



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2018; 7(1): 316-318

© 2018 TPI

www.thepharmajournal.com

Received: 21-11-2017

Accepted: 22-12-2017

Anjali

Department of Pharmaceutical Sciences, Maharshi Dayanand University, Rohtak, Haryana, India

Vandana Garg

Department of Pharmaceutical Sciences, Maharshi Dayanand University, Rohtak, Haryana, India

Anju Dhiman

Department of Pharmaceutical Sciences, Maharshi Dayanand University, Rohtak, Haryana, India

Rohit Dutt

School of Medical and Allied Sciences, G. D. Goenka University, Gurgaon, Haryana, India

Sweetie Ranga

Extension Lecturer, Baba Mastnath University, Rohtak, Haryana, India

Correspondence**Vandana Garg**

Department of Pharmaceutical Sciences, Maharshi Dayanand University, Rohtak, Haryana, India

The genus *Manilkara*: An update

Anjali, Vandana Garg, Anju Dhiman, Rohit Dutt and Sweetie Ranga

Abstract

The genus *Manilkara* includes 135 plants that distributed Worldwide. In this review we had discussed three popular plants from Genus *Manilkara*. i.e. *M. bidentata* (A.DC.) is native to South America. *M. hexandra* (Roxb.) and *M. zapota* (L.) are native to South Asia. Above mentioned species from *Manilkara* i.e. *M. hexandra* and *M. zapota* are known for their medicinal properties and pleasant taste. Traditionally these species are used in wound healing, inflammation and fever. All the three species of the Genus have been largely explored for their anticancer and antibacterial activities.

Keywords: *M. zapota*, *M. hexandra*, ethnopharmacology, anticancer, antibacterial

1. Introduction

Literature of Genus *Manilkara* is organized from the chief directory such as Taylor & Francis, Forest Products Laboratory, Chemical abstracts, Annals of Phytomedicine, Scholars Research Library, PubMed, Research Gate, Elsevier, Academic Sciences, Pharma Scholars using as references.

The given data of three species from *Manilkara* is categorized in to four parts i.e. Ethnopharmacology, morphology, chemical constituents and pharmacological activities. The ethnopharmacological uses includes its traditional and other medicinal uses.

Taxonomic Nomenclature

The classification of Genus *Manilkara* is as follows: [1]

Taxonomic Nomenclature	
Kingdom	Plantae (plants)
Sub kingdom	Tracheobionta (vascular plants)
Super division	Spermatophyta (seed plants)
Division	Magnoliophyta (flowering plants)
Class	Magnoliopsida (dicotyledanae)
Sub class	Dilleniidae
Order	Ebenales
Family	Sapotaceae
Genus	<i>Manilkara</i> Adans. (<i>Manilkara</i>)
Species	<i>M. bidentata</i> (A. DC.), <i>M. hexandra</i> (Roxb.), <i>M. zapota</i> (L.)

Biological Description of Three Species

Name of species	Common names	Synonyms	References
<i>M. bidentata</i>	Bulletwood, Balata rouge, Quinilla	<i>Achras balata</i> Aubl. <i>Manilkara balata</i> (Aubl.) Dubard; <i>Manilkara balata</i> var. <i>cruegeri</i> (Pierre) Dubard; <i>Manilkara balata</i> var. <i>hartii</i> (Pierre) Dubard; <i>Manilkara balata</i> var. <i>schomburgkii</i> (Pierre) Dubard; <i>Manilkara balata</i> var. <i>sieberi</i> (A.D.) Dubard; <i>Manilkara darienensis</i> (Pittier) Standl.; <i>Mimusops balata</i> (Aubl.) CF Gaertn.; <i>Mimusops balata</i> var. <i>gutta</i> Pierre; <i>Mimusops balata</i> var. <i>melinonis</i> Pierre; <i>Mimusops surinamensis</i> Miq.; <i>Sapota mulleri</i> Blume ex Bleekrode	[2] [3]
<i>M. hexandra</i>	Khirmi, Ryan, Raina	<i>Mimusops indica</i> (A. DC.)	[4]
<i>M. zapota</i>	Sapodilla, Chikoo, Sapota, Chiclé	<i>Manilkara zapotilla</i> (Jacq.) Gilly; <i>Manilkara achras</i> (Miller) Fosberg; <i>Mimusopus manilkara</i> ; <i>Achras zapota</i> L. var <i>zapotilla</i> Jacq.; <i>Achras sapota</i> L.	[5]

Morphological Features

M. bidentata [6]

- **Leaves:** The leaves are alternate, elliptical and dark green, around 11-24 cm long.
- **Flowers:** It bears small white colored flowers having 0.5-1.5 cm length approximately.
- **Fruits:** Fruits are yellow berries with 3-5 cm or 1.2-2.0 inch diameter.

