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A Comprehensive Review on Antidiabetic Potential of Medicinal Plants

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ABSTRACT

Diabetes mellitus is one of the common metabolic disorders acquiring around 2.8% of the world's population and is anticipated to cross 5.4% by the year 2025. India is slated to be the diabetic capital of the world, with 50.8 million diabetics. Since ancient time plants have been exemplary source of medicine. Ayurveda and other Indian literature mentioned the used of plants in treatment of various ailments. Recently, the World Health Organization (WHO) recommended the use of medicinal plants for the management of DM and further encouraged the expansion of the frontiers of scientific evaluation of the hypoglycemic properties of diverse plant species. A comprehensive review was conducted to pile up information about medicinal plants used for the treatment of diabetes mellitus. The profiles presented include information about the scientific and family name, plant parts and test model used, the degree of hypoglycemic activity, and the active chemical constituents. The review describes some new bioactive drugs and isolated compounds from plants such as diallyl trisulfide, lophenol, cinnamaldehyde, curcumin, mangiferin, oleanolic acid, coagulanolide, tetrahydrocurcumin showing significant insulinomimetic and anti-diabetic activity with more efficacy than conventional hypoglycaemic agents. Thus, from the review majorly, the antidiabetic activity of medicinal plants is attributed to the presence of polyphenols, flavonoids, terpenoids, coumarins and other constituents which show reduction in blood glucose levels. The review also discusses the management aspect of diabetes mellitus using these plants and their active principles.

KEYWORDS

Diabetes mellitus, Herbal medicine, Active ingredient, Hypoglycaemic activity, Medicinal plant, Phytoconstituents



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INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder caused by an absolute or relative lack of insulin and/or reduced insulin activity that results in hyperglycemia and abnormalities in carbohydrate, protein and fat metabolism¹. Due to insulin deficiency, people are suffering from diabetes have high levels of blood glucose. Non-insulin-dependent diabetes mellitus or Type 2 diabetes, is the most common form of the disease, that accounts for 90%–95% of cases in which the body is not able to produce enough insulin or properly use it². According to International Diabetes Federation (IFD), the world diabetic population in 2015 was estimated to be 415 million and the prevalence increased from 4.7% in 1980 to 8.5% in 2015. The International Diabetes Federation (IDF) revealed that, in 2040, diabetes will affect 642 million persons making it one of the leading cause of death and disability worldwide³. Now a days, oral blood glucose lowering agents and insulin are used in the clinical management of diabetes mellitus⁴. The current therapies that are available for diabetes include insulin and various other oral antidi-

abetic agents such as sulfonylureas, biguanides and glinides. Many of them have serious side effects; therefore, the search for more safer and effective hypoglycemic agents is one of the important areas for investigation². Unfortunately, the prevalence of this disease continues to rise worldwide and little can be done to prevent the delay of its secondary complications⁴. Plants are good source of drugs and many of the currently available drugs have been derived directly or indirectly from plants². Human race has used plants for the treatment of diabetes mellitus, there are 700 recipes containing more than 400 plants known for their antidiabetic activity. India is sitting on a gold mine of well-recorded and well-practiced knowledge of traditional herbal medicine and hence must capitalize on this herbal wealth by promoting its use worldwide⁴. Natural products having antidiabetic potential that acts through either insulinomimetic or secretagogues properties are reviewed in this paper. List of the medicinal plants having antidiabetic potential according to plant part used and mode of action were presented in table 1.



PLANTS POSSESSING ANTIDIABETIC ACTIVITY

Table 1: List of plants possessing blood sugar lowering activity

S.no.	Biological Source	Extract Used/ Plant Part	Dose / Days / Animal / Model Used / Route of Administration	Results / Inference / Mechanism of Action
1	<i>Abutilon indicum</i> (Malvaceae) ⁵ Indian mallow	Aqueous/ Whole plant	0.5 and 1 g/kg bw/ Rat	Antidiabetic/ Inhibited glucose absorption and stimulated insulin secretion
2	<i>Acacia arabica</i> (Lam.) Willd. (Fabaceae) ¹ Babul	Chloroform/ Bark	250 and 500 mg/kg bw/ 2 Weeks/ Rat/ Alloxan	Antidiabetic
3	<i>Achillea santolina</i> L. (Compositae) ⁶ Gasium	Ethanol:Water (7:3 v/v)/ Aerial parts	0.1 g/kg/ 30 days/ Rat/ STZ/ Oral	high hypoglycaemic activity and this may be attributed to its antioxidative potential
4	<i>Acorus calamus</i> L. (Acoraceae) ⁷ Sweet flag	Ethyl acetate fraction/ Radix	100 mg/kg/ 3 weeks/ Mice/ Oral	Insulin sensitizing activity
5	<i>Aegle marmelos</i> (L.) Corr. Serr. (Rutaceae) Bael	Aqueous/ Seeds ⁸	250 mg/kg/ 14 days/ Rat/ STZ/ Oral	Antidiabetic and hypolipidemic
		Aqueous/ Fruits ⁹	125 and 250 mg/kg/ 4 Weeks/ Rat/ STZ/ Oral	Hypoglycaemic
		Lupeol (1) (Triterpenoid)/ Leaves ¹⁰	100 mg/kg bw/ Rat / STZ	Antihyperglycemic
6	<i>Aerva lanata</i> (L.) Juss. ex Schultes. (Amaranthaceae) ¹¹ Sunny khur	Alcohol/ Shoots	375 mg/kg and 500 mg/kg bw/ 2 weeks/ Rat/ Alloxan/ Oral	Antidiabetic
7	<i>Afzelia africana</i> (Smith)ex Pers. (Fabaceae) ¹² Makola	Aqueous/ Stem bark	200 mg/kg bw/ 10 days/ Rat/ STZ/ Oral	Antihyperglycemic
8	<i>Agaricus bisporus</i> (Agaricaceae) ¹³ White button mushroom	Powder/ Fruits	200 mg/kg bw/ 3 week / Rat/ STZ/ Oral	Hypoglycemic and hypolipidemic



