ISSN: 2278-4632
Vol-13, Issue-03, No.02, March 2023

STUDIES OF ANTIDIABETIC INDIAN MEDICINAL PLANT LEAVES *{MANGIFERA INDICA*

Deepa Soni, Research scholar, Rabindranath Tagore University, Bhopal (M.P.)
Dr. Suchi Modi, Professor, Rabindranath Tagore University, Bhopal (M.P.)
deepasoni.1980@gmail.com

ABSTRACT
Many medicinal plants have been used for the treatment of diabetes mellitus in Indian system of medicine and in other ancient systems of the world. Medicinal plants are significant source of biological compounds and many of the currently available biological compounds have been derived directly or indirectly from them. The major focus of this review is on anti-diabetic activity of medicinal plants like *Mangifera indica*. These medicinal plants act on various mechanisms either by acting directly on pancreas and stimulate insulin levels in blood or by altering the activities of regulatory enzymes in different pathways like glycolysis, gluconeogensis and thus producing effects on tissues like liver, muscle, adipose tissue etc. All medicinal plants, as specified, have shown different degrees of anti-diabetic activity.

Key words: *Mangifera indica,* Antidiabetic effect, Review, Medicinal plants

INTRODUCATION
According to recent estimates the prevalence of diabetes mellitus is 4% worldwide and that indicates 143 million persons are affected which will increase to 300 million by the year 2025. In urban India, mortality rates are twofold higher in people with diabetes compared to non-diabetic subjects [8] . Three types of diabetes of interest to our group are: insulin-dependent diabetes mellitus (IDDM), non-insulin-dependent diabetes mellitus (NIDDM), and malnutrition-related diabetes mellitus (MRDM), the later affects young people in poor tropical countries and is linked to a history of nutritional deficiency. Treatment to diabetes by western classical medicines is costly. Many herbal therapies have been recommended for the treatment of diabetes. The ethno botanical information reports about 800 plants that may have anti-diabetic activities[6] Bio-active herbal ingredients are admixtures of many chemical compounds (alkaloids, glycosides, triterpenes, polysaccharides, and saponins etc) and some of them have documented anti-diabetic activities. . There is a growing interest in herbal remedies because of their effectiveness, minimal side effects in clinical experiences and relatively low costs. Herbal drugs or their extracts are prescribed widely, even when their biological active compounds are unknown as they are being traditionally used. Thus, studies with medicinal plants extracts are useful to know their efficacy, mechanism of action and safety.
Mangifera indica: Aam (Hindi) *Mangifera indica* (family: Anacardiacea) is used medicinally in tropical Africa. aqueous extract of *Mangifera indica* Linn stem bark, leaves showed Antinflammatory, analgesic, and anti-diabetic activities due to different chemical constituents, especially the polyphenolics, flavonoids, triterpenoids, mangiferin and other chemical compounds present in the plant[13]. Intra-peritoneal administration of mangiferin isolated from *Mangifera indica* exhibited potent antioxidant effects and ameliorates glycosylated haemoglobin levels in diabetic animals.

Material and method
Collection
The leaves of above given plants were collected from the different open areas.

Storage
The different parts such as leaves and fruits were dried initially under shade. It was preserved in airtight container and powdered as per requirements.

ISSN: 2278-4632
Vol-13, Issue-03, No.02, March 2023

Extraction

The correctly identified leaves were dried and coarsely powdered. These were defatted with n-hexane, extracted by using 95% ethanol and finally partitioned between dichloromethane and methanol water.

Mango *(Mangifera indica L.*) ascribed to the family Anacardiaceae has been adjudged as the vital traditionally significant and one of the most economically important tropical fruit crop globally . Mango is an evergreen tree with a lot of traditional medicinal resources apart from its very famous fruits. s. Apart from its economically important portion (fruit), large amounts of crop residues such as leaves, flowers, stem, and bark are generated during pruning, which causes complications of disposal to the farmers. Mango leaves (MLs) are the potential source of minerals, viz. nitrogen, potassium, phosphorus, iron, sodium, calcium, magnesium, and vitamins, viz. A, B, E, and C. A major bio-macromolecule present in mango leaves is protein. MLs can be utilized as an alternative source of livestock feeding in developing countries for alleviating the food shortage for livestock. Extracts of the MLs have been utilized for traditional medicines to cure diabetes, bronchitis, diarrhea, asthma, kidney, scabies, respiratory problems, syphilis, and urinary disorders [2,3]. The most active biological constituent of MLs is mangiferin, followed by phenolic acids, benzophenones, and other antioxidants such as flavonoids, carotenoids, quercetin, isoquercetin, ascorbic acid, and tocopherols. Mangiferin is the main contributor of most of the biological activities of MLs extract. MLs have a great scope of valorization as they are recognized to possess varied phytochemical, biological, and pharmacological properties, viz. anti-microbial, antioxidant, anti-diabetic, anti-tumour, and immunomodulatory effects. ML oil (MLO) contains monoterpenes, sesquiterpenes, minor quantities of other analogues, and trace amounts of non-terpenoid hydrocarbons and oxygenated hydrocarbons. The essential oil from MLs also possesses bacteriostatic properties and contains several antimicrobial constituents such as α-gurjunene, trans-caryophyllene, α-humulene, α-selinene, and camphor. The benzophenone derivatives in MLs possess significant αglucosidase inhibitory and immunosuppressive activities. There is no critical compilation on the crucial information on MLs' bioactives and associated bioactivities. Therefore, the current review will be focused on the nutritional and phytochemical profile of the MLs. The review also delivers important health promoting activities of the MLs extracts.

