

**Herbal plants used in treatment of diabetes mellitus: an updated review**

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Diabetes mellitus is one such disease which is causing serious problems to human being health. Diabetes Mellitus is a metabolic disorder characterized by hyperglycemia due to defect in insulin secretion, insulin action or both. It is caused by the deficiency or ineffective production of insulin by pancreas which results in increase or decrease in concentrations of glucose in the blood. It is found to damage many of the body schemes, mostly the blood vessels and nerves both insulin-dependent DM (IDDM) and non-insulin dependent DM (NIDDM) is a common and serious metabolic disorder throughout the world. The utilize of plants as medicines has been an important component of the health care system in India. Traditional plant treatments have been used throughout the world for the therapy of diabetes mellitus. Allopathic drugs have not shown any significant effect for the treatment of the disease. Many more medicinal plants have found potential use as hypoglycemic in the Indian system of medicines. In this review, there are 50 plants described. The present review gives detailed information about diabetes mellitus and the various medicinal plants used in the treatment of the disease.

**Keywords:** diabetes mellitus, insulin, hyperglycemia, medicinal plants**INTRODUCTION:**

Diabetes Mellitus is a metabolic disorder characterized by hyperlipidemia, hyperglycemia and hypoinsulinaemia; it leads to decrease in both insulin secretion and insulin action. It is estimated that 25% of the world population is affected by this disease. Diabetes mellitus is caused by the abnormality of carbohydrate metabolism which is linked to low blood insulin level or insensitivity of target organs to insulin<sup>1</sup>.

Diabetes mellitus, commonly referred to as diabetes was first identified as a disease associated with "sweet urine," with excessive muscle loss in the traditional world. Prominent levels of blood glucose (hyperglycemia) lead to spillage of glucose into the urine, therefore the word sweet urine. Usually, blood glucose levels are compactly controlled by insulin, a hormone formed by the pancreas. Insulin lowers the blood glucose level.<sup>2</sup>

**Table 1: Blood sugar level in normal & diabetic patients<sup>3</sup>**

CATEGORY OF A PERSON	FASTING VALUE		AFTER MEAL
	Minimum value	Maximum value	Value after 2 hours of consuming glucose
NORMAL	70	100	Less than 140
EARLY DIABETES	101	126	140-200
ESTABLISHED DIABETES	More than 126	—	More than 200

\* All values are in mg/100ml

**CAUSES OF DIABETES**

Deficient production of insulin, production of defective insulin or the inability of cells to use insulin properly and efficiently leads to hyperglycemia and diabetes.

If someone is resistant to insulin, the body can increase production of insulin and overcome the level of resistance. After time, if production decreases and insulin cannot be free as powerfully, hyperglycemia develops.

Glucose is a simple sugar found in food. Glucose is necessary nutrients that supply energy for the proper functioning of the body cells. Carbohydrates are broken down in the small intestine and the glucose in digested food is then absorbed by the intestinal cells into the bloodstream and is conveyed by the bloodstream to all the cells in the body. Hence glucose cannot enter the cells alone and needs insulin to aid in its transport into the cells<sup>3</sup>.

Without insulin the cells become starved of glucose energy despite the presence of abundant glucose in the bloodstream. The abundant, unutilized glucose is wastefully excreted in the urine.

After a meal, the blood glucose level rises and the response to the increased glucose level, the pancreas normally releases more insulin into the bloodstream to help glucose enter the cells and lower blood glucose levels after a meal while the blood glucose levels are minors, the insulin release from the pancreas is turned down. It is essential to note that still in the fasting state there is a low steady release of insulin than fluctuates a bit and helps to maintain a steady blood sugar level for the duration of fasting. In normal individuals, such a regulatory system helps to keep blood glucose levels in a tightly controlled range<sup>4</sup>.

#### CLASSIFICATION OF DIABETES MELLITUS

Insulin is the principal hormone that regulates uptake of glucose into most cells from the blood (primarily muscle and fat cells, but not central nervous system cells), absence of insulin or the insensitivity of its receptors plays a central role in all forms of diabetes mellitus. Therefore, diabetes mellitus as a disease condition is classified into three major types of diabetes<sup>5</sup>.

