 Nutritional and bioactive contents of some selected African wild fruits, and their medicinal properties

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Adansonia digitata L.	Rich in vitamin C, iron, calcium and dietary fibre	Flavonoids and polyphenols	Antioxidant antimicrobial, anti-inflammatory and anti-anaemic	De Caluwé et al. (2010), Rahul et al. (2015)
Balanites aegyptiaca L.	Rich in vitamin C and iron	Flavonoids, saponins, glycosides and phenolics	Cardioprotective, antioxidant, anticancer, antibacterial, antiviral, anti-inflammatory, hepatoprotective and antidiabetic	Chothani and Vaghasiya (2011)
Borassus aethiopum Mart.	Rich in vitamin C	Flavonoids, saponins, glycosides and phenolics	Anti-atherogenic, antibacterial, anti-inflammatory, antioxidant, cardioprotective and antidiabetic	Peprah et al. (2018)
Ficus sycomorus L.	Rich in dietary fibre	Triterpenoids, phenolic acids, flavonoids and chalcones	Antimicrobial, cardioprotective, antioxidant, ant-inflammatory and anticancer	Hossain (2018)
Parinari curatellifolia Planch. ex Benth.	Rich in dietary fibre	Polyphenols, alkaloids, flavonoids, anthraquinones and glycosides	Hypolipidemic, hepatoprotective, antiatherogenic and antioxidant	Manuwa et al. (2017)
Parkia biglobosa (Jacq.) R.Br. ex G.Don	Rich in vegetable protein	Polyphenols, glycosides and triterpenoids	Antibacterial, antidiabetic, anti-hypertension, anti-snake venom, antioxidant, hepatoprotective and anti-inflammatory	Gnansounou et al. (2018), Nkafamiya et al. (2007)
Vitex doniana sweet	Rich in vitamins, minerals and fibre	Flavonoids, phenolic compounds and essential oils	Anti-inflammatory, antitumor, antioxidant antidysentry, hypoglycemic, antimicrobial and antiplasmodial	Moke et al. (2018)
Ziziphus mauritiana Lam.	Rich in vitamins, A, B and C, calcium and iron	Tannins, flavonoids and polyphenols	Hypolipidemic, antidiabetic, antioxidant, anti-inflammatory and accelerate wound healing	Abubakar et al. (2018), Verma et al. (2018)

Table 8.2 Nutritional and bioactive contents of some selected American wild fruits, and their medicinal properties

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Acrocomia aculeata Lodd. ex Mart.	Rich in dietary fibre	Carotenoids, tocopherols, β-carotene and phenolic compounds	Hypoglycemic, antioxidant, anti-inflammatory	Arena et al. (2018), Canavaciolo et al. (2015), Coimbra and Jorge (2011), Nunes et al. (2018)
Carica papaya L.	Rich in vitamins A, C, E and minerals Mg, K, Fe	Carotenoids, flavonoids, alkaloids, enzymes, and lycopene	Antioxidant, anticancer, anti-inflammatory, hypoglycemic, hypolipidemic, antifungal, antibacterial, antifertility, anti-sickling, anti-Helmintic, antihypertensive, immunomodulatory and accelerates wound healing	Shahid and Fatima (2018)
Euterpe edulis Mart.	Rich in fibre and vitamin C	Anthocyanins, flavonoids, polyphenols and unsaturated fatty acids	Anti-inflammatory, antioxidant, antipoliferative and hepatoprotective	Almeida Morais et al. (2014), Marques Cardoso et al. (2015)
Malpighia emarginata DC.	Rich in vitamin C	Flavonoids, anthocyanins, carotenoids	Antioxidant, antihyperglycemic, antihyperlipidemic, anti-photoaging, antimicrobial, antitumor, anti-inflammatory, antigenotoxic, hepatoprotective	Belwal et al. (2018)
Myrciara dubia (Kunth)	Rich in vitamin C	Polyphenols, pro-anthocyanins, tanins	Antioxidant, antihypertensive, anti-inflammatory, antigenotoxic and antiobesity	Anhê et al. (2019), Aride et al. (2018), dos Santos Garcia et al. (2018), Serrano et al. (2018)
Opuntia polyacantha Haw.	Rich in calcium	Pro-anthocyanins, carotenoids, betanins, polysaccharides	Neuroprotective, antiulcer, hypoglycemic, anti-inflammatory, hepatoprotective, antioxidant and immunomodulatory	Schepetkin et al. (2008)
Prunus virginiana L.	Rich in dietary fibre and minerals, Ca, K, Mn and Zn	Anthocyanins and phenolic compounds	Antioxidant and protects against eye diseases	Aladedunye et al. (2014), Fang (2015), Grover and Samson (2014)