M. hexandra [4, 7]

- **Leaves:** Leaves are found to be alternate, elliptical, estipulate and rounded at apex. These are 2.5-11 × 1-6 cm in size
- **Flowers:** It bears small white color flowers with 3-6 flowers in axillary fascicles. Peduncles of flowers are shorter than petioles.
- **Fruits:** It bears oval, sweet edible berry fruits with one or more seeds.

M. zapota [8]

- **Leaves:** Sapodilla is an evergreen tree. The leaves of this tree may length from 5 to 20 cm or 2 to 5 inches. These are rigid, sharp and are aggregated like bundle at the end of shoots.
- **Flowers:** It bears off-white, small, bell-shaped and bisexual flowers. The size of flowers may range from 9.5 mm or 3/8 inch in diameter.
- **Fruits:** Fruits of *M. zapota* are oval or round shaped. Color of fruit is brown, shaggy and leather-like with 2-4 inch diameter. It becomes gentle on ripening.

Ethnopharmacology

Traditional Uses

M. bidentata was traditionally used to cure various ailments. Stem was used to cure dysentery and nausea, fruits may be useful to treat constipation and their leaves were used for treatment of paralysis of limbs [9]. Traditionally, the decoction of stem of *M. hexandra* was used to prevent diarrhea, fever and stomach infections by Koli tribe [10]. *M. hexandra*'s bark was also known for its astringent property and powdered seeds mixed with honey were also used to cure redness in eyes [11]. Decoction from bark of *M. zapota* was used against diarrhea, peludism [12] and dysentery. Leaves were also beneficial to treat cough and cold symptoms [13].

Alternative and complimentary medicinal uses

Wood of *M. bidentata* is known to resist growth of brown- and white-rot fungus and dry wood termite. Hence, it may be best for manufacturing of furniture, billiard cues, violin bows and flooring [14]. *M. hexandra* can be used as anti-inflammatory and antigout agent [15]. It can be used in treatment of colic dyspepsia, hyper-dyspepsia and as anthelmintic [16]. The fruits of *M. hexandra* are known to contain rich amount of carbohydrates, iron, minerals, proteins and sugars. Viably, it may be used for the vegetative propagation of Sapota in various regions in Worldwide [4]. *M. zapota* is widely known for its sweet taste and medicinal properties. Almost all parts of *M. zapota* such as leaves, fruit, stem bark and roots possess antioxidant [17], anticancer [18, 19], antimicrobial [20], antipyretic and anti-inflammatory activities [21].

Phyto-Constituents

The chemical constituents present in the given plants of genus

Manilkara are as follows:

***M. bidentata*:** Various phytoconstituents were extracted from different extracts of seed kernel of *M. bidentata* such as 2,6,10,14,18-pentamethyl-2,6,10,14,18-eicosapentaene was identified in n-hexane extract, 9-octadecenoic acid and (Z)-2,3-dihydroxypropyl ester was identified from chloroform extract, (Z)-ethyl oleate was extracted using ethyl acetate as solvent whereas Z,E-2-methyl-3 and 13-octadecadien-1-ol are identified in ethanol and methanol extracts [22].

***M. hexandra*:** Stem and stem bark of *M. bidentata* contains cinnamic acid esters of α - and β -amyrins, ursolic acid, taraxerol and α -spinasterol [23]. The inositol and quercitol were also identified in roots. [24]. Hentriacontane, β -sitosterol derivatives and cinnamic acid were also reported in leaves and mesocarp of *M. bidentata* [7].

***M. zapota*:** Leaves and seeds of *M. zapota* contain D-quercitol, myricetin-3-O- α -L-rhamnoside, saptotin, saptinine and saccharose [25]. Methyl chlorogenate, quercetin, (+)-catechin, (+)-gallocatechin, myricitrin, (-)-epicatechin, polyphenol oxidase, methyl chlorogenate, quercetin, (+)-catechin, (+)-gallocatechin and β -carotene are the phytoconstituents which were identified in all parts of the plant i.e. leaves, flowers, fruits, stem and the root [26-28]. Arginine and lysine were also found to be present in the roots of *M. zapota* [29].

Pharmacological Activities

Leaves of *M. bidentata* can be utilized as anti-inflammatory and anti-ageing, in formulations of pharmaceuticals as well as in cosmetics products [30].