1. Type-I (Insulin dependent diabetes mellitus)
2. Type-II (Non-insulin dependent diabetes mellitus)

#### 3. Gestational diabetes mellitus.<sup>6</sup>

**1) Type -I or Insulin Dependent Diabetes Mellitus:** In insulin dependent diabetes mellitus, insulin is completely absent because the pancreas lacks cells or contains defective cells. This arises from the metabolic control provided by periodic insulin injection. The usual rapid onset of the indications of insulin dependent diabetes mellitus suggested that the autoimmune attack on the pancreatic cells is responsible for the shorter duration of this disease. The main signs and symptoms include hyperglycemia, increased thirst and hunger, frequent urination, weight loss, ketoacidosis<sup>7</sup>.

**2) Type-II or Non-insulin Dependent Diabetes Mellitus:** Non insulin dependent diabetes mellitus is characterized by reduced insulin secretion in response to glucose levels and Insulin resistance which leads to the inefficient absorption of glucose into the cell for energy. The elevated insulin production results from overeating (obesity is almost always the result of overeating). It eventually suppresses the synthesis of insulin receptor (a plasma membrane bound glycoprotein). This hypothesis concludes that diet alone is usually sufficient to control this type of diabetes.<sup>8</sup>

**3) Gestational diabetes mellitus:** Gestational diabetes mainly develops during the time of pregnancy. It results due to the hormonal changes in pregnancy which can change the body ability to use insulin leading to carbohydrate intolerance. It results in hyperglycemia of variable severity. It usually disappears after the birth of child, and does not clarify that the child will be born with diabetes<sup>9</sup>.

#### ORAL HYPOGLYCEMIC DRUGS

These drugs lower blood glucose levels and are effective orally. The chief drawback of insulin is- it must be given by injection.

Table 2: Classification of oral hypoglycemia<sup>10</sup>

<b>SULFONYLUREAS</b>	<b>FIRST GENERATION</b>	Tolbutamide Chlorpropamide,
	<b>SECOND GENERATION</b>	Glipizide, Gliclazide, Glimepride, Glibenclamide,
<b>BIGUNIDES</b>		Metformin
<b>MEGLOTINIDE</b>		Nateglinide, Repaglinide
<b>THIAZOLIDINEDIONES</b>		Pioglitazone, Rosiglitazone
<b>A GLUCOSIDASE INHIBITORS</b>		Acarbose, Miglitol

#### HERBAL PLANTS USED IN THE TREATMENT OF DIABETES MELLITUS:

The treatments of diabetes include diet, exercise, use of oral hypoglycemic agents and insulin is the primary forms of treatment for diabetes. Medicinal plants have been

used in virtually all cultures as a source of medicine since time immemorial. Its use as a normative basis for the maintenance of good health has been widely observed in developing countries<sup>11</sup>.

Currently available synthetic antidiabetic agents besides being expensive produce serious side effects. Apart from currently available therapeutic opportunity, several herbal medicines have been optional for the treatment of diabetes mellitus; medicinal plants have the benefit of having no side effects and low cost<sup>12</sup>. The active principles present in medicinal plants have been reported

to possess pancreatic beta cells redevelop, insulin releasing and fighting the difficulty of insulin resistance<sup>13</sup>. Some of the medicinal plants have been reported to be useful in the diabetes and antihyperlipidemic remedies. Antihyperglycemic activity of medicinal plants is mainly due to their ability to restore the function of pancreatic tissues by absorption of glucose or to the facilitation of metabolites in insulin dependent processes<sup>14</sup>.

