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Current Researches on Plants Having Antidiabetic Potential: An Overview

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ABSTRACT

Diabetes mellitus is a major threat to global public health as the world wide incidences rising day by day and now emerging as global epidemic affecting approximately 285 million people worldwide that will increase to 439 million by 2030. International Diabetic Federation (IDF) has estimated that by 2025 every fifth diabetic subject in world will be an Indian. As the disease progresses, tissue or vascular damage ensues leading to severe diabetic complications such as retinopathy, neuropathy, nephropathy, cardiovascular complications and ulceration and projected as the World's main disablerand killer in the next 25 years.Therefore, the management of diabetes is still challenging one. In last few years, there has been an exponential growth in the field of herbal medicine and gaining popularity both in developing and developed countries because of their natural origin and less side effects. There is a great demand for search on safer and cost effective natural products with anti-diabetic properties. Various scientific studies have confirmed the beneficial effect of plants with antidiabetic effects in the management of Diabetes mellitus in Streptozotocin and Alloxan induced diabetic animal models. In present reviewmedicinal plants with antidiabetic activity are enlisted based on article published in various scientific journals.

INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Several distinct types of DM exist and are caused by a complex interaction of genetics and environmental factors. Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production. The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system[1].Diabetes mellitus is a global health crisis, which has been persistently affecting the humanity, irrespective of the socioeconomic profile and geographic location of the population. According to an estimate, one person is detected with diabetes every 5 sec somewhere in the world, while someone dies of it every 10 sec.[2]Many synthetic hypoglycemic agents are currently available but they are either too expensive or produce undesirable side effects on chronic use[3].Plants and plant derived compounds have a great potential to cure and control diabetes, additionally they are safer and cost effective. Since the antiquity Diabetes has been treated with plant medicines and many plants were known for their antihyperglycaemic activity across the world. Now a days more than 400 plants species having hypoglycemic property and many of them still remain to be scientifically evaluated.[4,5] Plant possess various phyto constituent whichseemstobetheactivehypoglycemic principles, suggests different sites of action within the body. Most of the researches are carried out to evaluate the therapeutic effect of the plants along with their mode of action.Plants shows antidiabetic activity with various mechanism, i.e.- alteration of glucose metabolism, insulin like effect/insulinotropic action, Improve glucose tolerance, reduction of absorption of glucose from intestine, enhancing insulin signal pathway, hypoglycemia through increase glucose uptake and glycogen synthesis, inhibiting for α -glucosidase and α-amylase, reduction of insulin resistance, reduction of oxidative stress and protecting against tissue damage, generation of beta cell in pancreas etc. After reviewing the recent research articles in various well established scientific journals, here 156 plants with antidiabetic potential are summarized in tabular form.

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S.No.	Botanical Name	Family	Parts used	Observation/ Mode of action
1.	*Adhatoda zeylanica*[6]	Acanthaceae	Leaf	Significant reduction in blood glucose level in allaxon induced diabetic rats.
2.	*Adenia lobata*[7]	Passifloraceae	stem	Significantly reduce the blood glucose level in STZ induced Diabetic rats.
3.	*Acacia tortilis*[8]	Mimosoideae	seed	Lowers serum glucose levels in normal and diabetic rats and significantly increases glucose tolerance in Alloxan-induced diabetic rats
4.	*Aloe vera*[9]	Liliaceae	Leaf	Shows Antidiabetic activity in streptozotocin induced diabetic rats
5.	*Astragalus membranaceus*[10]	Fabaceae	PLSH. fraction	Shows hypoglycemic effect of polysaccharides enriched extract in diet induced insulin resistantmice
6.	*Andrographis stenophylla*[11]	Acanthaceae	Leaf	ShowsHypoglycaemic Activity
7.	*Abutilon indicum*[12]	Malvaceae	Whole plant	Aqueous extract inhibits glucose absorption and stimulates insulin secretion in rodents.
8.	*Acosmium panamense*[13]	Fabaceae	Bark	Glucose lowering activity in streptozotocin diabetic rats
9.	*Acourtia thurberi*[14]	Asteraceae	Root	Reduces blood glucose in normal mice & Lowered hyperglycemia in rabbits
10.	*Aegle marmelos*[15-17]	Rutaceae	Fruit	improve functional state of the pancreatic ss-cells and partially reversed the damage caused by STZ to the pancreatic islets
			Leaf	modulates the activity of enzymic and nonenzymic antioxidants and enhances the defense against reactive oxygen species-generated damage in diabetic rats
			Leaf	Effectively reduced the oxidative stress induced by alloxan and produced a reduction in blood sugar.