9	<i>Ajuga iva</i> (L.) Schreber. (Labiatae) Musky bugle/ French groundpine	Aqueous/ Whole Plant ¹⁴	10 mg/kg/ 6 hr/ Rat / STZ/ Oral	Strong hypoglycaemic effect
		Aqueous/ Whole Plant ¹⁵	10 mg/kg/ 3 weeks/ Rat/ STZ/ Oral	Hypoglycemic and hypolipidemic
10	<i>Allium cepa</i> Linn. (Lilliaceae) ¹⁶ Onion	Juice	1 ml /100 g bw (equivalent to 0.4 g/100 g bw)/ 4 weeks/ Rat/ Alloxan/ Oral	Antioxidant and antihyperglycemic effects
11	<i>Allium sativum</i> Linn. (Lilliaceae) Garlic	Juice ¹⁶	1 ml/100 g bw (equivalent to 0.4 g/100 g bw)/ 4 weeks/ Rat/ Alloxan/ Oral	Antioxidant and antihyperglycemic effects
		Garlic oil and Diallyl trisulfide (2) ¹⁷	Garlic oil (100 mg/kg bw), Diallyl trisulfide (40 mg/kg bw)/ 3 weeks/ Rat/ STZ/ Gavage	Improve glycemic control in diabetic rats through increased insulin secretion and increased insulin sensitivity
		Ethanol ¹⁸	0.1, 0.25 and 0.5 g/kg bw/ 14 days/ Rat/ STZ/ Oral	Antidiabetic
		Aqueous ¹⁹	Rat/ STZ/ Oral	Proper use in diet may help decrease the oxidative load in diabetes mellitus
		Raw Garlic ²⁰	500 mg/kg/ 7 weeks/ Rat/ STZ/ I.P.	Hypoglycaemic
12	<i>Alpinia galanga</i> (L.) Willd.(Zingiberaceae) ²¹ Langkwas	Aqueous and methanol/ Rhizomes	4 g/kg bw/ 24 hrs./ Rabbit/ Alloxan/ Oral	Fall in blood glucose levels in normal rabbits
13	<i>Allium porrum</i> L. (Liliaceae) ²² Common leek	Ethanol/ Bulbs	250 and 500 mg/kg / 5 days/ Rat/ STZ/ Oral	Hypoglycemic
14	<i>Amaranthus caudatus</i> (Amaranthaceae) ²³ Velvet flower	Methanol/ Leaves	200 and 400 mg/kg/ 21 days/ Rat/ STZ/ p.o.	Significant antidiabetic and anti-cholesterolemic activity
15	<i>Amaranthus spinosus</i> (Amaranthaceae) ²³ Pakai	Methanol/ Leaves	200 and 400 mg/kg/ 21 days/ Rat/ STZ/ p.o.	Significant antidiabetic and anti-cholesterolemic
16	<i>Amaranthus viridis</i> (Amaranthaceae) Green amaranth	Methanol/ Leaves ²³	200 and 400 mg/kg/ 21 days/ Rat/ STZ/ p.o.	Significant antidiabetic and anti-cholesterolemic



		Methanol/ Whole plant ²⁴	200 and 400 mg/kg/ 15 days/ Rat/ Alloxan/ Oral	Antidiabetic
17	<i>Ananas comosus</i> L. Merr. (Bromeliaceae) ²⁵ Pineapple	Ethanol/ Leaves	0.40 g/kg/ Rat/ STZ/ Oral	Extract may improve insulin sensitivity in type 2 diabetes
18	<i>Angelica hirsutiflora</i> (Umbelliferae) ²⁶	Methanol/ Roots	<i>In vitro</i>	Control of hyperglycemia by acting as an insulin secretagogue
19	<i>Annona squamosa</i> L. (Annonaceae) Custard apple	Aqueous/ Leaves ²⁷	250 and 500 mg/kg bw/ Rat/ STZ- Nicotinamide / 12 days/ Oral	Antidiabetic
		Ethanol/ Leaves ²⁸	350 mg/kg bw/ 10 day/ STZ- Nicotinamide/ Oral 350 mg/kg bw/ 10 days/ Rabbit/ Alloxan/ Oral	Hypoglycemic and anti-diabetic
20	<i>Alangium lamarckii</i> (Alangiaceae) ²⁹ Dela	Alcohol/ Leaves	250 and 500 mg/kg / Rat/ STZ- Nicotinamide/ p.o.	Significant antidiabetic activity
21	<i>Albizia odoratissima</i> (L. f.) Benth. (Fabaceae) ³⁰ Kali siris	Methanol/ Bark	250 and 500 mg/kg bw / Mice/ Alloxan / p.o.	Antidiabetic
22	<i>Aloe vera</i> (Liliaceae) ³¹ Aloe	Lophenol (3) and Cycloartanol (4) (Phytosterols)/ Aloe vera gel	25 µg/kg daily/ 44 days/ Rat	Reduces visceral fat accumulation and useful for the improvement of hyperlipidemia and hyperglycemia
23	<i>Alstonia scholaris</i> Linn. (R.Br.) (Apocynaceae) ³² Saptaparni	Ethanol/ Leaves	100, 200 and 400 mg/kg/ 6 weeks/ Rat/ STZ/ Oral	Antidiabetic, antihyperlipidemic and antioxidant activities
24	<i>Aporosa lindleyana</i> (wt.)Bail. (Euphorbiaceae) ³³ Kebella	Aqueous and alcohol/ Roots	100 mg/kg/ Rat/ Alloxan/ Oral	Antihyperglycemic and hypoglycemic
25	<i>Arachis hypogaea</i> L. (Fabaceae) ³⁴ Groundnut	Aqueous/ Seeds	Rat/ Alloxan	Hypoglycemic and hypolipidemic