(continued)

Table 8.2 (continued)

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Rubus idaeus L.	Rich in dietary fibre and vitamin C	Anthocyanins, phenolic, compounds	Anti-inflammatory, anti-obesity, antidiabetic and antioxidative	Noratto et al. (2017), Surya et al. (2018), Szymanowska et al. (2018), Zou et al. (2018)
Solanum sisymbriifolium Lam.	Rich in minerals, Ca, K, Mn and Zn	Triterpenoids, steroidal glycosides, flavonoids and alkaloids	Antitumor, antineoplastic, anticancer, antioxidant, antiviral, hypotensive and nematicidal	Fernández-Ruiz et al. (2017), Pestana et al. (2014)

Table 8.3 Nutritional and bioactive contents of some selected American wild fruits, and their medicinal properties

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Antidesma velutinum L.	Rich in dietary fibre, vitamin E and minerals Ca, Mg, P	Phenolic compounds, quercetin and caffeic acid	Antioxidant and antibacterial	Fernández-Ruiz et al. (2017), D'Annibale et al. (2011), Panda et al. (2017), Shajib et al. (2013)
Averrhoa bilimbi L.	Rich in dietary fibre	Flavonoids, phenolic compounds, quercetin	Hypoglycemic, hypolipidemic, antidiabetic, hypotensive, antioxidant, antiulcer and anti-inflammatory	Fernández-Ruiz et al. (2017), Jagessar et al. (2018), Kurup and Mini (2017), Suluvoy et al. (2017)
Cordia myxa L.	Rich in minerals Mg, Cu, Fe, Zn and selenium	Phenolic compounds and flavonoids	Antipyretic, antiobesity, antioxidant and antidiabetic and antimicrobial	Nasab et al. (2017), Padhi and Singh (2017)
Litchi chinensis Sonn.	Rich in fibre, vitamins B, C, E, K and minerals Mg, Ca, Zn and selenium	Anthocyanins, polyphenols and carotenoids	Antiobesity, antidiabetic, antioxidant, hepatoprotective, anti-inflammatory and antitumor	Alexander-Aguilera et al. (2019), Emanuele et al. (2017), Hu et al. (2018)
Mimusops elengi L.	Rich in Ca	Flavonoids, phenolic compounds, alkaloids and tannins	Antimicrobial, antihelmintic, antibacterial, gastroprotective, cardiotonic, hypotensive and protects gum from bleeding	Fernández-Ruiz et al. (2017), Mathur and Vijayvergia (2017)

(continued)

Table 8.3 (continued)

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Morus alba L.	Rich in minerals K, Ca, Mg, Fe Cu and selenium	Anthocyanins, polyphenols, flavonoids, alkaloids, glycoside derivatives	Anticholesterol, antidiabetic, antioxidant, antiobesity. Hypolipidemic, hepatoprotective, neuroprotective and cardioprotective	Zhang et al. (2018)
Phyllanthus emblica L.	Rich in minerals, and vitamin C	Tannins, phenolics, flavonoids, gallic acid and emblicol	Antioxidant, antibacterial, anti-inflammatory, cardioprotective, anti-Alzheimer, hypocholesterolemic, and anticancer	Gao et al. (2018), Rahmatullah et al. (2009)
Spondias pinnata Kurz.	Rich in vitamin E	Flavonoids, triterpenoids, phenolic compounds, syringic acid, essential amino acids and tannins	Antioxidant, antiulcer, anti-inflammatory, hepatoprotective, photoprotective, anti-arthritic, thrombolytic, analgesic, antipyretic, antimicrobial, antihypertensive, hypoglycemic, laxative, anti-helmintic and antipsychotic	Fernández-Ruiz et al. (2017), Sameh et al. (2018)
Taddalia asiatica Baill.	Rich in minerals, Fe, Cu, Mn	Essential oils, cumarins, triterpenoids, alkaloids	Antibacterial, antiviral, anti-diarrheal, anti-malarial, antidiabetic, cadioprotective, antitumor, anti-inflammatory and antioxidant	Fernández-Ruiz et al. (2017), Kariuki et al. (2013)

