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Review Article

The Medicinal Plants and Diabetic Cardiomyopathy: A Recent Review

Aditya Prakash[1], Ravindra Pal Singh[2], Subhanshi Gupta[1]

[1]Department of Pharmacy Practice, NIMS Institute of Pharmacy, NIMS University, Jaipur, Rajasthan, India.
[2]Department of Pharmacy, NIMS Institute of Pharmacy, NIMS University, Jaipur, Rajasthan, India.

I N F O

E-mail Id:
apmicky@gmail.com
Orcid Id:
https://orcid.org/0000-0002-7840-7420

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A B S T R A C T

Background: Diabetic Cardiomyopathy (DbCM) is a definite primary disease operation, individualistic of CAD, which shows to heart-related diseases like heart failure in diabetic person. Cardiomyopathy is a structural and functional disease related to the dysfunctional of the heart muscles. Cardiomyopathies act as wide ranging group of disease that often causes to heart failure. In early age, cardiomyopathy is an asymptomatic and mostly symptoms are same as those seen in any type of heart failure. Symptoms are cough, shortness of breath, edema and nocturnal dyspnoea. Epidemiology and their clinical sequences have established a higher incidence of and ubiquity of heart failure in diabetes. Echocardiographic 7 magnetic resonance process has authorized a more precise means of phenotype diabetic cardiomyopathy. A modify in the metabolic process, diminished ca^{2+} homeostasis and production of energy, enhancing swelling and oxidative distress, also deposition of modern glycation end effect are method implications in the pathologic process of diabetic cardiomyopathy. Notwithstanding a growing delight in the pathophysiology of DbCM, there are no specified guidelines for recognizing patients or arranging a treatment program in clinical practice. Mainly anti-hyperglycaemic drugs are critical in the therapy of diabetic cardiomyopathy patients by effectively decreases, microvascular complication, suppress the effect of renal failure, retinopathy and nerve injury. Interestingly, many drugs presently in use can enhance cardiac efficiency and output beyond their capacity to control glycaemic.

Methods: Biochemical data collections of plant parts were searched to the recognized key points about the medicines and their functions are critically introduced in this review.

Results: In this evaluation, we will discuss the clinical also an experimental discussion of medicinal plants in the treatment of diabetic cardiomyopathy.

Conclusion: Clinical trials are essentially required to demonstrate the effectiveness of presently available representative of HF also novel remedies in patients conspicuously with diabetic cardiomyopathy.

Keywords: Diabetic Cardiomyopathy, Hyperglycaemia, Insulin Resistance, Retinopathy, Nerve Injury

Introduction

Diabetes Mellitus (DM) is one of the most common, serious and complex metabolic health problems has precipitated giant morbidity & mortality via the multiple aetiologies like microvascular (retinopathy, neuropathy) and macrovascular (Heart attack, PVD) with profound outcomes both acute and chronic condition.[1,2] It is represented by the enhancing of blood glucose level after taking a meal.[3] Human bodies acquire biological & non-biological antioxidative processes which restrict the science of relative oxygen species accountable for much degenerative illness which embody diabetes.[4] According To WHO, approx. 3.4% of the world's population affects from this disease and it is anticipated that more than 6.4% of peoples will suffer from these diseases till 2030.[5] Genetic and environmental agents contribute consequentially to the development of the risk factor of diabetes.[6] When the lack of insulin, the body cannot able to absorb sufficient quantity of carbohydrates from the blood; then the volume of glucose is increased in the blood, this situation is known as hyperglycaemia. If the blood glucose volume is elevated over a longer duration, this can harm organs like kidney, heart, liver and sometimes damage the organs and assists to death.[7] Insulin activates the embodiment to disintegrate its fats, protein into amino acids and glycogen into glucose which ultimately produces sugar, leading to the existence of excessive blood glucose volume with the surplus by-products called ketones being assembled by the liver.[8,9] Discuss some plants with their some characterstics features (Table 1).