26	<i>Artemisia dracunculus</i> L. (Asteraceae) ³⁵ Dragon herb	Ethanol/ Seeds	500 mg/kg bw/ 7 days/ Mice/ STZ/ Gavage	Antihyperglycemic
27	<i>Artemisia herba-alba</i> As- so. (Lamiaceae) ³⁶ White wormwood	Hydroalcoholic/ Aeri- al parts	2 g/kg bw/ 20 weeks/ Mice/ Oral	Hypoglycaemic
28	<i>Axonopus compressus</i> (SW.) (P. Beauv). (Poaceae) ³⁷ Lawn grass	Methanol/ Leaves	250, 500 and 1000 mg/kg/ Rat/ Alloxan/ Gastric gavage	Antidiabetic
29	<i>Azadirachta indica</i> A. Juss. (Meliaceae) Neem	Aqueous ³⁸	Rat/ STZ/ Oral	Minimizing diabetic- related complications such as diabetic reti- nopathy, neuropathy and nephropathy
		Petroleum ether/ Ker- nel and husk ³⁹	Kernel (0.9 gm/kg, b.wt.) and husk (2.0 gm/kg, b.wt.)/ 28 days/ Rat/ STZ/ Oral	Prevents oxidative stress caused by STZ in heart and erythrocytes
30	<i>Barleria lupulina</i> Lindl. (Acanthaceae) ⁴⁰ Vishellakarani	Methanol/ Aerial parts	100, 200 and 300 mg/kg/ 12 hrs./ Rat / STZ/ Oral	Antidiabetic
31	<i>Bauhinia cheilandra</i> (Fabaceae) ⁴¹ Brazilian orchid tree	Methanol/ Leaves	300, 600 and 900 mg/kg/ 10 days/ Rat/ Alloxan	Hypoglycemic
32	<i>Bauhinia forficata</i> Link. (Leguminosae) Paw of cow	Decoction/ Leaves ⁴²	35.2±7.8 ml/100 g bw mean daily dose/ 31 days/ Rat/ STZ/ Oral	Antidiabetic
		<i>n</i> -butanol/ Leaves ⁴³	500 and 600 mg/kg / Rat/ Alloxan/ Oral	Hypoglycemic
		Kaempferitrin (Fla- vonol glycoside)fromn-BuOH frac- tion/ Leaves ⁴⁴	100 mg/kg/ Rat/ Allo- an/ Oral	Hypoglycemic
		Aqueous / Leaves ⁴⁵	500 mg/kg from 0 to 4th day of pregnancy, 600 mg/kg from 5th to 14th day and 1000 mg/kg from 15th to 20th day (twice a day)/ 21 days/ Rat/ STZ/ Oral	No hypoglycemic ef- fect, did not improve maternal outcomes in diabetic rats



		Leaves ⁴⁶	200 mg/kg bw/ 7 days/ Rat/ STZ/ Oral	Hypoglycemic
33	<i>Belamcanda chinensis</i> (Iridaceae) ⁴⁷ Blackberry lily	Aqueous/ Leaves	400–1600 mg/kg/ 14 days/Rat/ STZ/ Oral	Hypoglycemic
34	<i>Benincasa hispida</i> Thunb. (Cucurbitaceae) ⁵ Ash gourd	Chloroform/ Fruits	250 and 500 mg/kg bw/ 2 weeks/ Rat/ Alloxan	Antidiabetic
35	<i>Berberis aristata</i> (Berberidaceae) ⁴⁸ Daruharidra	50% Aqueous and ethanol/ Roots	250 mg/kg/ 21 days/ Rat/ Alloxan/ Oral	Strong potential to regu- late glucose homeosta- sis through decreased gluconeogenesis and oxidative stress
36	<i>Berberis vulgaris</i> L. (Berberidaceae) ⁴⁹ Daruharidra	Aqueous	62.5 and 25.0 mg/kg/ 21 days/ Rat / STZ	Antidiabetic
37	<i>Bidens pilosa</i> (Asteraceae) ⁵⁰ Spanish needle	Aqueous/ Whole plant	10, 50 and 250 mg/kg bw/ 28 days / Mice/ STZ/ Oral	Stimulated insulin se- cretion via pancreatic islets
38	<i>Boerhaavia diffusa</i> L. (Nyctaginaceae) ⁵¹ Pig weed	Aqueous/ Leaves	200 mg/kg/ 4 weeks/ Rat/ Alloxan/ Oral	Significant decrease in blood glucose and sig- nificant increase in plasma insulin levels
39	<i>Brassica juncea</i> (L.) Czern. (Brassicaceae) ⁵² Brown mustard	Aqueous/ Seeds	250, 350 and 450 mg/kg bw/ 4 weeks / Rat/ STZ/ Oral	Hypoglycemic
40	<i>Brassica rapa</i> L. (Brassicaceae) ⁵³ Turnip	Ethanol/ Roots	0.26 g/100 g diet/ Mice	Antidiabetic effect by enhancing the glucose and lipid metabolism
41	<i>Bryophyllum pinnatum</i> (Crassulaceae) ⁵⁴ Miracle leaf	Aqueous/ Leaves	25–800 mg/kg/ Rat / STZ/ p.o. or I.P.	Hypoglycaemic
42	<i>Buchholzia coriacea</i> (Cap- paraceae) ⁵⁵ Magic cola	Ethanol extract and butanol fraction/ Seeds	10 days/ Rat/ STZ/ Oral	Potent hypoglycemic
43	<i>Butea monosperma</i> (Lam.) Taub. (Fabaceae) Palash	Ethanol/ Flowers ⁵⁶	200 mg/kg/ 2 weeks/ Rat/ Alloxan/ Oral	Antidiabetic
		Ethanol/ Seeds ⁵⁷	300 mg/kg bw/ 4 weeks/ Rat/ STZ/ Oral	Antidiabetic