11.	*Agarista mexicana*[18]	Ericaceae	Stem	Hypoglycemic activity in alloxan induced diabetic mice
12.	*Aloe barbedensis*[19]	Liliaceae	Leaf	significant decrease in serum glucose, total cholesterol and triacylglycerols
13.	*Panax quinquefolius*[20]	Araliaceae	Root	significant effects on fasting blood glucose levels and glucose tolerance test
14.	*Anacardium occidentale*[21]	Anacardiaceae	Leaf	significantly reduced the blood glucose levels in a dose dependent manner in streptozotocin-induced diabetic rats
15.	*Anemarrhena asphodeloides*[22]	Asphodelaceae	Rhizome	Stimulates insulin secretion in islets of normal Wistar and diabetic GK rats.
16.	*Arachis hypogaea*[23]	Fabaceae	Nut	Hypoglycemic activity in normal and in streptozotocin induced diabetic rats
17.	*Artemisia pallens*[24]	Asteraceae	Arial part	Blood glucose lowering effects in hyperglycemic and alloxan induced diabetic rats
18.	*Artemisia judaica*[25]	Asteraceae	Whole plant	Significantly reduce the blood glucose level in diabetic rats.
19.	*Artemisia santonicum*[26]	Asteraceae	Panicle	Hypoglycemic activity in alloxan-induced diabetic rabbits
20.	*Annona squamosa*[27,28]	Annonaceae	Root	Antidiabetic activity in Streptozotocin induced-hyperglycemic Rats
			leaf	Hypoglycemic and antidiabetic effect in streptozotocin (STZ)-induced diabetic rats and alloxan-induced diabetic rabbits(23)
21.	*Azadirachta indica*[29-31]	Meliaceae	Fruit	beneficial effects on blood glucose levels in normoglycemic rabbits
			leaf	Blood sugar lowering activity in streptozotocin induced diabetic rats
			Seed	the whole oil and the acidic portion of oil shows very significant hypoglycaemic effect
22.	*Artocarpus heterophyllus*[32]	Moraceae	Leaf	Significant reduction in the F.B.S. conc. and a significant improvement in glucose tolerance in normoglycemic rats,
23.	*Beta vulgaris*[33]	Amaranthaceae	Rhizome	Reversed the effects of diabetes on blood glucose and tissue lipid peroxidation and glutathione levels.

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24.	*Biophytum sensitivum*[34]	Oxalidaceae	Leaf	Significantly reduce the blood glucose and glycosylated haemoglobin level
25.	*Barleria lupulina*[35]	Acanthaceae	Aerial part	Reduction of blood glucose in streptozotocin hyperglycemic rats
26.	*Bauhinia candicans*[36]	Fabaceae	Leaf	Hypoglycemic activity in alloxan-induced diabetic rabbits
27.	*Bauhinia forficata*[37-38]	Fabaceae	leaf	Shows hypoglycemic effect
			Leaf	Reducing hyperglycemia as well as hyperlipidemia in alloxan-induced diabetic rats
28.	*Boerhavia diffusa*[39]	Nyctaginaceae	Leaf	Significant reduction in serum and tissue cholesterol, free fatty acids, phospholipids, and triglycerides in alloxone induced diabetic rats.
29.	*Berberis aristata*[40]	Berberidaceae	Root	Strong potential to regulate glucose homeostasis through decreased gluconeogenesis and oxidative stress.
30.	*Begonia malabarica*[41]	Begoniaceae	Stem	Reduction in fasting and postprandial plasma glucose levels, increase inSerum insulin levels and liver glycogen levels
31.	*Benincasa hispida* [42]	Cucurbitaceae	Fruit	Improve the glucose level and metabolic derangements in lipid caused by alloxan induced diabetes in rats
32.	*Bougainvillea spectabilis*[43]	Nyctaginaceae	Bark	Sugar-lowering capacity streptozotocin induced diabetic albino rats
33.	*Brassica juncea*[44]	Brassicaceae	Seed	Significant dosage dependent augmenting effect of the seed extract on the serum insulin was recorded on streptozotocin induced diabetic male albino rats.
