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Comprehensive review on various medicinal plants having potent anti-diabetic activity

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Abstract

A review on medicinal plants possessing anti-diabetic activity. Brief description of parts used, extraction and mechanism of induction of diabetes is presented. Diabetes is a metabolic disorder characterised by disturbances in carbohydrate, protein and fat metabolism. Diabetes may be controlled by diet management, insulin injection and by oral hypoglycaemic agents. Herbal medicine have more significance due to their safety, efficacy, and easy availability.medicinal plants are popularly known for their health benefits.By suggestion of ethanobotanical information about 800 plants shows antidiabetic potential. The most common active constituents to treat diabetes is Flavonoids, tannnnins, phenolic acids, alkaloids. Various extarctions like aqueous, methanolic, ethanolic,dichloromethane, petroleum ether, and hexane were used to demonstrate effective hypoglycaemic activity. Various models like streptozotocin (STZ)-induced diabetes, Alloxan-induced diabetes, alloxan-monohydrate induced diabetes, streptozotocin+ nicotinamide induced diabetes mellitus in rats are used to induce diabetes.

Key words: Botanical name, extraction, anti-diabetic, mechanism.

Introduction

Diabetes mellitus is a group of metabolic disorders that ar e characterized by hyperglycemia due to insulin secretion defects, insulin action, or both. Chronic diabetes hyperglyc emia is associated with longterm injury, dysfunction, and l oss of numerous organs, including the eyes, necks, nerves, heart and blood vessels [1].

In the development of diabetes, many pathogenic mechani sms are involved. These range from autoimmune disruptio n of the pancreas cells resulting in insulin deficiency, to an omalies resulting in insulin resistance. Deficient insulin act ion on target tissues is the cause of the defects in carbohyd rate, fat, and protein metabolism in diabetes.

Insufficient insulin action results from insufficient secretio n of insulin and/or reduced tissue insulin responses at one or more points in the complex pathways.2 insulin secretion dificiency and insulin defects frequently coexist in the same patient, and it is often unknown which abnormality is the primary cause of hyperglycemia [2].

The WHO Global Burden of Disease estimated that about 1 77 million people in the world had diabetes in the year 20 00 in terms of the worldwide burden. This second version of the Diabetes Atlas is estimated at 194 million in 2003, w ith nearly twothirds of these people living in developingco untries. No comfort at all is given by the forecasts for the f uture. The above figure can well more than double the year 2025 if current trends prevail [3].

We also recognize that in some communities, as much as a fifth or even a third of acute health sector funding needs to be allocated to diabetes and its longterm complications. In the world, there are almost 2000 ethnic groups, and almost every group has its own traditional medical knowledge and experi ence [4].

Anti-diabetic activity of various plants:

Sl. No	Botanical name	Local name	Family	Parts used	Extracts	Mechanism	Reference
1	*Camellia sinensis*	green tea	Theaceae	Leaves	75%Methanolic extract	Alloxan-induced diabetes	Sabu *et al.*,2002 [5].
2	*Syzygium cumini*	Java plum	Myrtaceae	seed	Ethanolic extract	streptozotocin (STZ)-induced diabetes	Kumar*et al.*,2013 [6].
3	*Azadirachta Indica*	Neem	Meliaceae	Leaves	Aqueous extract	Streptozotocin induced models of IDDM, NIDDM model	Sonia *et al.*,1999 [7].
4	*Tridax procumbens*	coatbuttons	Compositae	Leaves	aqueous, alcoholic, and petroleum ether extracts	Alloxan-induced diabetes	Bhagwan *et al.*,2008 [8]
5	*Terminalia Catappa Linn*	Almond	Combretaceae	Leaves	Aqueous cold extract	alloxan-induced diabetic rats	Ahmed *et al.*,2005 [9].
6	*Bauhinia forficata*	kachnar	Fabaceae	Leaves	ethanol extract	streptozotocin-diabetes (STZ-diabetes)	Pepato *et al.*,2002 [10].
7	*Hibiscus rosasinensis*	China rose	Malvaceae	flowers	ethanol extract	Alloxan-induced diabetic	Venkatesh *et al.*,2008 [11].
8	*Murraya koenigii*	Curry	Rutaceae	Leaves	Aqueous extract	STZ induced diabetes	Prasad *et al.*,2009 [12].
9	*Psidium guajava*	guava	Myrtaceae				
10	*Catharanthus roseus*	Cape periwinkle	Apocynaceae				
11	*ferula assafoetida*	Asafetida	Apiaceae	resins	Aqueous extract	pancreatic β-cells damage by alloxan-induced diabetes	Abu *et al.*,2010 [13].
12	*Vinca rosea*	Bright eyes	Apocynaceae	whole plant	Methanolic extract	alloxan induced diabetes in rats	Ahmed *et al.*, 2010[14].
13	*Terminalia chebula Retz*	Black myrobalan	Combretaceae	fruits	Ethanolic extract	alloxan-monohydrate induced diabetes	Kannan *et al.*,2012 [15].
14	*Marrubium vulgare*	white horehound	Lamiaceae	aerial part	aqueous extract	alloxan-monohydrate induced diabetes	Boudjelal *et al.*,2012 [16].
15	*Morus alba* L.	white mulberry	Moraceae	Leaves	70% ethanol extract	STZ induced diabetes	Hunyadi *et al.*,2012