Presently, the available remedy of diabetes is insulin and some other oral antidiabetic drug of classes such as Sulfonylurea (tolbutamide), Biguanide (metformin), DPP-4(nateglinide), and GLP-1(exenatide). They have a large no of critical complications occurs like retinopathy, neuropathy, PCOs and oedema.[10,11] This is the necessary cause for a growing no of human beings discovering alternating therapist that may also have much less severe or no aspect effect.[12,13] Overall, an income of herbal drugs is developing with the aid of about 10% yearly. Over 25-30% of our frequent medicines contain at the minimum one or more compound acquires from plants. In less growing global areas, the WHO evaluates that 75-8% of the peoples count on a plant-based virtually treatment for predominant health care.[14] Discuss some plants with their common name and their scientific name along with family (Table 1).

Antihyperglycemia action of the plant is frequently due to their capability to restore the activity of pancreatic tissue through inflicting an extend in insulin output or restrict the absorption of glucose from intestine or to a collaboration of metabolites in insulin based process. Various plants carry a large variety of natural products like flavours, alkaloids, and terpenoids etc., that are regularly involved as having antidiabetic effects. Distinguish for these medicinal plants due to their parts of plants (Table 2).

Table 1.Discuss Some Plants with their Some Characteristics Features

S. No.	Common Name	Scientific Name	Part	Family
1.	Babul	*Acacia arabica*	Bark	Mimosaceae
2.	Bael	*Aegel marmelos*	Leaf extract	Rutaceae
3.	Church steeples	*Argimonia eupatoruia*	Whole plant	Rosaceae
4.	Onion	*Allium cepa*	Bulb	Liliaceae
5.	Garlic	*Allium sativum*	Leaves and bulb	Liliaceae
6.	Ghrit kumari	*Aloe vera*	Leaves	Asphodelaceae
7.	Neem	*Azadirachta indicia*	Leaves	Meliaceae
8.	Wax gourd	*Benincasa hispida*	Stem	Cucurbitaceae
9.	Beet root	*Beta vulgaris*	Leaves	Chenopodiaceae
10.	Fever nut	*Caesalpinia bonducella*	Stem	Fabaceae
11.	Bitter apple	*Citrullus colocynthis*	Root	Cucurbitaceae
12.	Ivy gourd	*Coccinia indica*	Root	Cucurbitaceae
13.	Blue gum	*Eucalyptus globulus*	Leaves	Mytraceae
14.	Banyan tree	*Ficus benghalenesis*	Root	Moraceae
15.	Gurmar	*Gymnema sylvestre*	Leaves	Apocynaceae
16.	Gurhal	*Hibiscus rosa sinesis*	Leaves	Malvaceae
17.	Sweet potato	*Ipomoea batatas*	Tubers	Convolvulaceae
18.	Barbados nut	*Jatropho curcas*	Latex	Euphorbiaceae

