IJBPAS, September, 2021, 10(9): 2942-2950

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

A SYSTEMATIC REVIEW ON PHARMACOGNOSTIC AND PHYTOCHEMICAL STUDY OF *MANILKARA ZAPOTA* LINN

LADE RP* AND MANURE MD. JAVEED MD. YAKUB

Appasaheb Birnale College of Pharmacy, Sangli. Maharashtra – 416416, India

***Corresponding Author: Rupali Prakash Lade: E Mail: dr.laderupali@gmail.com; Mob. No.: +91 9579818147**

Received 26th Oct. 2020; Revised 27th Nov. 2020; Accepted 12th Dec. 2020; Available online 1st Sept. 2021

https://doi.org/10.31032/IJBPAS/2021/10.9.5603

ABSTRACT

Manilkara zapota is commonly named Chiku. It cultivated for its delicious fruits. It is an evergreen plant, every part of the tree used for various ailments in traditional medicine. A variety of phytochemical components have isolated from different parts of this plant. The scenario of the present study is an overview of the pharmacognostic, phytochemical and pharmacological action. Fruits contain cyanogenic glycoside, phenolic compound and terpenoid. Bark used as a tonic and the decoction given in diarrhea, dysentery and preludes. The leaves of the plant possess antioxidant and antimicrobial activity. The present work beneficial for proper further study of the *Manilkara zapota* plant

Keywords: *Manilkara zapota;* Pharmacognosy; Phytochemistry; Pharmacological action

INTRODUCTION

Manilkara zapota belongs to the family *Sapotaceae.* It is evergreen, slow-growing tree, 5-20 m in agriculture but getting up to 40 m in height in the forest, with an usual trunk diameter of 1.5 m. The coronet is pyramidal to round. Branches are horizontal or drooping. Leaves are 5-13 cm long with sharp ends, stiff and alternate, clustering at ends of shoots, pinkish upon emergence, turning light green, then darkening with age. Flowers are inconspicuous, bell-shaped, and white, 0.9 cm in diameter and borne singly or in clusters in leaf axils near the tips of branches. The fruit is a berry, round to oval or conical, 5-10 cm in diameter, weighing 100 to 400 g (some cultivars weigh up to 1 kg). Fruits mature year-round, but most abundantly from May to September. They are covered with a hairy, brown peel and

have very sweet, light-brown to reddish-brown pulpy flesh, gritty to smooth in texture. Each fruit has 0-12 flattened, shiny, black seeds, each 1.9 cm in diameter. Larger trees have red-brown bark with a flaky appearance. Milky latex which exudes from all tree parts coagulates into "chicle", the principal constituent of chewing gum before the advent of synthetics **(Table 1) [1, 2]**.

Table 1: Taxonomic of *Manilkara zapota*

Kingdome	**Plantae**
Phylum	**Spermatophyta**
Subphylum	**Angiospermae**
Class	**Dicotyledonae**
Order	**Ebenales**
Family	**Sapotaceae**
Genus	**Manilkara**
Species	***Manilkara zapota***

M. zapota was introduced as a fruit tree by native people in ancient times to most of tropical America, the West Indies, Bermuda, the Florida Keys and southern mainland Florida. It was also introduced as a fruit crop to other tropical and subtropical regions of the world including Asia, Africa and several islands in the Pacific region **[3, 4]**.

Traditional application

In the 18th century, white gummy chicle used for the production of chewing gum and in dental surgery obtained from the bark **[5]**. Fruits are highly nutritious used in diarrhoea and pulmonary diseases. The seeds are laxative, Antipyretic, boost and have used in the elimination of bladder and kidney stones **[6]**. Leaves are also a rich source of constituents and used in treat cough, cold, diarrhoea while its decoction used for fever, haemorrhage, healing of wounds and ulcers **[7]**.

The objective of the present study is to overview on pharmacognostic, phytochemical and pharmacological action of zapota plant.