Phytochemical Profile

The medicinal properties of MLs make them a useful ingredient in traditional folk tea preparation, and to treat diabetes and respiratory diseases in Asian and African countries [9]. As described in the previous Sections 2.1–2.3, they a contain superior quality of bioactive polysaccharides, proteins, lipids, vitamins, and minerals. Bioactive phytochemicals present in MLs extracts have a high potential in terms of biological and pharmacological activities viz. antioxidant, antidiabetic, anti-inflammatory, antimicrobial, antiviral, immunomodulatory, anti-obesity, antiallergic, antifungal, antiparasitic, antidiarrheal, antipyretic, and anti-tumour activities [14]. Phytochemicals present in MLs can be broadly categorized as polyphenols, terpenoids, carbohydrates, sterols, carotenoids, vitamins, fatty acids, and amino acids. Among them, total phenolic compounds (TPC), including phenolic acids, xanthones, benzophenones, tannins, terpenoids, and flavonoids, are most abundant in ML. Several epidemiological studies have proved the activities of TPC against chronic diseases viz. cancer, diabetes, and cardiovascular and neurodegenerative diseases.

Anti-Diabetic Activity

MLs have been widely claimed as effective ethnomedicine against DM due to their antidiabetic bioactive constituents like benzophenones (mangiferin) and flavonoids (quercetin and its glucoside forms). One of the best effective approaches in the cure of DM is the inhibition of α-amylase and α-glucosidase enzymes, which regulate postprandial glucose absorption [15]. A comparative analysis of mangiferin and MLs extract was done to check the efficiency of each extract to inhibit α-glucosidase enzymes. MLs extracts at a concentration of 100, 250, and 500 mg/mL caused up to 77.8%, 83.4%, and 95.7% inhibition of α-glucosidase, respectively. At the same time, mangiferin at

a concentration of 10, 25, and 50 resulted in 86.85%, 92.35%, and 99.11% inhibition of α-glucosidase, respectively. It can be inferred that mangiferin is an active ingredient in the inhibition of α-glucosidase enzyme activity and in managing the diabetic condition. . Ganogpichayagrai et al. [11] evaluated the anti-diabetic activity of mangiferin and MLs extract through the inhibition of α-glucosidase and α-amylase in vitro. The anti-diabetic potential of the mangiferin is schematically . The anti-diabetic potential of mangiferin was also demonstrated, as it increases insulin sensitivity and inhibits α-glucosidase [4].

Bhuvaneshwari et al. [2] investigated the anti-diabetic activity of tender and mature leaves of totapuri cultivar of mango, and authors found that tender leaves extract (500 mg/kg) efficiently inhibited the α-amylase with IC50 22.01 µg/mL, while mature leaf extract (500 mg/kg) exhibited the α-glucosidase inhibition with IC50 21.03 µg/mL. Findings suggest that bioactive compounds from the ML can be effective in reducing the risk of diabetes.

RESULT

Mangiferin, a bioactive compound of the mango, against lifestyle-related disorders. Mangiferin (2-β-D-glucopyranosyl-1,3,6,7-tetrahydroxy-9H-xanthen-9-one) can be isolated from higher plants as well as the mango fruit and their byproducts (i.e. peel, seed, and kernel). It possesses several health endorsing properties such as antioxidant, antimicrobial, antidiabetic, antiallergic, anticancer, hypocholesterolemic, and immunomodulatory. It suppresses the activation of peroxisome proliferator activated receptor isoforms by changing the transcription process. Mangiferin protects against different human cancers, including lung, colon, breast, and neuronal cancers, through the suppression of tumor necrosis factor α expression, inducible nitric oxide synthase potential, and proliferation and induction of apoptosis. It also protects against neural and breast cancers by suppressing the expression of matrix metalloproteinase (MMP)-9 and MMP-7 and inhibiting enzymatic activity, metastatic potential, and activation of the β-catenin pathway. It has the capacity to block lipid peroxidation, in order to provide a shielding effect against physiological threats. Additionally, mangiferin enhances the capacity of the monocyte-macrophage system and possesses antibacterial activity against gram-positive and gram-negative bacteria. This review summarizes the literature pertaining to mangiferin and its associated health claims.

