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MEDICINAL PLANTS POTENTIAL TO TREAT DIABETES: A REVIEW

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ABSTRACT

Diabetes mellitus is a systematic metabolic disease which is characterised by hyperglycemia, hyperaminoacidemia and hypoinsulinemia this leads to decrease in insulin secretion and insulin action. This dreadful disease is found in all parts of the world, it is becoming a serious threat to mankind health. It is caused by deficiency in the production of insulin which results in decrease or increase in the glucose in the blood. Antidiabetic agents are the drugs which are used to treat diabetes. Hypoglycemic agents are the drugs which are used to treat diabetes mellitus by lowerig glucose level in the blood. Hyperglycemic agents are the drus which are used to increase the glucose level in the blood. In present review, many authors collected more information about the herbal plants phytoconstituents that has been studied against diabetes. The plants containing chemical constituents like polyphenols, alkaloids, glycosides, flavonoids, polysaccharides and terpenoids. These chemical constituents are responsible for the treatment of diabetes. The herbs have own pharmacological action with the prescribed as an antidiabetic drug.

KEYWORDS: Diabetes, Antihyperglycemic agents, Hypoglycemic agents.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder, it occurs due to the presence of higher concentration of glucose in in blood. It also occurs due to increase in production of insulin pancreas or decrease in the production of insulin.[1] Diabetes is one amongst various lifestyle disorder which acts as breeding ground for all life threatening diseases. The major cause of

diabetes is premature illness occurs due cardio vascular disease, blindness and kidney failure.[2] Diabetes is associated with one common manifestation hyperglycemia and it is a group of metabolic disorder.[3,4] Damage of eyes, kidneys, nerves, heart and blood vessels, these are the causes of chronic hyperglycemia.[5] Some of the oral hypoglycemic agents produce undesirable side effects, for this alternative therapy is required.[6] Some of the traditional medicines are used in the therapy of diabetes in a bright future. Diabetes may be doubled in 2030.[7] Diabetes is characterised by the symptoms like polyuria(frequent urination), polyphagia(increase hunger) and polydypsia(increased thirst).[8] Lots of chemical agents are available to treat diabetic patients. As per the world health organization 21,000 plants are used for medicinal purpose around the world and some of the herbal drugs are used for the treatment of diabetes.

Diabetes can be determined by performing some diagnostic tests like measurement of blood glucose level, oral glucose tolerance test, fasting blood glucose test. Now a days insulin injections, oral antidiabetic drugs, like Sulfonylureas, Metaglinides(increase insulin secretion), Biguanides(decrease glucose production), Thiazolidinediones(increase insulin sensitivity) and α-glucosidase inhibitors.[9]

According to world health organization, diabetes mellitus as a metabolic illness of multiple causes, distinguished by persistant increase in blood sugar level along with changes in carbohydrate, fat and protein metabolism. In India it occurs between the age group of 45-64 years.[10]

It is one of the refractory disease which is identified by Indian council of medical research for the achievement of alternative medicine is needed for the treatment.[11] Number of medicinal plants are used traditionally over 1000 years named Rasayana are present in herbal preparation.[12]

Classification of Diabetes Mellitus[13]

- **Type 1 Diabetes mellitus**: It is also known as Insulin dependent diabetes mellitus or immune mediated diabetes. It occurs due to the damage of pancreatic β-cells which are responsible for producing insulin. In this type of diabetes very little or no insulin is produced in pancreas. Symptoms of Type 1 Diabetes mellitus are frequent urination, increased thirst, increased hunger and weight loss.

- **Type 2 Diabetes mellitus**: It is also known as Non-insulin dependent diabetes mellitus. It is caused by insulin resistance with relative insulin deficit to insulin secretory deficiency. It is a long term metabolic disorder which is characterised by high blood sugar, insulin resistance. Long term complications from high blood sugar includes heart disease, strokes, diabetic retinopathy which results in blindness and kidney failure.
- **Gestational Diabetes**: This type of diabetes occurs in pregnant women. Who never has diabetes earlier, but have high blood glucose level during pregnancy, this leads to development of Type 2 diabetes mellitus. Symptoms of gestational diabetes are, feeling more thirsty, feeling more hunger.