34.	*Brassica oleracea*[45]	Brassicaceae	Stem	Hypoglycemic activity in alloxan induced hyperglycemic rats
35.	*Bryophyllum pinnatum*[46]	Crassulaceae	Leaf	Antidiabetic properties in streptozotocin (STZ)-induced diabetes mellitus
36.	*Butea monosperma*[47]	Fabaceae	Leaf	Significant hypoglycemic and anti-oxidant activity in alloxan induced diabetic male adult mice
37.	*Caesalpinia bonducella*[48]	Caesalpiniaceae	Seed	Significant recovery in the activities of carbohydrate metabolic enzymes along with correction in FBG and glycogen levels
38.	*Calamintha officinalis*[49]	Lamiaceae	Aerial part	Hypoglycemic effect independently of insulin secretion in streptozotocin induced diabetic rats
39.	*Camellia sinensis*[50]	Theaceae	Leaf	Effective to reduce most of the diabetes associated abnormalities in a steptozotocin-induced diabetes model of rats
40.	*Carica papaya*[51]	Caricaceae	Leaf	Exerted a hypoglycemic and antioxidant effect and also improved the lipid profile in diabetic rats
41.	*Catharanthus roseus*[52]	Apocynaceae	Leaf	Lowering of plasma glucose and an increase in plasma insulin were observed
42.	*Caralluma attenuata*[53]	Asclepidaceae	Whole plant	Glucose lowering activity in both diabetic and normal rats
43.	*Cyanodon dactylon*[54]	Poaceae	Whole plant	Aqueous extract and non-polysaccharide fraction of *Cyanodon dactylon shows* Antidiabetic activity
44.	*Cichorium intybus*[55]	Asteraceae	Whole plant	Shows Antidiabetic Effect in STZ-Diabetic Rats
45.	*Cassia fistula*[56]	Fabaceae	Stem	Reduced serum blood glucose conc., induced favorable changes in body weight, improved transaminase activity.
46.	*Citrullus colocynthis*[57,58]	Cucurbitaceae	Root	Significant reduction in blood sugar level, serum creatinine, serum urea and serum protein
			Fruit	Significant reduction in F.B.S.,P.P.B.S.and glycosylated haemoglobin in clinical trial
47.	*Carthamus tinctorius*[59]	Asteraceae	Flower	Meaningful decrease in FBS, triglyceride, cholesterol, LDL-C and VLDL-C in diabetic rats
48.	*Carum carvi*[60]	Apiaceae	Seed	Caraway has both antihyperglycemic and hypolipidemic activity in diabetic
49.	*Cinnamomum tamala*[61]	Lauraceae	Oil	Significant reduction in blood glucose level liver glycogen content, plasma insulin level and glycosylated hemoglob in

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				streptozotocin induced diabetic rats
50.	*Coccinia indica*[62]	Cucurbitaceae	Fruit	Reduction of fasting blood sugar alloxan induced diabetic rats.
51.	*Costus speciosus*[63]	Costaceae	Root	Significantly decreased Plasma glucose level, glycosylated hemoglobin (HbA(1c)), increased plasma insulin & tissue glycogen.
52.	*Costus igneus*[64]	Costaceae	Leaf	Reduced the fasting and postprandial blood sugar levels, bringing them towards normal, in dexamethasone-induced hyperglycemia in rats.
53.	*Cogniauxia podolaena*[65]	Cucurbitaceae	Leaf	Hypoglycemic activity in alloxan induced diabetic rats
54.	*Cecropia pachystachya*[66]	Urticaceae	Leaf	Significant hypoglycemic effect with a blood glucose reduction & antioxidant activity
55.	*Coriandrum sativum*[67]	Apiaceae	Fruit	Reduced plasma glucose ,insulin and IR, TC, LDL-cholesterol in obese-hyperglycemic-hyperlipidemic (OHH) Meriones shawi rats
56.	*Clerodendron infortunatum*[68]	Verbenaceae	Leaf	Significantly reduced blood glucose levels SGOT, SGPT, alkaline phosphatase in STZ diabetic rats.
57.	*Cucumis trigonus*[69]	Cucurbitaceae	Fruit	Significant increase in the body weight, liver glycogen and serum insulin level and decrease in the blood glucose, glycosylated hemoglobin levels.