Leaves extract of *M. hexandra* also possess antiarthritic activity [15]. Its bark may be also useful in helminthiasis and jaundice [10].

Both methanol and ethanol extracts of *M. zapota* have good antioxidant activity [31]. The leaves, fruits and stem of sapodilla are reported to have analgesic and anti-inflammatory [32], antidiabetic [33] and antidiarrhoeal [34] activities. The ethyl acetate and aqueous extracts of leaves of *M. zapota* have antifungal activity against *Alternaria alternate*, *Aspergillus Niger*, *Candida albicans*, *Curvularia lunata*, *Fusarium eumartii*, *Mucor hiemalis*, *Penicillium chrysogenum*, *Rhizopus stolonifera* and *Saccharomyces cerevisiae* [35]. Methanolic extract of *M. zapota* showed best antibacterial activity against *Pseudomonas aeruginosa*, *Salmonella typhimurium* and *Enterobacter aerogenes* [36]. The ethyl acetate extract of leaves fruits [36] and stem bark [20] of the *M. zapota* was reported against EAC cell lines. Methanolic extract of the plant showed cytotoxic activity against EAC, NAML-6, MCF7, K-562 and T47D cancer cell lines [18].

Conclusion

About 135 species of the genus *Manilkara* have been reported in various floras. An exhaustive literature survey revealed that information is available on three species amongst others. Pharmacological studies infer that *M. bidentata* exhibits anti-emetic property and also used to treat paralysis of limbs; *M. hexandra* exhibits anti-arthritis, anti-inflammatory, analgesic, diuretic, antiurolithiatic, antipyretic, antimicrobial activities. *M. zapota* exhibits antioxidant, analgesic, anti-inflammatory, antimicrobial and antitumor activities. Therefore, Genus *Manilkara* hold great potential in investigations of various

pharmacological activities present in various species.