							[17].
16	*Paspalum scrobiculatum* Linn.	*Kodo millet*	Poaceae	grains	aqueous and ethanolic extracts	alloxan induced diabetic rats.	Jain *et al.,* 2010[18].
17	*Suillellus luridus*	lurid bolete	Boletaceae	Fungus	hot water and ethanolic extract	Diabetes induced by injecting streptozotocin	Zhang *et al.,*2018 [19].
18	*Cassia occidentalis*	coffee senna	Fabaceae	whole plant	petroleum ether, chloroform and aqueous extract	alloxan-induced diabetic rats	Verma *et al.,*2010 [20].
19	*Barleria prionitis* Linn	porcupine flower	Acanthaceae	Leaves, roots	Alcoholic extract	normal and alloxan-induced diabetic rats	Dheer *et al.,* 2010[21].
20	*Psidium guajava*	guava	Myrtaceae	leaves,	methanolic extract	by the inhibition of alpha-glucosidase and alpha-amylase enzyme	Manikandan *et al.,* 2013[22].
21	*Vaccinium bracteatum* Thunb.	Sea Bilberry	Ericaceae	leaves		streptozotocin-induced diabetic mice	Wang *et al.,* 2013[23].
22	*Ocimum basilicum*	Basil	Lamiaceae	aerial parts	dichloromethane, methanol, and hexane extracts	Evaluation of role of glucose transporter-4 (GLUT4)	Kadan *et al.,* 2016[24].
23	*Gynostemma pentaphyllum*	jiaogulan	Cucurbitaceae	Herb		inhibit the glucose absorption	Wang *et al.,*2019 [25].
24	*Glycosmis pentaphylla*	Orangeberry	Rutaceae	stem bark	ethanol extracts, polyherbal formulation	streptozotocin+ nicotinamide induced diabetes mellitus in rats.	Petchi *et al.,*2014 [26].
25	*Tridax procumbens,*	coatbuttons	Compositae	whole plant			
26	*Mangifera indica*	Mango	Anacardiaceae	Leaves			
27	*Ficus amplissima*	kal-itchchi	Moraceae	Bark	methanolic extract	streptozotocin-induced diabetic rats	Arunachalam *et al.,*2013 [27].
28	*Vernonia cinerea*	Iron weeds	Compositae	Leaves	Ethanol extracts	alpha-amylase and alpha-glycosidase assays	Alara *et al.,* 2018[28].
29	*mulberry*	morus	Moraceae	Leaves		streptozotocin (STZ)-induced diabetic rats	Zhang *et al.,* 2014[29].
30	*Aegle marmelos*	Bael	Rutaceae	Leaves,callus	Methanol extracts	streptozotocin (STZ)-induced diabetic rabbits	Arumugam *et al.,* 2015[30].
31	*Croton macrostachyus*	Broad-leaved *Croton*	Euphorbiacea	leaves	Aqueous extract	Alloxan Induced Diabetic Mice	Akira *et al.,* 2015[31].
32	*Anacardium occidental L.*	Cashew nut	Anacardiaceae	Leaves	Ethanol extract	*n*-streptozotocin diabetic rats	Jaiswal *et al.,* 2017[32].

33	*Ajuga remota Benth*	Auja	Lamiaceae	Leaves	aqueous and 70% ethanol extracts	alloxan-induced diabetic mice	Tafesse *et al.,* 2017[33].
34	*Nerium oleander* L.	Nerium	Apocynaceae	Leaves	hydromethanolic extract	alloxan induced diabetes in mice	Dey *et al.,* 2015[34].
35	Syzygium calophyllifolium	Pretty-Leaved Plum	Myrtaceae	Bark	Methanol extract	Streptozotocin-Nicotinamide (STZ-NA) induced diabetic rats	Chandran *et al.,*2016[35].
36	*Nigella sativa*	Balck cumin	Ranunculaceae	Seeds	Methanol extract	*Streptozotoc in*induced diabetic male rats	El Rabey *et al.,* 2017[36].
37	*Momordica charantia*	Bitter melon	Cucurbitaceae			Streptozotocin induced diabetes	Shanker *et al.,* 2017[37].
38	*Emblica officinalis*	Indian gooseberry	Phyllanthaceae		Ethanolic extract		Fatima *et al.,* 2017[38].
39	*Momordica charantia* L.	Bitter melon	Cucurbitaceae	Fruit	Aqueous extract	alloxan-induced diabetic mice	Xu *et al.,* 2015[39].
40	*Myrtus Communis*	myrtle	Myrtaceae	Leaves	Hydroalcholic extract	Streptozotocin induced diabetic rats	Panjeshahin *et al.,* 2016[40].

Sl. No	***Botanical name***	**Local name**	**Family**	**Parts used**	**Nanoparticles**	**Mechanism**	**reference**
1	*Hibiscus subdariffa*	Roselle	Malvaceae	leaves	Zinc oxide nano particles	streptozotocin (STZ) induced diabetic mice	Bala *et al.,*2015[41].
2	-	-	-	-	zinc oxide and silver nanoparticles	streptozotocin (STZ) induced	Alkaladi *et al.,*2014[42].
3					Zinc oxide nanoparticles	streptozotocin-induced Type 1 and 2 diabetic rats	Umrani *et al.,*2014[43].
4	*Glycyrrhiza glabra*	liquorice	Fabaceae	Roots,rhizomes	glycyrrhizin loaded nanoparticles	nicotinamide-streptozotocin induced diabetic rats	Rani *et al.,* 2017[44].

Conclusion

This artice concludes the details about various plants and their parts used to treat anti-diabetic activity. This article consist of list of the plants recorded for the treatment of diabetes and their parts used. The Detailed Results would definitely draw the number of researchers to conduct additional studies that may lead to diabetes treatment medications.This can be accompalished by studies on pure plant derived chemical constituents in invivo clinical trials.however for the improved status of medicinal plants,much needs to be achieved in further research.

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Conflict of Interest

The authors have declared no conflict of interest.

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