58.	*Curcuma longa*[70]	Zingiberaceae	Rhizome	Significantly suppressed an increase in blood glucose level in type 2 diabetic KK-A(y) mice
59.	*Cucurbita ficifolia*[71]	Cucurbitaceae	Fruit	Hypoglycemic action, improve GSH redox state, increasing glutathione pool
60.	*Cyamopsis tetragonoloba*[72]	Fabaceae	Bean	Antihyperglycaemic activity in alloxan induced diabetic rats
61.	*Datura metel*[73]	Solanaceae	Seed	Blood glucose lowering effect in normoglycemic and in alloxan-induced hyperglycemic rats
62.	*Dillenia indica*[74]	Dilleniaceae	Leaf	Beneficial effect on blood glucose level and enhance serum insulin level
63.	*Dalbergia sissoo*[75]	Fabaceae	Bark	Significant reduction in blood glucose levels increase in glycogen content in liver of Alloxan-induced diabetic rats
64.	*Desmodium gangeticum*[76]	Fabaceae	aerial parts	Significant reduction in blood glucose & increase in insulin secretion from MIN6 cells grown as monolayers and as pseudo islets, indicating the antidiabetic activity
65.	*Diospyros peregrina*[77]	Ebenaceae	Fruit	Possess significant dose dependent hypoglycemic and hypolipidemic activity
66.	*Dioscorea alata*[78]	Dioscoriaceae	Tuber	Blood glucose level was reduced significantly and Serum lipid levels, total protein, albumin, and creatinine were reversed toward near normal
67.	*Dioscorea bulbifera*[79]	Dioscoriaceae	Bulb	Showed α-amylase inhibitory activity
68.	*Emblica officinalis*[80]	Euphorbiaceae	Leaf	Showed a significant decrease in fasting blood glucose and increase insulin level as compared with the diabetic rats
69.	*Enicostemma littorale*[81]	Gentianaceae	Whole plant	Significant decrease in serum glucose and triglycerides
70.	*Equisetum myriochaetum*[82]	Equisetaceae	Aerial part	Showed Hypoglycemic activity
71.	*Eugenia jambolana*[83]	Myrtaceae	Seed	Showed dose-dependent decrease in blood glucose level in diabetic rats
72.	*Eugenia uniflora*[84]	Myrtaceae	Leaf	Inhibitory activities on increase plasma glucose level in sucrose tolerance test
73.	*Eucalyptus globulus*[85]	Myrtaceae	Leaf	Reduces the oxidative stress in alloxan-induced rat
74.	*Ficus glomerata*[86]	Moraceae	Leaf	Shows hypoglycaemic Activity in alloxan Induced Diabetic Rats
75.	*Ficus bengalensis*[87]	Moraceae	Aerial root	Hypoglycemic effect in normoglycemic and antidiabetic effect in sub- and mild-diabetic models
76.	*Ficus religiosa*[88]	Moraceae	Bark	Significant reduction in blood glucose levels glucose-loaded hyperglycemic and streptozotocin (STZ)-induced diabetic rats.

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77.	*Ficus racemosa*[89]	Moraceae	Bark	Glucose lowering efficacy in alloxan induced diabetic rats
78.	*Ficus hispida*[90]	Moraceae	Bark	Hypoglycemic activity in normal and diabetic rats
79.	*Ganoderma lucidum*[91]	Ganodermataceae	Fruiting bodies.	Body weights and serum insulin levels of the GI-PS treated groups are significantly higher whereasFBG levels are significantly lower.
80.	*Ginkgo biloba*[92]	Ginkoaceae	Root	Antihyperglycaemic, antioxidant & antihyperlipidemia activities in STZ-induced chronic diabetic rats
81.	*Garuga pinnata*[93]	Burseraceae	Bark	Significant increase in the liver glycogen and serum insulin level and a significant decrease in fasting blood glucose and glycated hemoglobin levels
82.	*Gymnema sylvestre*[94]	Asclepiadaceae	Leaf	Significant reduction in fasting blood glucose, cholesterol and serum triglyceride content
83.	*Helicteres isora*[95,96]	Sterculiaceae	Fruit	Exhibit significant antioxidant activity and moderate antidiabetic activity
			Root	Hypoglycemic activity
84.	*Hemidesmus indicus*[97]	Asclepiadaceae	Root	Decrease blood glucose level significantly and restored serum electrolytes, glycolytic enzymes and hepatic cytochrome P-450-dependent enzyme systems
85.	*Indigofera tinctoria*[98]	Fabaceae	Leaf	Significant decrease in blood glucose level of rabbits as estimated by Folin-Wu Method.