Complications of Diabetes Mellitus

- Diabetic retinopathy
- Diabetic foot infection
- Diabetic nephropathy
- Diabetic ketoacidosis
- Stroke

Plant Extracts Used for the Treatment of Diabetes

Table No. 1: Antidiabetic Activity of the Plant Extracts.

Sl.No	Botanical Name	Common Name	Family	Parts used	Activity	Reference
01	*Abrama augusta*	Devil`s cotton	Sterculiaceae	Stem & Bark	Anti diabetic	[14]
02	*Aconitum Palmatum*	Aconite	Raunculaceae	Stem & Bark	Anti diabetic	[14]
03	*Abrus precatorius L*	Kundumani	Fabaceae	Leaves		[15]
04	*Abutilon indicum*	Thuthi	Malvaceae	Stem & Bark	Anti diabetic	[14]
05	*Albizia odoratissima*	Black siris	Mimosaceae	Bark	Anti diabetic	[17]
06	*Aegle marmelos*	Bael	Rutaceae	Fruit	Anti diabetic	[16]
07	*Aloe barbadensis*	Aloe vera	Liliaceae	Leaves	Anti diabetic	[19]
08	*Allivum sativum*	Garlic	Liliaceae	Bulb	Anti diabetic	[18]
09	*Asparagus racemosusa*	Satavari	Liliaceae	Shoots	Anti diabetic	[14]
10	*Acacia Arabica*	Babul	Leguminaceae	Bark	Anti diabetic	[60]
11	*Axonopus Compressus*	Savannah	Poaceae	Leaves	Antidiabetic	[20]
12	*Allium cepa*	Onion	Amaryllidaceae	Onion powder	Anti diabetic	[21]
13	*Boenninghau Senia albifora*	White Himalayan Rue	Rutaceae	Whole plant	Anti diabetic	[14]
14	*Berberis aristata*	Indian berry	Berberidaceae	Root & Bark	Anti diabetic	[14]
15	*Bougainvillea Glabra*	Paper flower	Nyctanginaceae	Leaves	Anti diabetic	[22]
16	*Bryonia alba*	White bryony	Curcurbitacae	Roots	Anti diabetic	[23]
17	*Caesalpinia digyna*	Vakeri mool	Fabaceae	Root	Anti diabetic	[24]
18	*Campylandra Aurantiaca*	Nakima	Liliaceae	Flower	Anti diabetic	[14]
19	*Cajanus cajan*	Pigeon pea	Fabaceae	Leaves	Anti diabetic	[25]