Pharmacognosy study

It is a dicot plant. Leaves are green coloured. Apex and base were acute; the margin was entire leathery, the shape was oblong petioles were 4.5 cm long. Microscopically leaves show the presence of lower and upper epidermis, xylem, phloem, vascular bundles, mesophyll, trichome and collenchyma. Mesophyll differentiated into palisade and spongy parenchyma. Palisade formed from compactly arranged elongated, narrow columnar cells with beaded anticlinal walls. Palisade cells filled with chlorophyll. Spongy parenchyma made up of parenchymatous cells of varying size and shape. Vascular bundles were arc-shaped. Xylem lignified, phloem was non-lignified. A unicellular trichome observed on the epidermis. Microscopy of power shows the presence of upper epidermis cells that were thick and irregular walled. Prisms of calcium oxalate crystals, simple unicellular trichome, pitted vessels, actinocytic stomata and xylem vessels in longitudinal

sectional view showed spiral thickening **[8, 9]**.

Seeds of Chiku are hard flattened more or less ovo-elongated with a one-sided apical beak-like bent notch, length 1.9 to 2 cm, width 0.8 to 1.1 cm. The external surface shell is black, shining, glossy and embedded in pale brownish, juicy, sweet, fragrant fleshy fruit pulp of globular berries. Inside the hard shell, the seed kernel is soft, nutty, oily, white mass, powder, coarse and oily. The powder is oily, sticky granular mass with mixed black and cream coloured particles with stale oily taste and no characteristic odour. It shows the presence of numerous sclereids of different shape and sizes that is oval to elongated, beaker shaped, polygonal, rectangular etc. single or in groups, few xylem vessels with spiral thickenings on a wall, few prismatic crystals of calcium oxalate, profuse oil globules throughout the sample, aseptate fibres and scleren-chymatopus cells containing oil globules **[10-12] (Figure 1)**.

Physicochemical study (Table 2)

Phytochemical Study

Phytoconstituents are basically divided into two groups like primary and secondary metabolites, according to their functions in plant metabolism. Primary metabolites consist of common sugars, amino acids, proteins and chlorophyll while alkaloids, terpenoids, flavonoids, tannins etc. contribute as the secondary metabolites. Different qualitative tests were carried out with the M. zapota leaves,bark and seeds. Methanol extract of seed, bark and leaves contains following constituents **(Table 3) [8, 9, 12, 13]**.

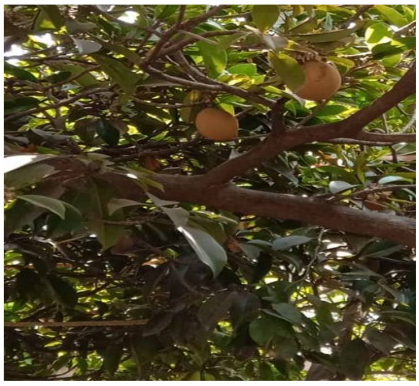

Figure 1: *Manilkara zapota* plant and seed

Table 2: Physicochemical parameter of leaves and seeds

Parameter	Leaves	Seed
Total ash value %(w/w)	6.15	5.33
Water soluble ash value%(w/w)	7.60	2.53
Acid insoluble ash value%(w/w)	0.85	2.34
Sulphated Ash%(w/w)	11.31	1.65
Loss on drying (LOD) %(w/w)	8.00	16.34

Table 3: Phytoconstituents from leaves seed and bark

Phytochemical class	Leaves	Seeds	Bark
Alkaloids	+	+	-
Steroids	-	+	-
Triterpenoids	+	-	
Flavonoids	+	-	+
Tannins	+	-	+
Glycoside	+	+	
Phenolic	+	+	
Oils	-	-	
Saponins	+	+	+
Fatty ester	+	-	
Reducing sugar	-	+	+
Gums	-	-	+

Leaf also contains hydrocarbons n-triacontane and n-octacosane, two sterols, β-sitosterol and stigmasterol. The GLC analysis showed a high percentage of saturated fatty acids, unsaturated fatty acids and polyunsaturated fatty acids. The main constituent of fatty acids oleic acid, linoleidic acid, and linoleic acid. lupeol-3-acetate, oleanolic acid, apigenin-7-O-aL-rhamnoside, myricetin-3-O-a-L-rhamnoside and caffeic acid was isolated from leaf **[14]**.