19.	Mango	*Mangifera indica*	Leaves	Anacardiaceae
20.	Bitter gourd	*Momardica charantia*	Fruit	Cucurbitaceae
21.	Mulberry	*Morus alba*	Root , fruit and leaves	Moraceae
22.	Velvet bean	*Mucuna puriens*	Seed	Fabaceae
23.	Tulsi	*Ocimum sanctum*	Leaves	Lamiaceae
24.	Indian Kino tree	*Pterocarpus marsupium*	Leaves ,flower	Fabaceae
25.	Pomegranate	*Punica granatum*	Seed and flower	Punicaceae
26.	Jamun	*Syzygium cumini*	Seed and bark	Myrtaceae
27.	Giloy	*Tinospora cordifolia*	Stem and leaves	Menispermaceae
28.	Fenugreek	*Trigonella foenum graecum*	Seeds	Fabaceae
29.	Pepal	*Ficus religiosa*	Whole plant	Moraceae
30.	Tea	*Camellia sinensis*	Leaves	Theaceae
31.	Giant dodder	*Cuscuta reflexa*	Seed	Cuscutaceae
32.	Gulmohar	*Delonix regua*	Leaves	Fabaceae
33.	Indian jujube	*Zizypus mauritiana*	Fruit	Rhamnaceae
34.	Purslane	*Zaleya decanda*	Root	Aizoaceae
35.	Bitter leaf	*Vernonia amygdalina*	Leaves	Asteraceae
36.	Caucasian whortleberry	*Vaccinium arctostaphylas*	Fruit	Ericaceae
37.	Indian almond	*Terminalia catappa*	Fruit	Combretaceae
38.	Shilikha	*Terminalia chebula*	Seed	Combretaceae
39.	Tamarind	*Tamarindus indica*	stem bark	Fabaceae
40.	Indian long pepper	*Piper longum*	Root	Piperaceae
41.	Barraja	*Sonchus oleraceus*	Whole plant	Asteraceae
42.	Kachnar	*Bauhinia variegate*	Leaves	Fabaceae
43.	Oregano	*Origanum vulgare*	Leaves	Lamiaceae
44.	Senjana	*Moringa oleifera*	Leaves	Moringaceae
45.	Curry leaf	*Murraya koenigii*	Leaves	Rutaceae
46.	Black creeper	*Chilladenus iphionoudes*	Seed	Asteraceae
47.	Turmeric	*Coscinium fenestratum*	Stem	Menispermaceae
48.	Lemon scented gum	*Eucalyptus citriodora*	Leaves	Myrtaceae
49.	Amaltas	*Cassia fistula*	Stem bark	Fabaceae
50.	Sadabahar	*Catharanthus roseus*	Leaves	Apocynaceae

Discussion

Acacia Arabica: Two doses were performed due to chloroform extract are 250 & 500 mg which is given orally administered. They were evaluated in alloxan influenced diabetic albino mice.[15] The outcomes of this study manifest an antidiabetic reaction in the two doses trailed, reducing serum glucose level and restoring all the types of cholesterol (TC, TG, HDL and LDL). In addition, it also decreased insulin resistance, enhance the glucose level in plasma and sometime occurs lipid metabolic disorders.[16,17]

Aegel Marmelos: Aqueous leaf take out from Aegel marmelos confirmed antidiabetic action. Most common dose of drugs are 125 and 250 mg/ kg mainly orally administered.[18] They are performed in streptozotocin brought about diabetic rats twice daily for about 4 weeks caused a notable decrease in blood glucose, enhancing the utilisation of glucose in blood, hydroperoxide, alpha-tocopherol, vitamin C or by direct incentimation of glucose uptake through elevated the secretion of insulin.[19] The usage of 250 mg/ kg dose of Aegel marmelos extract was more effectual than glibenclamide in the development of these criterions.

Table 2.Distinguish Between the Parts of Plants

S. No.	Part of Plants	Name of Medicinal Plant
1.	Bark	Acacia Arabica, Tamarindus indica, Syzygium cumini
2.	Leaves	Catharanthus roseus , Eucalyptus citriodora , Murraya koenigii, Origanum vulgare, Moringa oleifera, Bauhinia variegate, Vernonia amygdalina, Delonix regua , Camellia sinensis, Tinospora cordifolia Pterocarpus marsupium, Ocimum sanctum, Morus alba, Mangifera indica, Hibiscus rosa- sinesis, Gymnema sylvestre, Eucalyptus globulus, Beta vulgaris, Azadirachta indicia, Aloe vera, Allium sativum, Aegel Marmelos
3.	Whole plant	Sonchus oleraceus, Ficus religiosa, Argimonia eupatoruia
4.	Bulb	Allium sativum, Allium cepa
5.	Stem	Cassia fistula, Coscinium fenestratum, Tamarindus indica, Tinospora cordifolia, Caesalpinia bonducella, Benincasa hispida
6.	Root	Piper longum, Zaleya decanda, Morus alba, Ficus benghalenesis, Coccinia indica, Coccinia indica
7.	Tuber	Ipomoea batatas
8.	Latex	Jatropho curcas
9.	Fruit	Terminalia catappa , Vaccinium arctostaphylas, Zizypus mauritiana, Morus alba, Momardica charantia
10.	Seed	Chilladenus iphionoudes, Terminalia chebula, Cuscuta reflexa, Trigonella foenum graecum, Syzygium cumini, Punica granatum, Mucuna puriens
11.	Flower	Punica granatum, Pterocarpus marsupium