8.6 Wild Fruits from Australia

Indigenous Australians are depending on wild fruits as important source of their food since thousands of years ago. For example, *Kunzea pomifera* fruits were used by native Australians as a source of flour making home cakes and also for trading the surplus. Native people of Australia used to gather seasonally ripened fruits and vegetables, and eat healthy diets free from sugars and preservatives. Additionally they store those seasonal fruits for their consumption in the seasons when those fruits are not available (Clarke and Jones 2018). At the pharmacology level, researchers have raised their reports that Australian wild plants used by native people contain many medicinal compounds (Clarke 2008). Table 8.5 views some of the health-promoting ingredients of selected wild fruit species from Australia.

Table 8.4 Nutritional and bioactive contents of some selected European wild fruits, and their medicinal properties

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Arbutus unedo L.	Rich in vitamin C, energy and fibre	Phenolic compounds, anthocyanins, tocopherols and carotenoids flavonoids	Neuroprotective, cardioprotective, gastroprotective, anticancer	Fonseca et al. (2015), Ruiz-Rodríguez et al. (2011)
Prunus spinosa L.	Rich in minerals and fibre	Flavonoids, phenolic acids and anthocyanins	Cytotoxic and apoptotic to cancer cells, antioxidant and treating gastrointestinal disorders	Meschini et al. (2017), Rop et al. (2009)
Rubus ulmifolius Scott.	Rich in vitamin C, iron and dietary fibre	Flavonoids, polyphenols, carotenoids and anthocyanins	Antilipidemic, antiglycemic, antioxidant, anti-inflammatory and antimicrobial	Surya et al. (2018), de Souza et al. (2018)
Sambucus nigra L.	Rich in calcium, iron and other minerals, and fibre	Anthocyanins, phenolic compounds, and triterpenoids	Antiproliferative, antidiabetic, and antioxidant	Divis et al. (2015), Gleńsk et al. (2017), Ho et al. (2017)

Table 8.5 Nutritional and bioactive contents of some selected American wild fruits, and their medicinal properties

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Citrus australasica F.Muell.	Rich in dietary fibre, vitamin C and minerals K, Ca, Mg and Cu	Polyphenols, terpenoids, sesquiterpenes and volatile metabolites	Hypotensive, anti-inflammatory, antidiabetic, antioxidant, anticancer, hepatoprotective and antimicrobial	Delort et al. (2015), Donkersley et al. (2018), Mohib et al. (2018)
Davidsonia jerseyana F.Muell. ex F.M.Bailey	Rich in dietary fibre, minerals Ca, Zn, Cu, Fe and vitamin C	Polyphenols, pro-anthocyanins and flavonoids	Antibacterial, antiproliferative, antioxidant, anticolon cancer and antihepatocarcinoma	Sakulnarmrat et al. (2014), Sirdaarta (2016), Williams et al. (2016)
Kunzea pomifera F.Muell.	Rich in dietary fibre, minerals Ca, Zn, Cu, Fe and vitamin C	Triterpenoids, tannins, flavonoids, saponins, anthocyanins and phenolic compounds	Antioxidant, anticancer, antiproliferative, anti-inflammatory and immunomodulatory	Sirdaarta (2016)

(continued)

Table 8.5 (continued)

Botanical name	Nutritional importance	Bioactive compounds	Medicinal property	Reference
Santalum acuminatum A.DC.	Rich in dietary fibre, minerals Ca, Zn, Cu, Fe and vitamin C	Chlogenic acid-rich polyphenols, phenolic compounds pro-anthocyanins and flavonoids	Cardioprotective, antiobesity, antioxidantant and pancreatic lipase inhibitor	Sakulnarmrat et al. (2014)
Syzygium luehmannii (F.Muell.)	Rich in dietary fibre, minerals Ca, Zn, Cu, Fe and vitamin C	Phenolic compounds, flavonoids, sesquiterpenes, tannins and terpenoids	Antimicrobial, antioxidant, antibacterial, antiseptic, antiproliferative, antiobesity and anti-inflammatory	Williams et al. (2016), Murhekar et al. (2017), Wright et al. (2016)
Terminalia ferdinandiana Exell	Rich in dietary fibre, minerals Ca, Zn, Cu and Fe in particular, and very rich in vitamin C	Polyphenols, flavonoids, tannins, cardiac glycosides and carotenoids	Anticancer, anti-inflammatory, antiproliferative, antiobesity and antioxidant	Mohanty and Cock (2012), Sirdaarta (2016)