86.	*Ipomoea aquatica*[99]	Convolvaceae	Leaf	Reduces the fasting blood sugar level of streptozotocin induced diabetic rats
87.	*Inula racemosa*[100]	Asteraceae	Root	Significant decrease in blood glucose levels,super oxide dismutase and glutathione
88.	*Juglans regia*[101]	Juglandaceae	Leaf	Significant reduction of glucose, HbA1c, total cholesterol and serum triglycerides
89.	*Jatropha curcas*[102]	Euphorbiaceae	Leaf	Significant reduction in blood glucose level inalloxan induced diabetic rats.
90.	*Kigelia pinnata*[103]	Bignoniaceae	Flower	Significantly reduced blood glucose, serum cholesterol and triglycerides levels
91.	*Leucas lavandulaefolia*[104]	Lamiaceae	Whole plant	Significant and consistent hypoglycemic effects in Alloxan hyperglycemic rats
92.	*Loranthus micranthus*[105]	Loranthaceae	Leaf	Hypoglycemic and antihyperglycaemic activity
93.	*Luffa acutangula*[106]	Cucurbitaceae	Seed	Significantly reduced fasting blood sugar of Streptozotocin diabetic rats in a dose-related manner, with maximum hypoglycemic effect at after 21 days
94.	*Luffa cylindrica*[107]	Cucurbitaceae	Fruit	Shows promising antidiabetic activity in alloxan-induced diabetic Wistar rats.
95.	*Malmea depressa*[108]	Annonaceae	Root	Hypoglycemic effect in streptozotocin diabetic rats
96.	*Mangifera indica*[109]	Anacardiaceae	Leaf Kernel	Significantly increased insulin level at the dose level of 100, 200 mg/kg in alloxan induced diabetic rats.
97.	*Momordica charantia*[110]	Cucurbitaceae	Fruit	Isolated compounds, bitter gourd extract, juices and powders have demonstrated potential in lowering blood sugar
98.	*Merremia emarginata*[111]	Convulvulaceae	Whole plant	Carbohydrate metabolizing enzymes such as hexokinase were significantly increased whereas G-6-P, fructose-1, 6-bisphosphatase were significantly decreased in diabetic rats.
99.	*Morinda citrifolia*[112]	Rubiaceae	Fruit	Gluconeogenic genes, phosphoenolpyruvate C kinase (PEPCK) and glucose-6-phosphatase (G6P), were significantly inhibited
100.	*Morus alba*[113]	Moraceae	Root bark	Hypoglycemic effect in streptozotocin-induced diabetic rats
101.	*Moringa oleifera*[114]	Moringaceae	Leaf	FBG and PPG levels were reduced whereas, total protein, body weight and haemoglobin were increased
102.	*Murraya koenigii*[115]	Rutaceae	Leaf	Increases plasma insulin level in alloxan-induced diabetic rats
103.	*Merremia tridentata*[116]	Convulvulaceae	Root	Significant increase in serum insulin, body weight and glycogen content in liver and skeletal muscle of STZ-induced diabetic rats
104.	*Musa sapientum*[117]	Musaceae	Flower	Antihyperglycaemic activity in alloxan diabetic rats
105.	*Mucuna pruriens*[118]	Fabaceae	Seed	Hypoglycemic activity in STZ induced diabetic rats.

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106.	*Ocimum sanctum*[119,120]	Labiatae	Leaf	Restored the depressed hepatic glycogen levels possibly by increasing the level of insulin
			Arieal part	Found potent antidiabetic by ameliorating glucose and lipid parameters
107.	*Origanum vulgare*[121]	Lamiaceae	Leaf	Antihyperglycemic activity in STZ diabetic rats without affecting insulin secretion
108.	*Otostegia persica*[122]	Labiateae	Whole plant	Shows antidiabetic effects on STZ diabetic rats.