44	<i>Caesalpinia bonducella</i> (Fabaceae) Gray nicker	Aqueous and ethanol/ Seeds ⁵⁸	250 mg/kg bw/ 7 days/ Rat/ STZ/ Oral	Hypoglycemic
		Petroleum ether and ethanol/ Seeds ⁵⁹	300 mg/kg/ Rat/ Allox- an/ Oral	Antihyperglycemic ac- tion may be due to the blocking of glucose absorption
45	<i>Carya illinoensis</i> (Wangenh) K. Koch. (Ju- glandaceae) ⁶⁰ Pecan tree	Caryatin-3' sulfate and Caryatin-3' me- thyl ether-7-O-β-D- glucoside (Flavonol methyl ether) from n- butanol fraction/ Bark	Rat/ STZ	Antidiabetic/ signifi- cantly hypoglycaemic and antioxidant activity
46	<i>Capparis spinosa</i> L. (Capparaceae) ⁶¹ Caper bush	Aqueous/ Fruits	20 mg/kg/ 14 days/ Rat/ STZ/ Oral	Antihyperglycaemic
47	<i>Casearia esculenta</i> Roxb. (Flacourtiaceae) ⁶² Carilla fruit	3-hydroxymethyl xylitol / Roots	40 mg/kg bw/ 45 days/ Rat/ STZ/ Oral	Antihyperglycemic
48	<i>Cassia siamea</i> (Leguminosae) ⁶³ Kassod	Methanol/ Leaves	250 mg/kg and 500 mg/kg/ 3 weeks/ Rat/ STZ/ Oral	Controls blood glucose level as well as improv- ing lipid metabolism and body weight in rats with induced diabetes
49	<i>Caralluma attenuata</i> (Apocynaceae) ⁶⁴ Caralluma	Ethanol, chloroform and butanol/ Whole plant	250 mg/kg/ Rat/ STZ/ Oral	Significant and consid- erable antihyperglyce- mic activity
50	<i>Caralluma sinaica</i> L. (Asclepiadaceae) ⁶⁵	Alcohol/ Aerial parts	100 mg/kg/ 30 days / Rabbit/ STZ/ p.o.	Antidiabetic
51	<i>Carum carvi</i> L. (Apiaceae) Caraway	Aqueous/ Fruits ⁶⁶	20 mg/kg/ 15 days/ Rat/ STZ/ Oral	Potent lipid lowering activity in both normal and severe hyperglyce- mic rats
		Aqueous/ Fruits ⁶¹	20 mg/kg/ 14 days/ Rat/ STZ/ Oral	Anti-hyperglycaemic activity
52	<i>Carissa carandas</i> Linn. (Apocynaceae) ⁶⁷ Karaunda	Methanol and ethyl acetate fraction/ Un- ripe fruits	200 and 400 mg/kg/ 24 hrs./ Rat/ STZ/ Oral	Antidiabetic
53	<i>Cassia auriculata</i> L. (Caesalpiniaceae) Senna	Aqueous/ Leaves ⁶⁸	400 mg/kg dose/ 3 weeks/ Rat / STZ/ Oral	Potent antihyperglyce- mic and hypolipidemic activity



		Aqueous/ Leaves ⁶⁹	100, 200, 400 mg/kg bw/ Rat/ Alloxan/ Oral	Glucose uptake and glycogen deposition studies suggest that ex- tract has no direct insu- lin like effect which can enhance the peripheral utilization of glucose
54	<i>Catharanthus roseus</i> (Apocynaceae) ⁷⁰ Sadabahar	Methanol/ Leaves	250 mg/kg/ 7 days/ Rat/ Alloxan/ Oral	Hypoglycemic
55	<i>Cecropia pachystachya</i> (Cecropiaceae) ⁷¹ Pumpwood	Methanol/ Leaves	80 mg/kg/ Rat/ Alloxan/ Oral	Hypoglycemic
56	<i>Ceiba pentandra</i> L. Gaertn. (Bombacaceae) ⁷² White silk cotton	Aqueous/ Bark	250, 400, 800 and 1500 mg/kg bw/ Rat/ STZ/ 28 days	Significant reduction in plasma glucose level
57	<i>Centaurium erythraea</i> Rafn. (Gentianaceae) Common centaury	Hydroalcoholic ³⁶ Aqueous/ Leaves ⁷³	2 g/kg bw/ 20 weeks/ Mice/ Oral 200 mg/kg bw/day/ 30 days/ Rat/ STZ / I.P.	Hypoglycaemic Exerts a therapeutic protective nature in dia- betes by decreasing oxidative stress and pancreatic β -cells dam- age which may be at- tributed to its antioxi- dative potential
58	<i>Chamaemelum nobile</i> (Asteraceae) ⁷⁴ Chamomile	Aqueous/ Aerial parts	20 mg/kg bw/ 15 days/ Rat/ STZ/ Oral	Significant hypogly- caemic without affect- ing basal plasma insulin concentrations
59	<i>Cinnamomum parthenoxy-</i> <i>lon</i> (Jack) Nees. (Lauraceae) ⁷⁵ Safrol	Polyphenolic oligo- mer-rich extract / Bark	100, 200 and 300 mg/kg bw/ 14 days/ Rat/ STZ/ Oral	Potentially useful for post-prandial hypergly- cemia treatment
60	<i>Cinnamomum zeylanicum</i> (Lauraceae) Cinnamon	Cinnamaldehyde ⁷⁶ Cinnamon oil ⁷⁷	5, 10 and 20 mg/kg/ 45 days/ Rat/ STZ 100 mg/kg/ 35 days/ Mice	Hypoglycemic and hy- polipidemic Regulative role in blood glucose level and lipids and improved the func- tion of pancreatic islets/ antidiabetic