8.7 Conclusion

Although many wild fruits are endangered in many regions around the world due to changes in the climatic conditions, pressure from over-population and many human activities, but many wild fruits are still under regular consumption from indigenous people particularly children and pregnant women for their considerable health benefits. In addition, many wild fruits are under research to elucidate more beneficial compounds for better life worldwide through treating micro and macronutrient deficiencies and health problems such as heart, autoimmune and Alzheimer's disease. For that purpose, financial and technological facilities are required from the concerned governments and organizations to support researchers in elucidating more bioactive compounds from wild fruits for better and healthy life.

References

Abubakar SM, Umar SA, Alexander I, Abubakar N, Abdulazeez MA, Sule MS (2018) Evaluation of hypoglycaemic, hypolipidemic, and non-toxic effect of hydro-methanolic extracts of *Ziziphus mauritiana*, *Ziziphus spina* christi fruit and glibenclamide on allatoxin induced diabetic rats. J Drug Deliv Ther 8(3):82–92

Aladedunye F, Przybylski R, Niehaus K, Bednarz H, Matthäus B (2014) Phenolic extracts from *Crataegus* × *mordenensis* and *Prunus virginiana*: composition, antioxidant activity and performance in sunflower oil. LWT-Food Sci Technol 59(1):308–319

Alexander-Aguilera A, Aguirre-Maldonado I, Antolín JR, Toledo LN, Rodríguez IS, Otero MGS (2019) Effect of *Litchi chinensis* on adipose and hepatic tissues in rats with obesity and non-alcoholic fatty liver disease (NAFLD). J Saudi Soc Agric Sci 18(3):235–240. https://doi.org/10.1016/j.jssas.2017.06.002

Allen LH, De Benoist B, Dary O, Hurrell R, World Health Organization (2006) Guidelines on food fortification with micronutrients. World Health Organization, Geneva

Almeida Morais C, Oyama LM, de Oliveira JL, Carvalho Garcia M, de Rosso VV, Sousa Mendes Amigo L et al (2014) Jussara (*Euterpe edulis* Mart.) supplementation during pregnancy and lactation modulates the gene and protein expression of inflammation biomarkers induced by trans-fatty acids in the colon of offspring. Mediat Inflamm 2014:11

Anhê FF, Nachbar RT, Varin TV, Trottier J, Dudonné S, Le Barz M et al (2019) Treatment with camu camu (*Myrciaria dubia*) prevents obesity by altering the gut microbiota and increasing energy expenditure in diet-induced obese mice. Gut 68(3):453–464. https://doi.org/10.1136/gutjnl-2017-315565

Arena A, Jorge B, Silva M, de Barros A, Fernandes A, Nóbrega R et al (2018) *Acrocomia aculeata* oil: beneficial effects on cyclophosphamide-induced reproductive toxicity in male rats. Andrologia 50:e13028

Aride P, Oliveira A, Batista R, Ferreira M, Pantoja-Lima J, Ladislau D et al (2018) Changes on physiological parameters of tambaqui (*Colossoma macropomum*) fed with diets supplemented with Amazonian fruit camu camu (Myrciaria dubia). Braz J Biol 78(2):360–367

Belwal T, Devkota HP, Hassan HA, Ahluwalia S, Ramadan MF, Mocan A et al (2018) Phytopharmacology of Acerola (Malpighia spp.) and its potential as functional food. Trends Food Sci Technol 74:99–106

Borek C (2017) Dietary antioxidants and human cancer. J Restor Med 6(1):53–61

Bvenura C, Sivakumar D (2017) The role of wild fruits and vegetables in delivering a balanced and healthy diet. Food Res Int 99:15–30

Canavaciolo VLG, Perez RCS, Ferreiro RMM, Guerra YP, Yera AO, Leyes EAR, et al (2015) Compounds from the fruits of acrocomia crispa and acrocomia aculeata for use against oxidative stress and inflammation. Google Patents, US 2015/0190358 A1

Chothani DL, Vaghasiya H (2011) A review on *Balanites aegyptiaca* Del (desert date): phytochemical constituents, traditional uses, and pharmacological activity. Pharmacogn Rev 5(9):55–62