109.	*Paspalum scrobiculatum*[123]	Poaceae	Grain	Significant increase in serum insulin level, liver glycogen and a significant decrease in glycated haemoglobin levels
110.	*Phoenix dactylifera*[124]	Arecaceae	Leaf	significantly reduced blood glucose &Plasma insulin level increased in alloxan-induced diabetic rats
111.	*Plectranthus amboinicus*[125]	Lamiaceae	Leaf	Significant reduction in blood glucose, possesses hypoglycemic and antihyperlipidemic effects mediated through the restoration of the functions of pancreatic tissues and insulinotropic effect.
112.	*Pterocarpus santalinus*[126]	Fabaceae	Bark	Significant antidiabetic activity by reducing the elevated blood glucose levels and glycosylated hemoglobin, improving hyperlipidemia and restoring the insulin levels in treated experimental induced diabetic rats
113.	*Punica granatum*[127,128]	Punicaceae	Rind	Showed significant and dose dependent antidiabetic activity by maintaining the blood glucose levels within the normal limits.
			Leaf	Significant increase in glycogen content in the liver, cardiac, and skeletal muscle and reduced intestinal glucose absorption.
114.	*Phyllanthus niruri*[129]	Euphorbiaceae	Leaf	Reduces the levels of plasma glucose
115.	*Pandanus fascicularis*[130]	Pandanaceae	Arieal root	Significant dose-dependent reduction in serum glucose in both normoglycemic and hyperglycemic rats and also improved glucose tolerance test
116.	*Psidium guajava*[131]	Myrtaceae	Leaf	Increase the plasma insulin level and glucose utilization in diabetic rats
117.	*Pterocarpus marsupium*[132]	Fabaceae	Bark	Exhibits significant antidiabetic activity and corrects the metabolic alterations in diabetic rats and this activity may resemble insulin-like properties.
118.	*Potentilla fulgens*[133]	Rosaceae	Root	Hypoglycemic activity in alloxan-induced diabetic mice
119.	*Pongamia pinnata*[134]	Fabaceae	Leaf	Decreased the blood glucose level in alloxan-induced diabetic albino rats
120.	*Panax ginseng*[135]	Araliaceae	Root, Berry	Antidiabetic and antihyperglycemic activity
121.	*Retama raetam*[136]	Fabaceae	Flower	Hypoglycaemic activity in normal and diabetic rats
122.	*Rehmannia glutinosa*[137]	Scrophulariaceae	Root	Hypoglycemic activity in glucose-induced hyperglycemic and alloxan-induced diabetc rats
123.	*Rubus fructicosis*[138]	Rosaceae	Leaf	Hypoglycemic activity in streptozotocin diabetic rats
124.	*Salacia Oblonga*[139]	Celastaceae	Root	Serum insulin was significantly increased & Plasma HbA1c was significantly decreased
125.	*Salmalia malabarica*[140]	Bombacaceae	Sepal	A significant reduction of FBG level in STZ-induced diabetic rat.
126.	*Salvia oficinalis*[141]	Lamiaceae	Leaf	Hypoglycaemic effect on streptozotocin-induced hyperglycaemic rats
127.	*Sclerocarya birrea*[142]	Anacardiaceae	Stem bark	Hypoglycemic activity in normal and in alloxan induced diabetic rats
128.	*Santalum album* [143]	Santalaceae	Heart wood	Santalum album pet ether fraction has potential antihyperlipidemic activity that can help in overcoming insulin resistance
129.	*Scoparia dulcis*[144]	Scrophulariaceae	Whole	Significant increase in plasma insulin levels, evoked two-fold

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			plant	stimulation of insulin secretion from isolated islets, indicating its insulin secretagogue activity
130.	*Sida tiagii*[145]	Malvaceae	Fruit	Significant improvement in blood glucose level, glycated hemoglobin and liver glycogen contents
131.	*Silybum marianum*[146]	Asteraceae	Aerial part	Hypoglycemic and antihyperglycemic activity in normal and STZ diabetic rats without affecting insulin secretion
132.	*Sizygium cumini*[147]	Myrtaceae	Bark	Significantly decreased the blood glucose, effect exerted by the extract was greater than that of glibenclamide.
133.	*Syzygium cordatum*[148]	Myrtaceae	Leaf	Short-term hypoglycaemic effect in streptozotocin-induced diabetic rats
134.	*Stereospermum suaveolens*[149]	Bignoniaceae	Bark	Significantly reduced the fasting blood glucose and pancreatic TBARS level and significantly increased the liver glycogen
135.	*Stevia rebaudiana*[150]	Asteraceae	Leaf	Significant decrease in the blood glucose level, without producing condition of hypoglycemia
136.	*Swietenia macrophylla*[151]	Meliaceae	Seed	Significantly reduced blood glucose levels after 45 days of treatment in STZ-diabetic rats.