Argimonia Eupatoruia: About 70-75% of Argimonia eupatoruia plant showed antihyperglycemia activity in Streptozotocin (STZ) diabetic mice which dose is 0.25-1 mg/ dl. The outcomes of this study manifest activation of insulin production from BRIN-BD11 beta cells of pancreas. Another effects was found to be glucose uptake & metabolism of glucose.[20]

Allium Cepa: Extract of bulb part from Allium cepa showed hypoglycemic and hypolipidemic results normalizing the action of liver hexokinase, G6P and HMG-COA reductase. Most commonly use of drug 100-150 gm/ kg which is administered in alloxan influenced diabetic mice caused appreciable reduce the level of fasting blood glucose by about 89-90 mg/dl in correlated to insulin (145 mg/dl) in diabetic patient, serum lipids, lipid peroxidation and also enhance the activity of antioxidant enzymes.[21,22]

Allium Sativum: Antidiabetic activity of ethanolic extracts obtained from leaf and bulb part of Allium sativum were studied in normal mice and streptozotocin influence diabetic mice.[18] Orally administration of ethyl ether extract dose is 0.25 mg/ kg of Allium sativum showed a lowering their serum glucose level, urea, LDL, HDL, Creatinine, LFT function. However, this extract enhanced the level of serum insulin in diabetic mice, yet not in healthy ones. Differentiate between the effectiveness of the garlic and glibenclamide illustrated that the antihyperglycemic activity of the garlic extract is more essential than glibenclamide.[23]

Aloevera: Leaves extract of Aloe vera was showed hypoglycemic effect. It was assessed in the STZ influenced diabetes mice and NIH/ 3T3 embryonic cells of mouse.[24] Orally administration of an extract at a dose 130 mg/kg or sometimes 150 mg/ kg per day for one month resulted in a remarkable reduce in blood glucose level, elevated the cholesterol level, an effect related to that of biguanide class of drug.[25]

Azadirachta Indica: Leaf extract and seed oil of the Azadirachta indica administration for a month decreases the level of blood glucose in alloxan induce diabetic rabbits. This extract had comparable outcome as the anti-diabetic drug of glibenclamide. This is also effective in delaying the starting of diabetes.[26]

Another effect of the Azadirachta indica was estimated and it was established that the dispensing of a single dose of bark & root extract at a dose 125 mg/ kg can reduce urea (10-15%), triglyceride (30-35%), cholesterol mainly LDL (10-12%), glucose (15-20%) and creatinine (20-25%) in diabetic mice for 24 hrs after therapy.[27]

Benincasa hispida: Stem extract of Benincasa hispida showed antihyperglycemic activity in Streptozotocin (STZ) induces rats. Orally administration of an extract at a dose 200 mg/ kg -400 mg/ kg per day for 15 days. In results, reduce the blood glucose level, reduces the lipid profile and enhance the HDL level and sometimes metabolic disturbance also occur.[28]

Caesalpinia Bonducella: This extract has anxiolytic, anti-diarrhoeal sometimes anti-nociceptive & anti- filarial activities will occur. Phytochemical reviews determined the appearance of alkaloids, tannins, flavonoids, saponins & triterpenoids in this plant.[29] Orally administered of the Caesalpinia bonducella seed extract at a dose 300-5 mg/ kg produced an antihyperglycemic consequences in alloxan induced rats and reduce the BUN level. In additionally, a significant decreases the cholesterol level and rises the LDL level in diabetes influenced hyperlipidaemia & blockage of glucose absorption.[30] In another research, hypoglycemic effect of aqueous extract was analysed in normal rats as well as Streptozotocin (STZ) diabetic rats. At the fifth day of drug administration at a dose 100 mg/ kg, both extract produced remarkable hypoglycemic effect in diabetic rats.[31]