Chua-Barcelo RT (2014) Ethno–botanical survey of edible wild fruits in Benguet, Cordillera administrative region, the Philippines. Asian Pac J Trop Biomed 4:S525–SS38

Clarke P (2008) Aboriginal healing practices and Australian bush medicine. J Anthropol Soc S Aust 33:3–38

Clarke PA, Jones DS (2018) Aboriginal culture and food-landscape relationships in Australia: indigenous knowledge for country and landscape. In: Zeunert J, Waterman T (eds) Routledge handbook of landscape and food. Routledge, London/New York, pp 41–60

Coimbra MC, Jorge N (2011) Proximate composition of guariroba (*Syagrus oleracea*), jerivá (*Syagrus romanzoffiana*) and macaúba (*Acrocomia aculeata*) palm fruits. Food Res Int 44(7):2139–2142

D'Annibale A, Maraldo K, Sechi V, Larsen T, Strandberg B, Cortet J, et al (eds) (2011) Response of the soil mesofauna trophic structure to elevated CO_2 and GM barley. In: 13th Nordic soil zoology symposium and PhD course, Lammi Biological Station, Finland, 25–29 Aug 2011

De Caluwé E, Halamová K, Van Damme P (2010) *Adansonia digitata* L.: a review of traditional uses, phytochemistry and pharmacology. Afrika Focus 23(1):11–51

de Souza AV, Vieites RL, Gomes EP, da Silva Vieira MR (2018) Biochemical characterization of blackberry fruit (Rubus sp) and jellies. Aust J Crop Sci 12(4):624–630

Delort E, Jaquier A, Decorzant E, Chapuis C, Casilli A, Frérot E (2015) Comparative analysis of three Australian finger lime (*Citrus australasica*) cultivars: identification of unique citrus chemotypes and new volatile molecules. Phytochemistry 109:111–124

Divis P, Porizka J, Vespalcová M, Matejicek A, Kaplan J (2015) Elemental composition of fruits from different black elder (*Sambucus nigra* L.) cultivars grown in the Czech Republic. J Elem 20(3):549–557

Donkersley P, Silva FW, Carvalho CM, Al-Sadi AM, Elliot SL (2018) Biological, environmental and socioeconomic threats to citrus lime production. J Plant Dis Prot 125(4):339–356

dos Santos Garcia VA, Borges JG, Maciel VBV, Mazalli MR, das Graças Lapa-Guimaraes J, Vanin FM et al (2018) Gelatin/starch orally disintegrating films as a promising system for vitamin C delivery. Food Hydrocoll 79:127–135

Emanuele S, Lauricella M, Calvaruso G, D'Anneo A, Giuliano M (2017) *Litchi chinensis* as a functional food and a source of antitumor compounds: an overview and a description of biochemical pathways. Nutrients 9(9):pii: E992. https://doi.org/10.3390/nu9090992

Fang J (2015) Classification of fruits based on anthocyanin types and relevance to their health effects. Nutrition 31(11–12):1301–1306

Fernández-Ruiz V, Morales P, Ruiz-Rodríguez BM, TorijaIsasa E (2017) Nutrients and bioactive compounds in wild fruits through different continents. In: Ferreira ICFR, Morales P, Barros L (eds) Wild plants, mushrooms and nuts: functional food properties and applications. Wiley, Chichester, pp 263–314

Fonseca DF, Salvador ÂC, Santos SA, Vilela C, Freire CS, Silvestre AJ et al (2015) Bioactive phytochemicals from wild *Arbutus unedo* L. berries from different locations in Portugal: quantification of lipophilic components. Int J Mol Sci 16(6):14194–14209

Gao Q, Li X, Huang H, Guan Y, Mi Q, Yao J (2018) The efficacy of a chewing gum containing *Phyllanthus emblica* fruit extract in improving oral health. Curr Microbiol 75(5):604–610

Gleńsk M, Czapińska E, Woźniak M, Ceremuga I, Włodarczyk M, Terlecki G et al (2017) Triterpenoid acids as important antiproliferative constituents of European elderberry fruits. Nutr Cancer 69(4):643–651

Gnansounou SM, Iskandar S, Robin M, Brunel J-M, Dahouenon E, Piccerelle P (2018) Dialium guineense Willd. Parkia biglobosa (Jacq.) R. Br. Ex Benth. and Tamarindus indica L.: review of known and synergetic bioactive compounds. J Med Plants 6(3):103–111