137.	*Symplocos cochinchinensis*[152]	Symplocaceae	Leaf	Significant reduction in plasma insulin, plasma and hepatic total cholesterol and a significant increase in liver glycogen were observed in treated diabetic rats.
138.	*Tamarindus indica*[153]	Fabaceae	Seed	Antidiabetic activity in streptozotocin induced diabetic rats
139.	*Terminalia arjuna* [154]	Combretaceae	Leaf	Demonstrated remarkable antihyperglycemic activity in STZ-induced diabetic rats
140.	*Terminalia belerica*[155]	Combretaceae	Fruit	Lower the serum glucose level in alloxan diabetic rats
141.	*Terminalia chebula*[156]	Combretaceae	Fruit	Significantly reduced the elevated blood glucose and elevated glycosylated hemoglobin
142.	*Toddalia asiatica*[157]	Rutaceae	Leaf	Significant decrease in blood glucose, plasma enzymes (SGOT, SGPT and ALP) and significant increase in body weight, total protein, serum insulin and liver glycogen levels in treated diabetic rats
143.	*Terminalia paniculata*[158]	Combretaceae	Bark	Significantly reduced elevated blood glucose, HbA1c, creatinine, urea, SGPT and SGOT levels
144.	*Tetrapleura tetraptera*[159]	Fabaceae	Fruit	Hypoglycemic activity
145.	*Tectona grandis*[160]	Lamiaceae	Flower	Shows antidiabetic activity in STZ induced diabetic rats
146.	*Tinospora cordifolia*[161]	Meninspermaceae	Stem	prevented the rise in glucose levels by 21.3%, insulin by 51.5%, triglycerides by 54.12% and glucose-insulin index by 59.8% of the fructose fed rats
147.	*Trigonella foenum-graecum*[162]	Meninspermaceae	Seed powd.	reverse the hyperglycemia induced changes to normal levels in diabetic rat brain.
148.	*Tridax procumbens*[163]	Asteraceae	Leaf	Shows antidiabetic activity
149.	*Vernonia colorata*[164]	Composeae	Leaf	Antidiabetic activity in normoglycaemic and alloxan-induced diabetic rats
150.	*Vinca rosea*[165]	Apocyanaceae	Whole plant	Shows antidiabetic activity in Allaxon diabetic rats.
151.	*Viscum album*[166]	Viscaceae	Leaf, stem	Shows anti-diabetic and anti-hyperlipidemic effects in STZ-diabetic rats
152.	*Withania coagulans*[167]	Solanaceae	Fruit	activities of glucokinase and phosphofructokinase were significantly increased ,whereas glucose-6-phosphatase activity was significantly decreased
153.	*Withania somnifera*[168]	Solanaceae	Root, Leaf	Possess hypoglycaemic and hypolipidaemic activities in alloxan-induced diabetes mellitus (DM) rats.
154.	*Zingiber officinale*[169]	Zingiberaceae	Rhizome	Reduced fasting blood glucose, increased serum insulin level and also enhanced insulin sensitivity in alloxan-induced diabetic and insulin resistant diabetic rats
155.	*Zizyphus spina-christi*[170]	Rhamnaceae	Leaf	Antidiabetic activity
156.	*Zizyphus jujuba*[171]	Rhamnaceae	Leaf	Significantly reduced fasting serum glucose level and increase serum insulin level

CONCLUSION

Plant products can be used as adjuvants or even may replace the synthetic drugs in the antidiabetic treatment, as they have no proven side effects and they can help reduce the costs associated with the treatment. By putting a bird's eye view on aforesaid plants, we found that lots of researches were carried out on plants having potent antidiabetic potential to establish their pharmacological activity and mechanism of action. During the management of diabetes by keeping every possibility of mechanism of each drug provides a basic knowledge for a compound formulation. Still most of the pharmacological activities were limited to animal model; hence clinical trial of individual as well as compound formulation should be conducted in order to establish the safety and effectiveness of above said claim. This review can be used as ready reckoner for further research as well as clinical purpose.

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