A water-soluble polysaccharide isolated from the hot water extract of the unripe fruits of zapota found to consist of 3-O-acyl-L-rhamnose, L-arabinose, 3-O-acetyl-D-methyl galacturonat **[15]**. From methanol extract methyl 4-Ogalloylchlorogenate, 4-O-galloylchlorogenic acid, methyl chlorogenate, dihydromyricetin, quercitrin, myricitrin, (+)- catechin, (-) epicatechin, (+)-gallocatechin, and gallic acid was isolated **[16]**. On storage of the fruit; the concentration of the polyphenolics with the basic blocks of gallocatechin or catechin or both were found to be reduced **[17]**. The fruit had high levels of aspartic and glutamic acid **[18]**. D-quercitol, saccharose isolated from seed **[19]**.

Pharmacological activities

Anti-inflammatory activity

Ethanolic extracts of *Manilkara zapota* leaves shows inflammatory, anti-pyretic activities. Carrageenan induced paw edema method used for evaluation of anti-inflammatory activity; anti-pyretic potential was determined by yeast-induced pyrexia method in albino Wistar rats. It shows significant activity compared to standard diclofenac **[20]**. Apigenin-7-O-ß-D-glucuronide flavonoid isolated from the leaves of ethyl extract of *Manilkara zapota*. It exhibit significant in vitro and in vivo anti-inflammatory activity **[21]**. Plenylated coumarins, manizapotins A-C isolated from fruits exhibit potential anti-inflammatory and anti-HIV effect **[22]**. Methanol extract of bark showed a significant anti-inflammatory activity both in the Carrageenan and histamine-induced oedema test models in rats **[23]**.

Antibacterial activity

Methanol extract of leaves showed antibacterial activity against Gram positive, Gram negative bacteria and one fungal strain, *Candida tropicalis* **[24]**. Ethyl acetate extracts of both stem bark and leaves of *Manilkara zapota* exhibit antimicrobial activity against *Aspergillus flavus, Vasianfactum sp* and *Fusarium sp* **[25]**. Silver nanoparticles were prepared using aqueous seed extract of *Manilkara zapota.* The as synthesized Silver nanoparticles showed excellent antimicrobial activity against *Candida* species **[26]**.

Antioxidant activity

The ethanolic crude extract of bark of M. zapota exhibited significant antioxidant activity in vitro and in vivo **[27]**. Similarly, cold ethanolic extract of leaf exhibited significant antioxidant effect in both in vitro and in vivo models. By DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical assay method, the IC50 of cold ethanolic extract of leaf was found to be 68.27 lg/ml **[28]**. The acetone extract of leaf also exhibited very significant antioxidant effect in DPPH radical scavenging activity with IC50 value of 20 mg/ml and in superoxide anion scavenging activity with IC50 of 140 mg/ml **[29]**. Activity-guided fractionation of a methanol extract from the fruits resulted in the isolation of potent antioxidant compound, 4-Ogalloylchlorogenic acid with IC50 23.5 mM in DPPH free radical assay **[30]**. Interestingly, the fruit peel extracts showed better antioxidant effect when compared to pulp extracts when tested on DPPH free radical assay **[31]**.

Alpha- amylase and a-glucosidase inhibitory activity

The immature fruit extract of zapota was reported to exhibit alpha-amylase inhibitory activity due to the presence of proanthocyanidins in the unripe fruit. Gallocatechins are the major compounds obtained from the analysis of proanthocyanidins **[32]**.

Anti-arthritic activity

Ethanolic leaf extract was tested for in-vitro antiarthritic activity by using the in vitro inhibition of protein denaturation model. Two different doses (100, 250 mcg/ml) of the extract were used with acetylsalicylic acid as the standard drug. Both the doses recorded greater percentage in protein denaturation in comparison to the control and standard **[33]**.

Anthelmintic activity

That study reported that 12.5 mg/ml of the ethanolic seed embryo extract of M. zapota resulted in potent anthelmintic activity against *Pheretima posthuma* when compared to 12.5 mg/ml of chloroform extract and 2.5 mg/ml of the standard drug piperazine citrate **[34]**.

Immunomodulatory activity

Fruit of zapota shows immunomodulatory effect **[35]**.