Grover AK, Samson SE (2014) Antioxidants and vision health: facts and fiction. Mol Cell Biochem 388(1–2):173–183

Ho GTT, Kase ET, Wangensteen H, Barsett H (2017) Phenolic elderberry extracts, anthocyanins, procyanidins, and metabolites influence glucose and fatty acid uptake in human skeletal muscle cells. J Agric Food Chem 65(13):2677–2685

Hossain MA (2018) A review on *Ficus sycomorus*: a potential indigenous medicinal plant in Oman. J King Saud Univ Sci. https://doi.org/10.1016/j.jksus.2018.07.002

Hu B, Li J, Wang D, Wang H, Qin Y, Hu G et al (2018) Transcriptome profiling of *Litchi chinensis* pericarp in response to exogenous cytokinins and abscisic acid. Plant Growth Regul 84(3):437–450

Jagessar R, Rodrigues A, Prasad K, Husain A, Kanhai V, Bernarai B (2018) An investigation of the hypoglycemic effect of the aqueous extract of the fruits of *Psidium guajava*, *Averrhoa bilimbi* and the peel of *Tamarindus indica* in normoglycemic guinea pigs. World J Pharm Pharm Sci 7(4):77–101

Jenkins DJ, Spence JD, Giovannucci EL, Kim Y-I, Josse R, Vieth R et al (2018) Supplemental vitamins and minerals for CVD prevention and treatment. J Am Coll Cardiol 71(22):2570–2584

Kariuki HN, Kariuki J, Mwonjoria K (2013) Ethnomedicinal, phytochemical and pharmacological profile of genus *Toddalia*. Phytopharmacology 4(2):259–268

Kumagai S, Nobuhara Y, Saegusa J (2003) Oxidative stress and autoimmune diseases. J Jpn Soc Intern Med 92(6):1096–1103

Kurup SB, Mini S (2017) *Averrhoa bilimbi* fruits attenuate hyperglycemia-mediated oxidative stress in streptozotocin-induced diabetic rats. J Food Drug Anal 25(2):360–368

Łuczaj Ł, Köhler P, Pirożnikow E, Graniszewska M, Pieroni A, Gervasi T (2013) Wild edible plants of Belarus: from Rostafiński's questionnaire of 1883 to the present. J Ethnobiol Ethnomed 9(1):21

Manuwa TR, Akinmoladun AC, Crown OO, Komolafe K, Olaleye MT (2017) Toxicological assessment and ameliorative effects of *Parinari curatellifolia* alkaloids on triton-induced hyperlipidemia and atherogenicity in rats. Proc Natl Acad Sci India Sect B Biol Sci 87(2):611–623

Marques Cardoso L, Dias Novaes R, De Castro CA, Azevedo Novello A, Gonçalves RV, Ricci-Silva ME et al (2015) Chemical composition, characterization of anthocyanins and antioxidant potential of *Euterpe edulis* fruits: applicability on genetic dyslipidemia and hepatic steatosis in mice. Nutr Hosp 32(2):702–709

Mathur R, Vijayvergia R (2017) Determination of total flavonoid and phenol content in *Mimusops elengi* Linn. Int J Pharm Sci Res 8(12):5282–5285

Meschini S, Pellegrini E, Condello M, Occhionero G, Delfine S, Condello G et al (2017) Cytotoxic and apoptotic activities of *Prunus spinosa* Trigno ecotype extract on human cancer cells. Molecules 22(9):pii: E1578. https://doi.org/10.3390/molecules22091578

Millen BE, Abrams S, Adams-Campbell L, Anderson CA, Brenna JT, Campbell WW et al (2016) The 2015 dietary guidelines advisory committee scientific report: development and major conclusions. Adv Nutr 7(3):438–444

Mohanty S, Cock IE (2012) The chemotherapeutic potential of *Terminalia ferdinandiana*: phytochemistry and bioactivity. Pharmacogn Rev 6(11):29–36

Mohib M, Afnan K, Paran TZ, Khan S, Sarker J, Hasan N et al (2018) Beneficial role of citrus fruit polyphenols against hepatic dysfunctions: a review. J Diet Suppl 15(2):223–250