61	<i>Cleome feline</i> (Comperatacea) ⁷⁸	Petroleum ether and benzene/ Whole plant	300 mg/kg/day/ 30 days/ Rat/ Alloxan/ Oral	Antidiabetic
62	<i>Clerodendrum capitatum</i> Willd. (Verbenaceae) ⁷⁹ Gung	Aqueous/ Leaves	100, 400 and 800 mg/kg/day/ 14 days/ Rat/ Oral	Hypoglycemic
63	<i>Cochlospermum vitifolium</i> Willd. (Bixaceae) ⁸⁰ Silk cottontree	Hexane/ Bark	120 mg/kg/ Rat	Hypoglycemic, vaso-relaxant and hepatoprotective properties
64	<i>Coccinia indica</i> (Cucurbitaceae) ⁸¹ Kundru	Ethanol/ Aerial parts	100 or 200 mg/kg bw/ 14 days/ Rat/ STZ/ p.o.	Antihyperglycemic and hypolipidemic
65	<i>Cocos nucifera</i> Linn. (Are- caceae) ⁸² Coconut	Hydromethanol/ Brunch	250 mg/kg and 500 mg/kg b.w/ 14 days/ Rat/ STZ/ p.o.	Antidiabetic
66	<i>Cogniauxia podoleana</i> (Cucurbitaceae) ⁸³ Bailon	Diethyl ether fraction/ Leaves	100 mg/kg/ 3hr/ Rat/ Alloxan/ Oral	Antidiabetic
67	<i>Commiphora mukul</i> (Bursaceae) Guggal	Guggulsterone ⁸⁴	75 mg/kg bw/ 8 weeks/ Rat/ Oral	Hypoglycemic and hypolipidemic
		Ethanol/ Gum resin ⁸⁵	200 mg/kg body weight/ 60 days/ Rat/ STZ	Antihyperglycemic
68	<i>Combretum micranthum</i> G. Don. (Combretaceae) ⁸⁶ Randga	Aqueous/ Leaves	100 mg/kg/ Rat/ Alloxan	Significant hypoglycaemic and antidiabetic activity
69	<i>Coprinus comatus</i> (Agaricaceae) ⁸⁷ Lawyer's wig	Comatin (4,5-dihydroxy-2-methoxy-benzaldehyde) /Broth	80 mg/kg bw/ Rat/ Alloxan	Maintains a low level of blood glucose and improve glucose tolerance
70	<i>Coriandrum sativum</i> L. (Umbelliferae) ⁸⁸ Dhania	Aqueous/ Seeds	20 mg/kg/ 30 days/ Rat/ Oral	Hypoglycemic
71	<i>Coscinium fenestratum</i> (Gaertn.) Colebr. (Menispermaceae) ⁸⁹ Darvi	Alcohol/ Stems	200 and 500 mg/kg bw/ 12 days/ Rat/ STZ/ Oral	Antidiabetic



72	<i>Costus afer</i> . Ker Gawl. (Zingiberaceae) ⁹⁰ Spiral ginger	Methanol/ Leaves	200 mg/kg bw/ Rat / STZ/ p.o.	Biphasic antihyperglycemic activity
73	<i>Costus pictus</i> D. Don. (Zingiberaceae) ⁹¹ Yellow lollipop	Aqueous/ Leaves	250 mg/kg bw/ 14 days/ Rat/ STZ/ Oral	Glucose lowering effect to be associated with the potentiation of insulin release from pancreatic islets and enhancement of peripheral utilization of glucose
74	<i>Costus speciosus</i> (Koen ex. Retz.) Sm. (Zingiberaceae) Kust	Eremanthin (Sesquiterpene)/ Hexane extract/ Rhizomes ⁹²	5, 10, 20 mg/kg bw/ 60 days/ Rat/ STZ/ Oral	Hypoglycemic
		Costunolide (Sesquiterpene)/ Hexane extract/ Roots ⁹³	20 mg/kg bw/ 30 days/ Rat/ STZ/ Oral	Stimulate the β islets to secrete insulin by inhibiting the expression of nitric oxide synthase. Results indicates normoglycemic and hypolipidemic activity
75	<i>Cucumis trigonus</i> Roxb. (Cucurbitaceae) ⁹⁴ Kachri food	Aqueous/ Fruits	500 mg/kg/ 21 day / Rat/ STZ/ p.o.	Antidiabetic
76	<i>Cucurbita ficifolia</i> Bouché. (Cucurbitaceae) Malabar gourd	Juice/ Fruit ⁹⁵	14 days/ Mice/ Alloxan/ Oral	Hypoglycemic
		Methanol/ Fruit ⁹⁶	300 and 600 mg/kg bw/ 30 days/ Rat/ STZ / Oral	Antihyperglycemic
77	<i>Cuminum cyminum</i> L. (Apiaceae) ⁹⁷ Jeera	Methanol/ Seeds	28 days/ Rat/ STZ	Antidiabetic
78	<i>Curcuma longa</i> (Zingiberaceae) Turmeric	Tetrahydrocurcumi ⁹⁸	80 mg/kg bw 45 days/ Rat/ STZ- Nicotinamide/ Oral	Antioxidant effect in addition to its antidiabetic
		Curcumin and Tetrahydrocurcumin ⁹⁹	80 mg/kg bw/ 45 days/ Rat/ STZ/ Oral	Antidiabetic
79	<i>Cyclocarya paliurus</i> (Batalin) Iljinsk. (Juglandaceae) ¹⁰⁰ Chinese wingnut	Chloroform fraction of the 75% Ethanol/ Bark	Rat/ Alloxan	Hypoglycemic