Citrullus Colocynthis: Root extract of this plant was researched on the biochemical criterion of normal and alloxan influenced diabetic rats.[32] Orally administered at a dose 200 mg/ kg of this plant showed a significant decreases the glucose level, enhances the serum insulin while the aqueous extraction of the peel enhances the glucose level and reduces the serum insulin. The seed of this plant is very effective in the treatment of type 2 DM rather than peel.[33]

Conclusion

This article mainly based on the plants which are used in diabetic cardiomyopathy. We are used to find the plants whose ingredients are very useful for the diabetic cardiomyopathy patients. This review tried to describe the antidiabetic evaluation, models used in the study and significant results. Most of the plants and their parts practically to control diabetes as the scientific report said. Those chemical which are mainly found in the plants play major role to control the blood sugar that has been explained in this article.

Conflict of Interest: None

References

1. Patel DK, Kumar R, Prasad SK et al. Antidiabetic and in vitro antioxidant potential of Hybanthus enneaspermus (Linn) F. Muell in streptozotocin-induced diabetic rats. *Asian Pac J Trop Biomed* 2011; 1(4): 316-322.
2. Soumya D, Srilatha B. Late stage complications of diabetes and insulin resistance. *J Diabetes Metab* 2011; 2: 1000167.
3. Modak M, Dixit P, Londhe J et al. Indian herbs and herbal drugs used for the treatment of diabetes. J *Clin Biochem Nutr* 2007; 40(3): 163. doi: 10.3164/ jcbn.40.163.
4. Patel DK, Kumar R, Prasad SK et al. Pedalium murex Linn (Pedaliaceae) fruits: a comparative antioxidant activity of its different fractions. *Asian Pac J Trop Biomed* 2011; 1(5): 395-400.
5. Mukesh R, Namita P. Medicinal Plants with Antidiabetic Potential-A Review. *American-Eurasian J Agric Environ Sci* 2013; 13(1): 81-94.
6. Murea M, Ma L, Freedman BI. Genetic and environmental factors associated with type 2 diabetes and diabetic vascular complications. *Rev Diabet Stud* 2012; 9: 6-22. doi: 10.1900/RDS.2012.9.6.
7. Ponnusamy S, Ravindran R, Zinjarde S et al. Evaluation of traditional Indian antidiabetic medicinal plants for human pancreatic amylase inhibitory effect in vitro. *Evid Based Complement Alternat Med* 2011; 2011: 515647.
8. Buowari O. Diabetes Mellitus-Insights and Perspectives. InTechOpen, Rijeka, Croatia, 2013.
9. Folorunso O, Oguntibeju O. Diabetes Mellitus-Insights and Perspectives. InTechOpen; Rijeka, Croatia: 2013. Chapter 5: The role of nutrition in the management of diabetes mellitus.
10. Saxena A, Vikram NK. Role of selected Indian plants in management of type 2 diabetes: a review. *J Altern Complement Med* 2004; 10(2): 369-378.
11. Lee HS. Rat lens aldose reductase inhibitory activities of Coptis japonica root-derived isoquinoline alkaloids. *J Agric Food Chem* 2002; 50(24): 7013-7026.
12. Rao MU, Sreenivasulu M, Chengaiah B et al. Herbal medicines for DM: A review. *International journal of pharma Tech Research* 2010; 2(3): 1883-1892.
13. Evans WC. Trease & Evans pharmacognosy, saunders company ltd. 2008; 13: 137.
14. WHO, Traditional medicine strategy, World Health Orgnisation, Geneva 2002.
15. Malviya N, Jain S, Malviya S. Antidiabetic potential of medicinal plants. *Acta Pol Pharm* 2010; 67(2): 113-118.
16. Hegazy GA, Alnoury AM, Gad HG. The role of Acacia Arabica extract as an antidiabetic, antihyperlipidemic, and antioxidant in streptozotocin-induced diabetic rats. *Saudi medical journal* 2013; 34(7): 727-33.
17. Gupta PD, De A. Diabetes Mellitus and its herbal treatment. *International Journal of Research in Pharmaceutical and Biomedical Sciences* 2012; 3(2): 706-21.
18. Ayodhya S, Kusum S, Anjali S. Hypoglycaemic activity of different extracts of various herbal plants Singh. *Int J Ayurveda Res Pharm* 2010; 1(1): 212-224.
19. Kamalakkannan N, Prince PSM. Hypoglycaemic effect of water extracts of Aegle marmelos fruits in streptozotocin diabetic rats. *Journal of ethnopharmacology* 2003; 87(2): 207-10.
20. Bnouham M, Ziyyat A, Mekhfi H et al. Medicinal plants with potential antidiabetic activity-a review of ten years of herbal medicine research. *Int J Diabetes Metab* 2006; 14: 1-25.
21. Reaven E, Wright D, Mondon CE et al. Effect of ahe and diet of insulin secretion and insulin action in rats.