20	*Canabis sativa*	Hemp	Cannabaceae	Leaves	Anti diabetic	[14]
21	*Ceibapentandra*	Silk cotton tree	Bombcaceae	Roots & Bark	Anti diabetic	[26]
22	*Centarium erythrea*	European centaury	Gentianaceae	Leaves	Anti diabetic	[27]
23	*Chaenomeles Sinensis*	Chinese quince	Rosaceae	Fruit	Anti diabetic	[28]
24	*Cissampelo pareira*	Velvet leaf	Menispermaceae	Root & Bark	Anti diabetic	[14]
25	*Citrulus colocynthis*	Bitter apple	Cucurbitaceae	Fruit	Anti diabetic	[29]
26	*Costus specious*	Crepe ginger	Costaceae	Rhizome	Anti diabetic	[14]
27	*Dillenia indica*	Elephant apple	Dilleniaceae	Leaves	Anti diabetic	[30]
28	*Embelia ribes*	Vidanga	Myrisinaceae	Berries	Anti diabetic	[31]
29	*Enicostemma littorale*	Indian gentian	Gentianaceae	Whole plant	Anti diabetic	[32]
30	*Ficus racemose*	Gular	Moraceae	Fruit	Anti diabetic	[14]
31	*Eucalyptus globulus*	Blue gum tree	Myrtaceae	Leaves	Anti diabetic	[34]
32	*Girardiana heterophylla*	Stinging needle	Urticaceae	Root	Anti diabetic	[14]
33	*Gynocardia odorata*	Chaulmurga seeds	Flacourtiaceae	Fruit	Anti diabetic	[14]
34	*Gymnema sylvestre*	Gurmar	Asclepiadaceae	Leaves	Anti diabetic	[33]
35	*Ipomoea batatus*	Sweet potato	Convolvulaceae	Leaves	Anti diabetic	[35]
36	*Hibiscus rosasinesis*	Shoe flower	Malvaceae	Leaves	Anti diabetic	[37]
37	*Hybanthus enneaspermus*	Spade flower	Violaceae	Whole plant	Anti diabetic	[36]
38	*Jatropha curcas*	Barbados nut	Euphorbiaceae	leaves	Anti diabetic	[38]
39	*Lippa nodiflora*	Hairy fogfruit	Lauraceae	Whole plant	Anti diabetic	[39]
40	*Listea cubeba*	May chang	Lauraceae	Fruit	Anti diabetic	[14]
41	*Ocimum sanctum*	Holy basil	Lamiaceae	Leaves	Anti diabetic	[40]
42	*Oroxylum indicum*	Indian trumpet flower	Bignoniaceae	Stem & bark	Anti diabetic	[14]
43	*Paederia foetida*	Chinese fever vine	Rubiaceae	Leaves	Anti diabetic	[14]
44	*Panax pseudo ginseng*	Himalayan ginseng	Araliaceae	Rhizome	Anti diabetic	[14]
45	*Picrorhiza kurrooa*	Kutki	Scrophulariaceae	Rhizome	Anti diabetic	[14]
46	*Potentilla fulgens*	Cinquefoils	Rosaceae	Root	Anti diabetic	[14]
47	*Prosopis glandulosa*	Honey mesquite	Fabaceae	Whole plant	Anti diabetic	[41]
48	*Punica granatum*	Pomegranate Anar	Punicaceae	Flower	Anti diabetic	[42]
49	*Quercus lanata*	Woolly leaved oak	Fagaceae	Stem & Bark	Anti diabetic	[14]
50	*Tinospora cordifolia*	Guduchi, giloy	Menispermaceae	Root	Anti diabetic	[19]
51	*Trigonella foenum-graceum*	Fengugreek	Fabaceae	Seed	Anti diabetic	[19]
52	*Saraca ascosa*	Ashoka tree	Caesalpiniaceae	Flower	Anti diabetic	[14]
53	*Sonneratia alba*	Mangrove apple	Lynthraceae	Leave	Anti diabetic	[44]
54	*Stephania glabra*	Thaya nuya	Menispermaceae	Root	Anti diabetic	[14]
55	*Semecarpus anacardium*	Bhilawa	Anacardiaceae	Nut	Anti diabetic	[43]
56	*Symplocos cochinchinensis*	Kambli-vetti	Symplocaceae	Leaves	Anti diabetic	[45]
57	*Syzygium cumini*	Jamun , Jambul	Myrtaceae	Seeds	Anti diabetic	[46]
58	*Vitis vinifera*	Woody vine	Vitaceae	Leaves	Anti diabetic	[47]
59	*Wattakaka volubilis*	Perun – kurinjan	Asclepiadaceae	Leaves	Anti diabetic	[19]

Table No. 2: Hypoglycemic Activity of The Plant Extracts.