80	<i>Cydonia oblonga</i> Mill. (Rosaceae) ¹⁰¹ Quince	Ethanol/ Leaves	250 and 500 mg/kg/ 5 days/ Rat/ STZ/ Oral	Hypoglycemic
81	<i>Cymbopogon proximus</i> (Gramineae) ¹⁰² Lemon grass	Aqueous	75 mg/100 g b.wt./ 4 weeks/ Rat/ Alloxan/ Oral	Antihyperglycemic
82	<i>Cynodon dactylon</i> (Poaceae) Bermuda grass	Aqueous/ Whole plant ¹⁰³	500 mg/kg/ 14 days/ Rat/ STZ/ Oral	High antidiabetic potential along with significant hypoglycemic and hypolipidemic effects
		Aqueous/ Leaves ¹⁰⁴	450 mg/kg bw per day/ 15 days/ Rat/ Alloxan/ Oral	Antidiabetic
83	<i>Cyperus rotundus</i> L. (Cyperaceae) ¹⁰⁵ Nagarmotha	Hydroethanolic/ Rhizomes	500 mg/kg/ 7 days/ Rat/ Alloxan/ Oral	Antihyperglycemic
84	<i>Datura metel</i> Linn. (Solanaceae) ¹⁰⁶ Thorn apple	Seed powder	25, 50 and 75 mg/kg/ 8hr./ Rat/ Alloxan/ p.o.	Significant reduction in blood glucose
85	<i>Dillenia indica</i> L. (Dilleniaceae) ¹⁰⁷ Elephant apple	Methanol/ Leaves	250 and 500 mg/kg bw/ 21 days/ Rat/ Alloxan/ Oral	Antidiabetic
86	<i>Diospyros peregrine</i> (Gaertn.) Gurke. (Ebenaceae) ¹⁰⁸ Gaabh	Aqueous/ Fruits	50 and 100 mg/kg bw/ 28 days/ Rat/ STZ/ Oral	Antidiabetic
87	<i>Dioscorea polygonoides</i> (Dioscoreaceae) ¹⁰⁹ Jamaican bitter yam	Steroidal saponin (Δ^3 diosgenin, diosgenin and pennogenin) and the phytosterols, stigmasterol and β -sitosterol from Tubers	Rat/ STZ	Hypoglycemic
88	<i>Dodecadenia grandiflora</i> Nees. (Lauraceae) ¹¹⁰	Dodegranoside A and Dodegranoside D (Catechol glycosides)/ Leaves	100 mg/kg bw/ Rat/ STZ/ Oral	Antihyperglycemic



89	<i>Elephantopus scaber</i> (Asteraceae) ¹¹¹ Elephant foot	28 Nor-22(R)Witha 2, 6, 23-trienolide (Steroid)/ Acetone extract/ Herb	150 mg/kg bw and ster- oid 2 mg/kg bw/ Rat/ STZ	Antidiabetic activity by reducing the elevated blood glucose levels and restoring the insulin levels in streptozotocin- induced diabetic rats
90	<i>Emblica officinalis</i> (Euphorbiaceae) ¹¹² Amla	Methanol/ Fruits	100 mg/kg bw/ 11 days/ Rat/ Alloxan/ Oral	Antidiabetic
91	<i>Embelia ribes</i> (Myrsinaceae) ¹¹³ False black pepper	Embelin (alkyl sub- stituted hydroxyben- zoquinone)/ berries	50 mg/kg bw/ 21 days/ Rat/ Alloxan/ Oral	Potential hypoglycemic effect
92	<i>Enicostemma littorale</i> (Gentianaceae) Chota-chirayata	Aqueous/ Whole plant ¹¹⁴	2 g/kg/ 6 weeks/ Rat/ STZ/ p.o.	Antidiabetic
		Aqueous/ Whole plant ¹¹⁵	8 hr./ Rat/ Alloxan	Glucose lowering effect
		Aqueous / Whole plant ¹¹⁶	20 days/ Rat/ Alloxan	Hypoglycemic
93	<i>Eriobotrya japonica</i> (Rosaceae) Loquat	Ethanol/ Leaves ¹¹⁷	300 mg/kg and 450 mg/kg/ 14 days/ Mice/ STZ/ Oral	Hypoglycemic potential
		Cinchonain Ib Aque- ous/ Leaves ¹¹⁸	Cinchonain Ib 108 mg/kg/ Rat/ Oral	Insulinotropic effect by stimulating the β -islets of langerhans to secrete insulin
		Total Triterpene acid fraction from Leaves ¹¹⁹	300 mg/kg/ 14 days/ Mice/ Alloxan/ STZ/ Oral	Antidiabetic
94	<i>Erythrina indica</i> (Papilio- naceae) ¹²⁰ Coral tree	Alcohol and aqueous/ Stem bark	200 and 400 mg/kg bw/ 7 days/ Rat/ Alloxan/ p.o.	Hypoglycaemic
95	<i>Eugenia jambolana</i> Lam. (Myrtaceae) Jamun	Fruit pulp ¹²¹	50 mg per day/ 41 days/ Rat/ STZ	Lack of apparent effect on the diabetes may be attributable to the re- gional ecosystem
		Ethanol/ Seeds ¹²²	100 mg/kg bw/ 15 days/ Rabbit/ Alloxan/ Oral	Hypoglycemic
96	<i>Euonymus alatus</i> (Celastraceae) ¹²³ Burning bush	50% Ethanol	350, 700 mg/kg/ 10 week/ ICR mice	Hypoglycemic