**Table 3:** Herbal plants used in the treatment of diabetes mellitus.

Table 3:

S.No.	Plant Name	Hindi Name	Part used	Activities	Ref. No.
1	<i>Ocimum sanctum</i>	Tulsi	Leaves	Antibacterial, anticancer, antiasthmatic,	15
2	<i>Berberis aristata</i>	Daruharidra	Stem, root , fruit	Fever, liver and spleen diseases	16
3	<i>Commiphora wightii</i>	Guggulu	Stem bark, Flower	pruritus, dyspepsia, fever	16
4	<i>Aconitum heterophyllum</i>	Ativisa	Bark, Fruit	nervous system, scorpion or snake bite	16
5	<i>Embelia ribes</i>	Vidanga	Fruit, Leaves	constipation, headache, flatulence	16
6	<i>Aegle marmelos</i>	Bilva	Leaves, fruit, stem, root	asthma, blood pressure, jaundice	16
7	<i>Plantago ovata</i>	Isabgol	Flower, fruit	Constipation, diarrhoea, dysentery, soften the stools	17
8	<i>Nardostachys jatamansi</i>	Jatamansi	Rhizome	hair loss, hypertension	17
9	<i>Convolvulus pluricaulis</i>	Shankhpushpi	Herb	Insomnia, epilepsy, urinary disorders	17
10	<i>Bacopa monnieri</i>	Brahmi	entire plant is used medicinally	Epilepsy, insomnia and skin disorders.	17
11	<i>Withania somnifera</i>	Aswagandha	Fruit, Root	Anxiety and depression, ulcer, Scabies	17
12	<i>Cassia angustifolia</i>	Svarnapatri	Leaves, fruit	jaundice, dysentery, Fever and haemorrhoid. Laxative,	17
13	<i>Holarrhena antidysenterica</i>	Kutaja	Stem bark and root	Anthelmintic, Amoebicidal, Antibacterial,	18
14	<i>Emblica officinalis</i>	Amla	Fruit	Anaemia, dyspepsia, cancer, hyperacidity	18
15	<i>Saraca asoca</i>	Asoka	Leaves	Carminative	18
16	<i>Santalum album</i>	Chandan	heartwood	sore throat, initial phase of pox, skin diseases	18
17	<i>Swertia chirata</i>	Kirata	Whole plant	Laxative, antipyretic,	18
18	<i>Tinospora Cordifolia</i>	Guduchi	Root, stem, leaf	allergy, gout, piles, high blood sugar, febrile conditions	18

19	<i>Picrorhiza Kurroa</i>	Katuka	Rhizome	Anti-inflammatory, hepatoprotective, stomachic	19
20	<i>Asparagus racemosus</i>	Shatavari	Leaves, Root	Antipyretic, diuretic, Antispasmodic	20
21	<i>Piper longum</i>	Pippali	Fruit	cold, bronchitis, asthma, indigestion, loss of appetite	20
22	<i>Azadirachta indica</i>	Nimba	Leaves, fruit, stem bark	gingivitis, malaria, rheumatism, asthma	21
23	<i>Gymnema sylvestre</i>	Meshashringi	Plant, leaves	diarrhoea, asthma, cardiopathy	22
24	<i>Andrographis paniculata</i>	Kalmegh	leaves and stems	cough, bronchitis, sinusitis, pharyngotonsillitis	23
25	<i>Azadirachta indica</i>	Nimba	Leaves, fruit, stem bark	gingivitis, malaria, rheumatism, asthma	23
26	<i>Chlorophytum borivillianum</i>	Safed Musli	Fibrous root	Joint pains, gonorrhoea, leucorrhoea	24
27	<i>Glycyrrhiza glabra</i>	Yastimadhuka	Root	throat, gastric, duodenal ulcer, dyspepsia, rheumatism	25
28	<i>Piper longum</i>	Pippali	Fruit	cold, bronchitis, asthma, indigestion, loss of appetite	26
29	<i>A. barbadensis</i>	<i>Aloe vera</i>	Leaves	Skin diseases, blisters, burns	27
30	<i>Saussurea lappa</i>	Kushta	Flower, fruit	Antiinflammatory, antiarthritic, aphrodisiac	28
31	<i>Solanum nigrum</i>	Kakamachi	fruit, stem and leaves	Liver disorders, stomach ulcer, dysentery	29
32	<i>Beta vulgaris</i>	Garden beet	Root	Diabetes mellitus	30
33	<i>Brassica juncea</i>	Brown musturd	Leaf	Diabetes mellitus	31
34	<i>Allium cepa</i>	Onion	bulb	Diabetes mellitus	32
35	<i>Citrillus colocynthis</i>	Bitter apple	Leaves	Diabetes mellitus	33
36	<i>Artemesia pallens</i>	Davana plant	Aerial parts	Diabetes mellitus	34
37	<i>Casalpinia bonducella</i>	Chinese cinnamon	Leaf	Diabetes mellitus	35
38	<i>Coccinia indica</i>	Ivy	Leaf	Diabetes mellitus	36
39	<i>Eugenia jambolana</i>	Indian black berry	Leaves	Diabetes mellitus	37
40	<i>Hibiscus rosa chinensis</i>	China rose	Leaves	Diabetes mellitus	38
41	<i>Murraya koenigii</i>	Curry leaves	leaves	Diabetes mellitus	39
42	<i>Allium sativum</i>	Garlic	bulbs	Diabetes mellitus	39
43	<i>Salacia reticulata</i>	Pomogranate	Leaves	Diabetes mellitus	40
44	<i>Swertia chirayita</i>	Indian gentian	aerial parts	Diabetes mellitus	41
45	<i>Scorparis dulcis</i>	Sweet broom weed	Leaf	Diabetes mellitus	42