Moke LE, Koto-te-Nyiwa Ngbolua GN, Bongo L, Messi M, Noté OP, Mbing JN et al (2018) *Vitex madiensis* Oliv.(Lamiaceae): phytochemistry, pharmacology and future directions, a mini-review. J Pharmacogn Phytochem 7(2):244–251

Murhekar S, Wright MH, Greene AC, Brownlie JC, Cock IE (2017) Inhibition of Shewanella spp. growth by *Syzygium australe* and *Syzygium luehmannii* extracts: natural methods for the prevention of fish spoilage. J Food Sci Technol 54(10):3314–3326

Na J, Sirdaartaa J, Cocka I (2014) The anti-proliferative properties of Australian plants with high antioxidant capacities against cancer cell lines. Pharmacogn Commun 4(4):71–82

Nasab FY, Hajinezhad MR, Hashemi H, Miri A (2017) Comparison the effects of *Trigonella foenum*-graecum L. seed and *Cordia myxa* fruit extracts on diabetes-induced memory impairment in rats. Int J Basic Sci Med 2(4):184–188

Nkafamiya I, Modibbo U, Manji A, Haggai D (2007) Nutrient content of seeds of some wild plants. Afr J Biotechnol 6(14):1665–1669

Noratto GD, Chew BP, Atienza LM (2017) Red raspberry (*Rubus idaeus* L.) intake decreases oxidative stress in obese diabetic (db/db) mice. Food Chem 227:305–314

Nunes ÂA, Buccini DF, Jaques JA, Portugal LC, Guimarães RC, Favaro SP et al (2018) Effect of *Acrocomia aculeata* kernel oil on adiposity in type 2 diabetic rats. Plant Foods Hum Nutr 73(1):61–67

Padhi M, Singh S (2017) Surface sterilization for reducing microbial contamination in *In Vitro* propagation of lasora (*Cordia myxa* Roxb.) using nodal segments. Int J Curr Microbiol App Sci 6(8):836–842

Panda SK, Padhi L, Leyssen P, Liu M, Neyts J, Luyten W (2017) Antimicrobial, anthelmintic, and antiviral activity of plants traditionally used for treating infectious disease in the Similipal Biosphere Reserve, Odisha, India. Front Pharmacol 8:658. https://doi.org/10.3389/fphar.2017.00658

Pardo-de-Santayana M, Tardío J, Blanco E, Carvalho AM, Lastra JJ, San Miguel E et al (2007) Traditional knowledge of wild edible plants used in the northwest of the Iberian Peninsula (Spain and Portugal): a comparative study. J Ethnobiol Ethnomed 3(1):27

Peprah M, Apprey C, Larbie C, Asamoah-Boakye O (2018) Phytochemical constituents of flour and composite bread from African palmyra (*Borassus aethiopum*) fruit from Ghana. Eur J Med Plants 23(1):1–7

Pestana M, Rodrigues M, Teixeira L, Abrantes IDO, Gouveia M, Cordeiro N (2014) *In vitro* evaluation of nematicidal properties of *Solanum sisymbriifolium* and *S. nigrum* extracts on *Pratylenchus goodeyi*. Nematology 16(1):41–51

Phillips KM, Pehrsson PR, Agnew WW, Scheett AJ, Follett JR, Lukaski HC et al (2014) Nutrient composition of selected traditional United States northern plains native American plant foods. J Food Compos Anal 34(2):136–152

Rahmatullah M, Noman A, Hossan MS, Rashid M, Rahman T, Chowdhury MH et al (2009) A survey of medicinal plants in two areas of Dinajpur district, Bangladesh including plants which can be used as functional foods. Am Eurasian J Sustain Agric 3(4):862–876

Rahul J, Jain MK, Singh SP, Kamal RK, Naz A, Gupta AK et al (2015) *Adansonia digitata* L. (baobab): a review of traditional information and taxonomic description. Asian Pac J Trop Biomed 5(1):79–84

Rop O, Jurikova T, Mlcek J, Kramarova D, Sengee Z (2009) Antioxidant activity and selected nutritional values of plums (*Prunus domestica* L.) typical of the White Carpathian mountains. Sci Hortic 122(4):545–549

Ruiz-Rodríguez B-M, Morales P, Fernández-Ruiz V, Sánchez-Mata M-C, Camara M, Díez-Marqués C et al (2011) Valorization of wild strawberry-tree fruits *(Arbutus unedo* L.) through nutritional assessment and natural production data. Food Res Int 44(5):1244–1253