CONCLUSION

From above review, it is understand that *Manilkara zapota* is a significant fruit crop and can be considered as one of the healthy fruits because of the presence of a variety of nutritious components in it. Plant is a rich source of number of phytochemicals. It shows significant pharmacological activities. In spite of being monetarily and therapeutically significant, it has not acquired ubiquity due to serious level of die capacity. Present study was therefore designed to collect the existing literature, of path scarce, describing the association between the physiology, biochemistry, and nutritional attributes of the plant.

REFERENCES

[1] Crane JH, Balerdi CF, Maguire I. Banana growing in the Florida home landscape, University of Florida IFAS Extension. Retrieved on. 2013; 11(02): 2013.

[2] Kaufman W, Kaufman SR. Invasive plants: guide to identification and the impacts and control of common North American species. Stackpole Books; 2013 Apr 1.

[3] Morton JF. Fruits of warm climates. Creative Resource Systems. Inc. Winterville, USA. 1987.

[4] Mickelbart MV. Sapodilla: A potential crop for subtropical climates. Progress in new crops. ASHS Press, Alexandria, VA. 1996: 439-46.

[5] Morton JF, Dowling CF. Fruits of warm climates, vol. 20534. Miami, FL: Morton JF. 1987.

[6] Anjaria J, Parabia M, Dwivedi S. Ethnovet Heritage Indian Ethnoveterinary Medicines. An overview, 1st ed., Pathik Enterprise, Ahmedabad, India. 2002.

[7] Mohiddin YB, Chin W, Worth DH. Traditional medicinal plants of Brunei Darussalam part III. Sengkurong. International journal of pharmacognosy. 1992 Jan 1; 30(2): 105-8.

[8] Khandelwal K. Practical pharmacognosy. Pragati Books Pvt. Ltd.; 2008 Sep 7.

[9] Nagani K, Kaneria M, Chanda S. Pharmacognostic studies on the leaves of *Manilkara zapota* L. (Sapotaceae). Pharmacognosy Journal. 2012 Jan 1; 4(27): 38-41.

[10] World Health Organization. Quality control methods for herbal materials. World Health Organization; 2011.

[11] Anonymous, Ayurvedic Pharma-copoeia of India. Min. of Health & Family Welfare, Govt. of India, New Delhi, India, 1992; 1: 142-143.

[12] Hazra K, Dutta S, Paria D, Ghosal S, Rao MM. Phyto-pharma-cognostical profile of *Manilkara zapota* (L.) P. Royen seeds. Journal of Pharmacognosy and Phytochemistry. 2019; 8(4): 3038-43.

[13] Hossain H, Jahan F, Howlader SI, Dey SK, Hira A, Ahmed A, Sarkar R. Evaluation of anti-inflammatory activity and total flavonoids content of *Manilkara zapota* (Linn.) Bark. Int J Pharm Phytopharmacol Res. 2012; 2(1): 35-9.

[14] Fayek NM, Monem AR, Mossa MY, Meselhy MR, Shazly AH. Chemical and Biological Study of *Manilkara zapota* (L.) Van Royen (Sapotaceae) Cultivated in Egypt. Pharmacognosy Res; 4 (2): 85-91.

[15] Mondal S, Das D, Roy SK, Islam SS. Isolation, purification and structural characterization of an acetylated heteroglycan from the unripe fruits of *Manilkara zapota* L. Carbohydrate research. 2012 Jun 1; 354: 74-8.

[16] Ma J, Luo XD, Protiva P, Yang H, Ma C, Basile MJ, Weinstein IB, Kennelly EJ. Bioactive novel polyphenols from the fruit of *Manilkara zapota* (Sapodilla). Journal of Natural Products. 2003 Jul 25; 66(7): 983-6.

[17] Shui G, Wong SP, Leong LP. Characterization of antioxidants and change of antioxidant levels during storage of *Manilkara zapota* L. Journal of agricultural and food chemistry. 2004 Dec 29; 52(26): 7834-41.

[18] Hall NT, Smoot JM, Knight Jr RJ, Nagy S. Protein and amino acid compositions of ten tropical fruits by gas-liquid chromatography. Journal of agricultural and food chemistry. 1980 Nov; 28(6): 1217-21.