97	<i>Exostema caribaeum</i> (Rubiaceae) ¹²⁴ Albarillo	Stem bark	30, 100, 300 mg/kg bw/ Rat/ STZ/ Oral	Antidiabetic
98	<i>Ficus bengalensis</i> L. (Moraceae) ¹²⁵ Banyan	Aqueous/ Roots	300 mg/kg/ Rat	Antidiabetic
99	<i>Ficus racemosa</i> (Moraceae) ¹²⁶ Gular	α-myrin acetate, p -chlorobenzoic acid derivative and Nicotinic acid deriv- ative/ Fruits	100 mg/kg bw/ Rat/ STZ	Antihyperglycemic
100	<i>Ficus religiosa</i> (Moraceae) ¹²⁷ Peepal	Aqueous/Stem bark powder	50 and 100 mg/kg/ 21 days/ Rat/ STZ Oral	Antidiabetic
101	<i>Fomes fomentarius</i> (Polyporaceae) ¹²⁸ Tinder fungus	Aqueous	100 mg/kg bw/ 2 weeks/ Rat/ STZ/ Oral	Hypoglycemic
102	<i>Garuga pinnata</i> Roxb. (Burseraceae) ¹²⁹ Ghogar	Aqueous/ Bark	250 and 500 mg/kg/ 15 days/Rat/ STZ/ Oral	Antidiabetic
103	<i>Gentiana olivieri</i> Griseb. (Gentianaceae) ¹³⁰ Gentian	Isorientin (C- glycosylflavone)/ Ethylacetate fraction	15 mg/kg bw dose / Rat/ STZ/ Oral	Hypoglycemic
104	<i>Globularia alypum</i> (Globulariaceae) ¹³¹ Botja	Aqueous/ Leaves	100 and 20 mg/kg/ STZ/ Oral	Hypoglycemic
105	<i>Gongronema latifolium</i> Benth. (Asclepiadaceae) Amaranth globe	Aqueous and ethanol/ Leaves ¹³²	100 mg/kg twice daily/ 2 weeks/ Rat/ STZ/ Oral	Antidiabetic
		Aqueous and etha- nol ¹³³	100 mg/kg/ 14 day/ Rat/ STZ	Ethanol extract ap- peared to be more effec- tive in reducing oxida- tive stress, lipid peroxi- dation, and increasing the GSH/GSSG ratio
		Aqueous and ethanol/ Leaves ¹³⁴	100 mg/kg/ 2 weeks/ Rat/ STZ/ Oral	Antihyperglycemic
106	<i>Gymnema montanum</i> Hook. F. (Asclepidaceae) Gurmar	Alcohol/ Leaves ¹³⁵	200 mg/kg/ 3 weeks/ Rat/ Alloxan/ Oral	Significant reduction in blood glucose and an increase in plasma insu- lin



		Leaves ¹³⁶	50, 100 and 200 mg/kg bw/ 30 days/ Rat/ Alloxan/ Oral	Antidiabetic
		Ethanol/ Leaves ¹³⁷	200 mg/kg/ 3 weeks/ Rat/ Alloxan/ Oral	Antidiabetic
		Ethanol/ Leaves ¹³⁸	200 mg/kg bw/ 3 weeks/ Rat/ Alloxan/ Oral	Antidiabetic
		Alcohol/ Stems ¹³⁹	100 and 200 mg/kg/ 3 weeks/ Rat/ STZ/ Oral	Antidiabetic
107	<i>Gymnema sylvestre</i> (Asclepiadaceae) ¹⁴⁰ Gurmar	Dihydroxy gymnemic tri-acetate (Triterpenoid) from acetone extract of Leaves	20 mg/kg bw/ 45 days/ Rat/ STZ/ Oral	Hypoglycemic and hypolipidemic
108	<i>Helianthus tuberosus</i> L. (Asteraceae) ¹⁰¹ Artichoke jerusalem	Ethanol/ Tubers	250 and 500 mg/kg bw/ 5 days/ Rat/ STZ/ Oral	Hypoglycemic
109	<i>Helichrysum plicatum</i> ssp. Plicatum. (Asteraceae) ¹⁴¹	Aqueous and ethanol/Capitulums	500 mg/kg/ Rat/ STZ/ Oral	Antihyperglycemic and antioxidant
110	<i>Helicteres isora</i> (Sterculiaceae) Indian screw fruit	Ethanol/ Roots ¹⁴²	300mg/kg/ 10 days/ Mice/ Oral	Antidiabetic
		Aqueous/ Bark ¹⁴³	100 and 200 mg/kg/ 21 days/ Rat/ STZ/ Oral	Hypoglycaemic
111	<i>Hibiscus rosa sinensis</i> Linn. (Malvaceae) ¹⁴⁴ Chinarose	Ethanol/ Flowers	250 mg/kg/ 21 days/ Rat/ STZ/ Oral	Hypoglycemic
112	<i>Hybanthus enneaspermus</i> (Linn)F.Muell. (Violaceae) ¹⁴⁵ Ratanpurus	Alcohol	125, 250 and 500 mg/kg/ 21 days/ Rat/ STZ/ p.o.	Antidiabetic
113	<i>Hygrophila auriculata</i> (K. Schum.) Heine. (Acanthaceae) ¹⁴⁶ Rasayana	Ethanol/ Aerial parts	100 and 250 mg/kg bw/ 3 weeks/ Rat/ STZ/ Oral	Antidiabetic activity along with potent antioxidant potential
114	<i>Hypericum perforatum</i> L. (Hypericaceae) ¹⁴⁷ Tipton's weed	Ethyl acetate	50, 100 and 200 mg/kg/ 15 days/ Rat/ STZ/ Oral	Antihyperglycemic