Sl.No	Botanical Name	Common Name	Family	Parts used	Activity	Reference
	Acacia Arabica	Babul	Leguminaceae	Bark	Hypoglycemic	[60]
1	*Annona squamosal*	Sugar apple	Annonaceae	Leaf	Hypoglycemic	[59]
2	*Barleria cristata*	Phillippine violet	Acanthaceae	Seeds	Hypoglycemic	[58]
3	*Allium sativum*	Garlic	Lilliaceae	Bulb	Hypoglycemic	[18]
4	*Aloe barbadensis*	Aloe vera	Lilliaceae	Leaves	Hypoglycemic	[19]
5	*Barberis vulgaris*	European berberry	Berberidaceae	Root	Hypoglycemic	[57]
6	*Beta vulgaris*	Sugar beet	amaranthaceae	Leaves	Hypoglycemic	[56]
7	*Catharanthus roseus*	Sadabahar	Apocyanaceae	Leaves	Hypoglycemic	[55]
8	*Ceibapentandra*	Silk cotton	Bombacaceae	Root & Bark	Hypoglycemic	[26]
9	*Cinnamomum tamala*	Tejpat	Lauraceae	Leaves	Hypoglycemic	[54]
10	*Coccinea grandis*	Kunderi	Cucurbitaceae	Whole plant	Hypoglycemic	[53]
11	*Ficus bengalenesis*	Banyan tree	Moraceae	Bark	Hypoglycemic	[52]
12	*Gymnema sylvestre*	Gurmar	Asclepiadaceae	Leaves	Hypoglycemic	[33]
13	*Lippa nodiflora*	Hairy fogfruit	Verbenaceae	Whole plant	Hypoglycemic	[39]
14	*Oscium sanctum*	Tulsi	Lamiaceae	Leaves	Hypoglycemic	[40]
15	*Ophiopogon japonicas*	Mondo grass	Aspargaceae	Root	Hypoglycemic	[51]
16	*Pterocarpus marsupium*	Vijayasar	Fabaceae	Wood	Hypoglycemic	[50]
17	*Trigonella foenum – graecum*	Fenugreek	Fabaceae	Seed	Hypoglycemic	[19]
18	*Withania somnifera*	Winter cherry Ashwagandha	Solanaceae	Root & Leaf	Hypoglycemic	[49]
19	*Zinziber officinale*	Ginger	Zinziberaceae	Rhizomes	Hypoglycemic	[48]

Table No. 3: Antihyperglycemic Activity of Plant Extracts.

Sl.No	Botanical Name	Common Name	Family	Parts used	Activity	Reference
1	*Allium cepa L*	Onion	Alliaceae	Bulb	Anti hyperglycemic	[15]
2	*Azadirachta indica*	Neem	Melliaceae	Leaves & Seeds	Anti hyperglycemic	[61]
3	*Brasssica juncea*	Mustard	Cruciferae	Seeds	Anti hyperglycemic	[62]
4	*Cassia auriculata*	Avartaki	Caesalpiniaceae	Leaves	Anti hyperglycemic	[63]
5	*Cocos nucifera*	Coconut	Arecaceae	Leaves	Anti hyperglycemic	[64]
6	*Lantana aculeate*	Red sage	Verbenaceae	Leaves	Anti hyperglycemic	[65]
7	*Psidium guajava*	Guava	Myrtaceae	Fruit	Anti hyperglycemic	[66]
8	*Solanum torvum*	Devil's fig	Solanaceae	Fruit	Anti hyperglycemic	[67]
9	*Solanum xanthocarpum*	Kantkari	solanaceae	Leaves	Anti hyperglycemic	[68]
10	*Vitex negundo*	Chainese chastetree	Lamiaceae	Leaves	Anti hyperglycemic	[69]
11	*Zea mays*	Maize	Gramineae	Corn silk	Anti hyperglycemic	[70]

CONCLUSION

Diabetes mellitus is a dreadful disease and also one of the most leading disorders, it may increases the risk of secondary applications which are affecting the eyes, kidneys, nerves and heart. It is one of the metablolic disease which is characterized by the presence of high concentration of glucose in the blood. So many therapies are available to treat the diabetes. However, the allopathic medicines producing several unwanted side effects. The herbal medicines having similar mechanism of action as allopathic medicines but it has negligible side effect with low cost. The chemical constituents like alkaloids, flavonoids, steroids, poly phenol, polysaccharides present in the herbal drugs are used in the treatment of many diseases including diabetes. Plant drugs and herbal medicines are less toxic and they are free from side effects than synthetic drugs. Antihyperglycemic effects of the plants due to their ability to restore the pancreatic tissues. Hence, treatment with herbal drugs has an effect to protect the pancreatic β- cells and smoothing out fluctuation in the glucose levels.

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