References

- Peiris KHS, *Manilkara zapota* L. van Royen. 2007; 6:184.
- Longwood FR, Agriculture Handbook. U.S. Department of Agriculture, Forest Service: 1962; 207:34. <http://www.tropicaltimber.info/specie/maparajuba-manilkara-bidentata>
- Attar SK, Thakur NS, Patel HF, Singh ND, Makawana AI, Leua HN *et al.* Underutilized fruit *Manilkara hexandra* (Khirmi). Hind Agricultural Research and Training Institute. 2016; 11(1):17-18.
- Peiris KHS. *Manilkara zapota* L. van Royen. 2007; 6:185-186. <https://www.pfaf.org/user/Plant.aspx?LatinName=Manilkara+bidentata>
- Chanda S, Nagani K, Parekh J. Assessment of quality of *Manilkara hexandra* (Roxb.) Dubard leaf (Sapotaceae): Pharmacognostical and Physicochemical profile. Phcogcognosy Journal, 2010; 2(13):520-524.
- Crane JH, Balerdi CF, Maguire I. Sapodilla Growing in the Florida Home Landscape. IFAS Extension, University of Florida, 2016, 1-7. https://www.revolv.com/main/index.php?s=Manilkara%20bidentata&item_type=topic
- Kirtikar KR, Basu BD. Indian Medicinal Plants. Oriental enterprises. 2001; 7:2058-2061.
- Gopalkrishnan B, Late Shraddha NS, Ringmichon CL. Pharmacognostic evaluation of “Khirmi” seed. Journal of Herbal Medicine and Toxicology. 2009; 3(1):163-167.
- Anjaria J, Parabia M, Dwivedi S. Ethnovete Heritage. Indian ethnoveterinary medicine: an overview. Pathik Enterprise, 2002, 420.
- Mohiddin HMYB, Chin W, Holdsworth D. Traditional medicinal plants of Brunei, Darussalam Part III. Sengkurong. International Journal of Pharmacognosy. 1992; 30:105-108. https://www.srs.fs.usda.gov/pubs/misc/ag_654/volume_2/manikara/bidentata.htm
- Pingili D, Awasthi A, Amminbavi D. Assessment of *in vitro* antiarthritic activity of *Manilkara hexandra* (Roxb.) Dubard leaf extract. Annals of Phytomedicine. 2016; 5(2):152-155.
- Joshi SG, Medicinal plants, Oxford Press, Kolkata, 2016, 361-392.
- Fayek NM, Monem ARA, Mossa MY, Meselhy MR, Shazly AH. Chemical and biological study of *Manilkara zapota* (L.) Van Royen leaves (Sapotaceae) cultivated in Egypt. Pharmacognosy Research. 2012; 4(12):85-91.
- Srivastava M, Hegde M, Chiruvella KK, Koroth J, Bhattacharya S, Choudhary B *et al.* Sapodilla plum (*Achras Sapota*) induces apoptosis in cancer cell lines and inhibits tumor progression in mice. Scientific Reports. 2014; 4(6147):1-9.
- Awasare S, Bhujbal S, Nanda R. *In vitro* cytotoxic activity of novel oleanane type of triterpenoid saponin from stem bark of *Manilkara zapota* Linn. Asian Journal of Pharmacy Clinical Research. 2012; 5(4):183-188.
- Osman MA, Aziz MA, Habib MR, Karim MR. Antimicrobial investigation on *Manilkara zapota* (L.) P. Royen. International Journal of Drug Development and Research. 2011; 3(1):185-190.
- Ganguly A, Al-Mahmud Z, Uddin MMN, Rahman SMA, *In-vivo* anti-inflammatory and anti-pyretic activities of *Manilkara zapota* leaves in albino Wistar rats. Asian Pacific Journal of Tropical Diseases. 2013; 3(4):301-307.
- George YL, Mohammed FK. GC-MS analysis of the bioactive phytoconstituents of various organic crude extracts from the seed kernels of *Manilkara bidentata* (balata) collected in Trinidad W.I. Natural Product Research. 2018; 32(3):358-361.
- Gopalkrishnan B, Late Shimpi SN, Ringmichon CL. Stem bark of *Manilkara hexandra* (Roxb.) Dubard-pharmacognosy. World Journal of Pharmacy and Pharmaceutical Sciences. 2013; 3(2):2503-2511.
- Mishra N, Pareek A. Traditional uses, phytochemistry and pharmacology of *Mimusops hexandra* Roxb. Advances in Pharmaceutical and Ethnomedicine. 2014; 2(2):32-35.
- Rao GV, Sahoo MR, Madhavi MSL, Mukhopadhyay T. Phytoconstituents from the leaves and seeds of *Manilkara zapota* Linn. Der Pharmacia Lettre. 2014; 6(2):69-73.
- Pillai D, Pandita N. Validated high performance thin layer chromatography method for the quantification of bioactive marker compounds in Draksharishta, an ayurvedic polyherbal formulation. Revista Brasileira de Farmacognosia. 2016; 26:558-563.
- Mewara D, Tamakuwala H, Desai B. Antifungal activity and phytochemical screening from leaf extract of *Manilkara zapota* and *Averrhoa carambola*. BMR Phytomedicine. 2017; 3(1):1-9.
- Ma J, Luo XD, Protiva P, Yang H, Ma C, Basile MJ *et al.* Bioactive novel polyphenols from the fruit of *Manilkara zapota* (Sapodilla). Journal of Natural Products. 2003; 66:983-986.
- Pingale R, Dash GK. Pharmacognostic evaluation of *Manilkara zapota* (L.) P. Royen root. International Journal of Pharmacognosy and Phytochemistry Research. 2015; 7(3):405-408.
- Rhourri-Frih B, Renimel I, Chaimbault P, Andre P, Herbette G, Lafosse M. Pentacyclic triterpenes from *Manilkara bidentata* resin. Isolation, identification and biological properties. Fitoterapia. 2013; 88:101-108.
- Gomathy K, Baskar R, Kumaresan K. Comparison of antioxidant potential in pulp and peel extracts of *Manilkara zapota* (L.) P. Royen. African Journal of Biotechnology. 2013; 12(31):4936-4943.
- Khan A. Evaluation of analgesic and anti-inflammatory activity of whole plant extract of *Manilkara zapota* Linn. World Journal of Pharmacy and Pharmaceutical Sciences. 2016; 5(7):881-892.
- Paul SR, Hakim ML. *In vivo* hypoglycemic study of *Manilkara zapota* leaf and seed extracts. Bangladesh Journal of Pharmacology. 2015; 10:246-250.
- Hossain H, Dey SK, Hira A, Howlader SI, Ahmed A, Sultana S. Evaluation of antidiarrhoeal potential of the ethanolic extract of three Bangladeshi medicinal plants. International Journal of Pharmacy Phytopharmacology Research. 2012; 1(6):371-374.
- Kaneria M, Baravalia Y, Vaghasiya Y, Chanda S. Determination of antibacterial and antioxidant potential of some medicinal plants from Saurashtra Region, India. Indian. J Pharm. Sci. 2009, 406-412.
- Khalek MA, Khatun Z, Habib MR, Karim MR. Antitumor activity of *Manilkara zapota* (L.) fruits against Ehrlich ascites carcinoma in mice. Bio logija. 2015; 61(3-4):145-152.