CONCLUSION

The ethnopharmacological use of herbal medicine for the treatment of diabetes mellitus is developed potentially as a preliminary point in the development of alternative and inexpensive therapies for treating the disease. Many valuable drugs have been obtained from plants over the years India is facing diabetic explosion. Many medicinal plants are being used to treat diabetes since ancient times and have served as an exemplary source of medicine. Herbal treatments are in practice both in patients with insulin dependent and non-insulin-dependent diabetes. Medicinal plants continue to provide valuable anti-diabetic agents, in both modern medicine and in traditional system. Current pharmacological modalities for diabetes are not ideal because of their side effects. Therefore, there is a necessity to look for newer anti-diabetic agents. All medicinal plants have shown different degrees of hypoglycemic activities. Some herbs have shown potential antidiabetic activity .All these studies indicated that there is a need to search for usage and pharmacological activities of bioactive compounds isolated from Indian medicinal plants having anti-diabetic properties. Continuing research is essential to evaluate the pharmacological activities of these herbs or their active constituents that are being used for the treatment of diabetes.

REFERENCES

1. Ali, B.A.; Alfa, A.A.; Tijani, K.B.; Idris, E.T.; Unoyiza, U.S.; Junaidu, Y. Nutritional Health Benefits and Bioactive Compounds of Mangifera indica L (Mango) Leaves Methanolic Extracts. Asian Plant Res. J. 2020, 6, 41–51.
2. Barreto, J.C.; Trevisan, M.T.S.; Hull, W.E.; Erben, G.; De Brito, E.S.; Pfundstein, B.; Würtele, G.; Spiegelhalder, B.; Owen, R.W. Characterization and Quantitation of

ISSN: 2278-4632
Vol-13, Issue-03, No.02, March 2023

Polyphenolic Compounds in Bark, Kernel, Leaves, and Peel of Mango (Mangifera indica L.). J. Agric. Food Chem. 2008, 56, 5599–5610.

3. Bhuvaneshwari, J.; Khanam, S.; Devi, K. In-vitro enzyme inhibition studies for antidiabetic activity of mature and tender leaves of Mangifera indica var. Totapuri. Res. Rev. J. Microbiol. Biotechnol. 2014, 3, 36–41.
4. B. Dinesh Kumar, A. Mitra and M. Manjunatha School of Medical Science and Technology, Indian Institute of Technology, Kharagpur, Journal of Herbal Medicine and Toxicology 3 (2) 9-14 (2009) ISSN : 0973-4643
5. Das, S.; Rao, B.N. Mangiferin attenuates methylmercury induced cytotoxicity against IMR-32, human neuroblastoma cells by the inhibition of oxidative stress and free radical scavenging potential. Chem. Interact. 2011, 193, 129–140.
6. Gupta, R. Active phytoconstituents for diabetes management: A review. J. Complement. Integr. Med. 2018, 15, 15.
7. Hannan, A.; Asghar, S.; Naeem, T.; Ullah, M.I.; Ahmed, I.; Aneela, S.; Hussain, S. Antibacterial effect of mango (Mangifera indica Linn.) leaf extract against antibiotic sensitive and multi-drug resistant Salmonella typhi. Pak. J. Pharm. Sci. 2013, 26, 715–719.
8. J. E. Shaw, R. A. Sicree, and P. Z. Zimmet, “Global estimates of the prevalence of diabetes for 2010 and 2030,” Diabetes Research and Clinical Practice, vol. 87, no. 1, pp. 4–14, 2010.
9. J. P. Boyle, M. M. Engelgau, T. J. Thompson et al., “Estimating prevalence of type 1 and type 2 diabetes in a population of African Americans with diabetes mellitus,” American Journal of Epidemiology, vol. 149, no. 1, pp. 55–63, 1999.
10. Oseghale, F.; Fasina, K.; Ohifueme, A.; Omoruyi, J. Biocontrol of Food Spoilage Microorganisms using Leaf extracts from Magnifera indica (Mango) and Psidium guajava (Guava). J. Chem. Soc. Niger. 2020, 45, 712–723.
11. Palanuvej, C.; Ganogpichayagrai, A.; Ruangrungsi, N. Antidiabetic and anticancer activities of Mangifera indica cv. Okrong leaves. J. Adv. Pharm. Technol. Res. 2017, 8, 19–24.
12. Prommajak, T.; Kim, S.M.; Pan, C.-H.; Kim, S.M.; Surawang, S.; Rattanapanone, N. Identification of Antioxidants in Young Mango Leaves by LC-ABTS and LC-MS. Chiang Mai Univ. J. Nat. Sci. 2014, 13, 317–330.
13. Reddeman, R.A.; Glávits, R.; Endres, J.R.; Clewell, A.E.; Hirka, G.; Vértesi, A.; Béres, E.; Szakonyiné, I.P. A Toxicological Evaluation of Mango Leaf Extract (Mangifera indica) Containing 60% Mangiferin. J. Toxicol. 2019, 2019, 1–14.
14. Rymbai, H.; Srivastav, M.; Sharma, R.R.; Patel, C.R.; Singh, A.K. Bio-active compounds in mango (Mangifera indica L.) and their roles in human health and plant defence—A review. J. Hortic. Sci. Biotechnol. 2013, 88, 369–379.
15. Singh S.N., Vats P., Suri S. Effect of an antidiabetic extract of Catharanthus roseus on enzymic activities in streptozotocin induced diabetic rats. J Ethnopharmacol. 2001;76(3):269–277.