Diabetes 1983; 32: 175-180.
22. Shukia R, Sharma SB, Puri D et al. Medicinal plants for treatment of diabetes mellitus. *Indian journal of clinical biochemistry sciences* 2000.
23. Eidi A, Eidi M, Esmaeili E. Antidiabetic effect of garlic (Allium sativum L.) normal and streptozotocin-induced diabetic rats. *Phytomedicine* 2006; 13(9): 624-9.
24. Kumar R, Sharma B, Tomar NR et al. Vivo evaluation of hypoglycemic activity of Aloe spp. And identification of its mode of action on GLUT-4 gene expression in vitro. *Appl Biochem Biotechnol* 2011; 164: 1246-1256.
25. Modak M, Dixit P, Londhe J et al. Indian herbs and herbal drugs used for the treatment of diabetes. *J Clin Biochem Nutr* 2007; 40(3): 163-173.
26. Khosla P, Bhanwra S, Singh J et al. A study of hypoglycaemic effects of Azadirachta indica (Neem) in normal and alloxan diabetic rabbits. *Indian J Physiol Pharmacol* 2000; 44(1): 69-74.
27. Hashmat I, Azad H, Ahmed A. Neem (Azadirachta indica A. Juss)-A nature's drugstore: an overview. *Int Res J Biol Sci* 2012; 1: 76-9.
28. Jayasree T, Chandrsekhar N, Rohit D. Evaluation of hypoglycemic effects of chloroform extracts of stem of Benincasa hispida in Male wistar rats. *International journel of pharmaceutical & phytopharmacological research* 2011; 1: 67-72.
29. Nazeerullah K, Sunil K, Pal SR et al. A pharmacognostic and pharmacological overview on Caesalpinia bonducella. *Research Journal of Pharmaceutical, Biological and Chemical Sciences* 2012; 3(1): 440-96.
30. Kannur D, Hukkeri V, Akki K. Antidiabetic activity of Caesalpinia bonducella seed extracts in rats. *Fitoterapia* 2006; 77(7): 546-9. doi: 10.1016/j.fitote.2006.06.013.
31. Sharma S, Dwivedi S, Swarup D. Hypoglycaemic, antihyperglycaemic and hypolipidemic activities of Caesalpinia bonducella seeds in rats. *Journal of Ethnopharmacology* 1997; 58(1): 39-44.
32. Giribabu N, Karim K, Kilari EK et al. Phyllanthus niruri leaves aqueous extract improves kidney functions, ameliorates kidney oxidative stress, inflammation, fibrosis and apoptosis and enhances kidney cell proliferation in adult male rats with diabetes mellitus. *J Ethnopharmacol* 2017; 205: 123-137.
33. Ahangarpour A, Oroojan A. Effect of crust and seed hydro-alcoholic and aqueous extracts and pulp hydro-alcoholic extract of Citrullus colocynthis on glucose, insulin and FIRI level in insulin resistant male rat's. *Horizon Med Sci* 2013; 19(3): 149-54.