46	<i>Canavalia ensiformis</i>	Horse been	Seeds	Diabetes mellitus	43
47	<i>Ficus hispida</i>	Daduri	Leaves	Diabetes mellitus	44
48	<i>Bambusa vulgaris</i>	Bambusa vulgaris	bamboos	Diabetes mellitus	45
49	<i>Gymnema sylvestre</i>	Madhu nashini	Leaf	Diabetes mellitus	46

Table 4: Some marketed Antidiabetic Polyherbal Formulations<sup>47</sup>

Name	Company	Ingredients
Epinsulin	Swastik Formulations	<i>Pterocarpus marsupium</i>
Gurmar powder	Garry and Sun natural Remedies	<i>Gymnema sylvestre</i>
Dia-care	Admark Herbals Limited	<i>Sanjeevan Mool; Himej, Jambu beej, Kadu, Namejav, Neem chal.</i>
Bitter gourd Powder	Garry and Sun natural remedies	<i>Momordica charantia</i>
Diabecure	Nature beaute sante	<i>Juglans regia, Erythrea centaurium, Millefolium Berberis vulgaris, Taraxacum,</i>
Syndrex	Plethico Laboretaries	Germinated <i>Fenugreek</i> seed extract
Diasulin	Tobbest Busindo	<i>Cassia auriculata, Coccinia indica, Curcuma longa, Emblica officinalis, Gymnema sylvestre, Momordica charantia, Scoparia dulcis, Syzygium cumini, Tinospora cordifolia, Trigonella foenum graecum.</i>

#### CONCLUSION:

The use of plant drugs also demands correct identification and characterization as their safety and efficacy depend on the use of proper plant part and its biological potency, which in revolve depends upon the existence and nature of required. In this review we discussed about folklore medicinal plants for the treatment of Diabetes mellitus. Diabetes mellitus is a chronic disease which leads to various complications on long standing. Allopathic medicines are not effective in treating the disease leading to various adverse effects. Hence medicinal plants are the best alternative for the treatment of diabetes mellitus. The plant species have proved their efficacy in reducing blood glucose levels. These efforts may provide treatment for all and justify the role of novel traditional medicinal plants having anti-diabetic potentials. In this review article an attempt has been made to focus on hypoglycemic plants & may be useful to the health professionals, scholars and scientists functioning in the field of pharmacology & therapeutics to develop evidence based alternative medicine to cure different kinds of diabetes in man & animals.

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