[19] Abu Osman M, Rashid MM, Abdul Aziz MA, Habib MR, Karim MR. Inhibition of Ehrlich ascites carcinoma by *Manilkara zapota* L. stem bark in Swiss albino mice. Asian Pac J Trop Biomed. 2011; 1(6): 448-51.

[20] Ganguly A, Al Mahmud Z, Uddin MM, Rahman SA. In-vivo anti-inflammatory and anti-pyretic activities of *Manilkara zapota* leaves in albino Wistar rats. Asian Pacific Journal of Tropical Disease. 2013 Aug 1; 3(4): 301-7.

[21] Hagos Z, SB P. Anti-inflammatory Activity of Bioactive Flavonoid Apigenin-7-O-β-D-Glucuronide Methyl Ester from Ethyl Acetate

Leaf Extract of *Manilkara zapota* on Lipopolysaccharide-induced Pro-inflammatory Mediators Nitric oxide (NO), Prostaglandin E 2 (PGE 2) in Raw 264.7 cells. Drug Invention Today. 2018 Apr 1; 10(4).

[22] Liu YP, Yan G, Guo JM, Liu YY, Li YJ, Zhao YY, Qiang L, Fu YH. Prenylated coumarins from the fruits of *Manilkara zapota* with potential anti-inflammatory effects and anti-HIV activities. Journal of agricultural and food chemistry. 2019 Oct 17; 67(43): 11942-7.

[23] Hossain H, Jahan F, Howlader SI, Dey SK, Hira A, Ahmed A, Sarkar R. Evaluation of antiinflammatory activity and total flavonoids content of *Manilkara zapota* (Linn.) Bark. Int J Pharm Phytopharmacol Res. 2012; 2(1): 35-9.

[24] Nair R, Chanda S. Antimicrobial activity of Terminalia catappa, *Manilkara zapota* and Piper betel leaf extract. Indian journal of pharmaceutical sciences. 2008 May; 70(3): 390.

[25] Osman MA, Aziz MA, Habib MR, Karim MR. Antimicrobial investigation on *Manilkara zapota* (L.) P. Royen. Int J Drug Dev Res. 2011 Jan; 3(1): 185-90.

[26] Otari SV, Patil RM, Ghosh SJ, Pawar SH. Green phytosynthesis of silver nanoparticles using aqueous extract of *Manilkara zapota* (L.) seeds and its inhibitory action against Candida species. Materials Letters. 2014 Feb 1; 116: 367-9.

[27] Islam ME, Parvin MS, Islam MR, Islam MS, Hasan SM. Antioxidant activity of the ethanol extract of *Manilkara zapota* leaf. Journal of Scientific Research. 2012; 4(1): 193-.

[28] Islam MR, Parvin MS, Hasan MR, Islam ME. In vitro and in vivo antioxidant activity of ethanolic extract of *Manilkara zapota* bark. J Global Pharm Technol. 2010; 3: 23-30.

[29] Chanda SV, Nagani KV. Antioxidant capacity of *Manilkara zapota* L. leaves extracts evaluated by four in vitro methods. Nature and science. 2010; 8(10): 260-6.

[30] Ma J, Luo XD, Protiva P, Yang H, Ma C, Basile MJ, Weinstein IB, Kennelly EJ. Bioactive novel polyphenols from the fruit of *Manilkara zapota* (Sapodilla). Journal of Natural Products. 2003 Jul 25; 66(7): 983-6.

[31] 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 Jul 31; 12(31): 4936-43.

[32] Wang H, Liu T, Song L, Huang D. Profiles and α-amylase inhibition activity of proanthocyanidins in unripe *Manilkara zapota* (Chiku). Journal of agricultural and food chemistry. 2012 Mar 28; 60(12): 3098-104.

[33] Singh M, Soni P, Upmanyu N, Shivhare Y. In-vitro Anti-arthritic activity of *Manilkara zapota* Linn. Asian J Pharm Tech. 2011 Oct; 1(4): 123-4.

[34] Yong KY, Shukkoor MS. *Manilkara zapota*: A phytochemical and pharmacological review. Materials Today: Proceedings. 2020 Jun 18.

[35] Pillai ST, Renganathan RG, Kumar RM. Immunomodulator activity of different fruits extracts against pathogenic organisms in mice. Global J. of Mod. Biol. & Tech. 2012; 2(2).