Sakulnarmrat K, Srzednicki G, Konczak I (2014) Composition and inhibitory activities towards digestive enzymes of polyphenolic-rich fractions of Davidson's plum and quandong. LWT-Food Sci Technol 57(1):366–375

Sameh S, Al-Sayed E, Labib RM, Singab AN (2018) Genus *Spondias*: a phytochemical and pharmacological review. Evid Based Complement Alternat Med 2018:13

Schell LM, Gallo MV (2012) Overweight and obesity among North American Indian infants, children, and youth. Am J Hum Biol 24(3):302–313

Schepetkin IA, Xie G, Kirpotina LN, Klein RA, Jutila MA, Quinn MT (2008) Macrophage immunomodulatory activity of polysaccharides isolated from *Opuntia polyacantha*. Int Immunopharmacol 8(10):1455–1466

Serrano A, Ros G, Nieto G (2018) Bioactive compounds and extracts from traditional herbs and their potential anti-inflammatory health effects. Medicines 5(3):76. https://doi.org/10.3390/medicines5030076

Shahid S, Fatima U (2018) Pharmacological activities of *Carica papaya* Linn. J Basic Appl Sci 14:210–216

Shajib MTI, Kawser M, Miah MN, Begum P, Bhattacharjee L, Hossain A et al (2013) Nutritional composition of minor indigenous fruits: cheapest nutritional source for the rural people of Bangladesh. Food Chem 140(3):466–470

Sirdaarta JP (2016) Phytochemical study and anticancer potential of high antioxidant Australian native plants. Downloaded from https://research-repository.griffith.edu.au/handle/10072/365567

Slavin J (2013) Fiber and prebiotics: mechanisms and health benefits. Nutrients 5(4):1417–1435

Suluvoy JK, Sakthivel K, Guruvayoorappan C, Grace VB (2017) Protective effect of *Averrhoa bilimbi* L. fruit extract on ulcerative colitis in wistar rats via regulation of inflammatory mediators and cytokines. Biomed Pharmacother 91:1113–1121

Surya MI, Suhartati S, Ismaini L, Lusini Y, Destri D, Anggraeni D et al (2018) Fruit nutrients of five species of wild raspberries (Rubus spp.) from Indonesian mountain's forests. J Trop Life Sci 8(1):75–80

Szymanowska U, Baraniak B, Bogucka-Kocka A (2018) Antioxidant, anti-inflammatory, and postulated cytotoxic activity of phenolic and anthocyanin-rich fractions from polana raspberry (*Rubus idaeus* L.) fruit and juice—in vitro study. Molecules 23(7):1

Udayanga D, Manamgoda DS, Liu X, Chukeatirote E, Hyde KD (2013) What are the common anthracnose pathogens of tropical fruits? Fungal Divers 61(1):165–179

Verma RK, Pandey M, Indoria MD, Singh R, Suthar S (2018) Phytochemical investigation and pharmacological evaluation of leaves of *Ziziphus mauritiana* for wound healing activity in albino rats tropical. J Pharm Life Sci 5(1):08–18

Williams D, Chaliha M, Sultanbawa Y (2016) Australian native plants: anti-obesity and anti-inflammatory properties. Google Books. CRC Press, Boca Raton, pp 237–294

Wilson DW, Nash P, Buttar HS, Griffiths K, Singh R, De Meester F et al (2017) The role of food antioxidants, benefits of functional foods, and influence of feeding habits on the health of the older person: an overview. Antioxidants 6(4):pii: E81. https://doi.org/10.3390/antiox6040081

Wright MH, Lee CJ, Pollock CE, Greene AC, Cock IE (2016) Growth inhibitory activity of selected high antioxidant Australian *Syzygium* species against the food poisoning and tissue necrotic pathogen Clostridium perfringens. Pharmacogn Commun 6(2):93–99

Zhang H, Ma ZF, Luo X, Li X (2018) Effects of mulberry fruit (*Morus alba* L.) consumption on health outcomes: a mini-review. Antioxidants 7(5):pii: E69. https://doi.org/10.3390/antiox7050069

Zou T, Wang B, Yang Q, de Avila JM, Zhu M-J, You J et al (2018) Raspberry promotes brown and beige adipocyte development in mice fed high-fat diet through activation of AMP-activated protein kinase (AMPK) α1. J Nutr Biochem 55:157–164