115	<i>Hypoxis hemerocallidea</i> Fisch. & C.A. Mey. (Hy- poxidaceae) ¹⁴⁸ African potato	Aqueous/ Corms	50–800 mg/kg/ Rat/ STZ/ p.o.	Antidiabetic
116	<i>Hyptis suaveolens</i> L. Poit. (Lamiaceae) ¹⁴⁹ Bush tea	Leaves	250 and 500 mg/kg bw/ 21 days/ Rat/ STZ/ Oral	Antihyperglycemic
117	<i>Ibervillea sonora</i> 's (Cu- curbitaceae) ¹⁵⁰ Wareque	Aqueous decoction and the raw extract (juice), dichloro- methane extract and methanol/ Roots	300 and 600 mg/kg/ 41 days/ Mice/ Alloxan/ p.o.	Hypoglycemic
118	<i>Ichnocarpus frutescence</i> (L.) R.Br. (Apocynaceae) ¹⁵¹ Dudhi	Methanol/ Leaves	100 and 200 mg/kg bw/ 45 days/ Rat/ STZ/ Oral	Protected the pancreatic tissue from streptozoto- cin-induced damage decreased plasma glu- cose levels without hy- poglycemic effect
119	<i>Inula viscosa</i> (Asteraceae) ¹⁵² False yellowhead	Aqueous/ Aerial parts	20 mg/kg/ 15 days/ Rat/ STZ/ Oral	Hypoglycaemic
120	<i>Jatropha curcus</i> L. (Euphorbiaceae) ⁵ Barbados nut	Chloroform/ Leaves	250 and 500 mg/kg bw/ 2 weeks/ Rat/ Alloxan	Antidiabetic
121	<i>Juniperus chinensis</i> L. (Cupressaceae) ¹⁵³ Chinese juniper berries	Ethanol and aqueous	50, 100 and 150 mg/kg bw/ 7 days/Rat/ Allox- an/ Oral	Hypoglycaemic
122	<i>Juniperus oxycedrus</i> subsp. oxycedrus L. (Cupressaceae) ¹⁵⁴ Prickly juniper	Aqueous and ethanol/ Berries	500 and 1000mg/kg bw/ 8 days/ Rat/ STZ/ Oral	Antidiabetic
123	<i>Lippia nodiflora</i> L. (Verbenaceae) Frog fruit	γ -Sitosterol ¹⁵⁵	20 mg/kg bw/ 21 days/ Rat/ STZ/ Oral	Antihyperglycemic
		Methanol ¹⁵⁶	15 days/ Rat/ STZ/ Oral	Antidiabetic and hypo- lipidaemic
124	<i>Lithocarpus polystachyus</i> Rehd. (Fabaceae) ¹⁵⁷ Sweet tea	Aqueous extract and ethanol/ Leaves	0.3 g/kg/ 4 weeks/ Rat/ STZ/ Oral	Antidiabetic effect in- cluding blood lipid and antioxidant mediation
125	<i>Lupinus albus</i> L. (Legumi- nosae) ¹⁰² White lupin	Aqueous	75 mg/100 g b.wt/ 4 weeks/ Rat/ Alloxan/ Oral	Antihyperglycemic



126	<i>Loranthus micranthus</i> Linn. (Loranthaceae) Plum	Methanol/ Leaves ¹⁵⁸	200 mg/kg/ Rat/ Allo- an/ I.P.	Hypoglycaemic and anti-hyperglycemic
		Aqueous and metha- nol/ Leaves ¹⁵⁹	250 mg/kg and 400 mg/kg/ Rat/ Alloxan/ I.P.	Antidiabetic
127	<i>Lycium barbarum</i> (Solanaceae) ¹⁶⁰ Goji	Water decoction, crude polysaccharide extracts and purified polysaccharide frac- tions/ Fruits	10 days/ Rabbit/ Allo- an	Hypoglycemic effect
128	<i>Mangifera indica</i> (Anacardiaceae) ¹⁶¹ Mango	Mangiferin/ Leaves	10 and 20 mg/kg/ 28 days/ Rat/ STZ / I.P	Antidiabetic, antihyper- lipidemic and antiathero- genic
129	<i>Melothria maderaspatana</i> (Cucurbitaceae) ¹⁶² Agumaki	Ethanol/ Aerial parts	100 or 200 mg/kg b.w/ 14 days/ Rat/ STZ/ p.o.	Antihyperglycemic and hypolipidemic
130	<i>Momordica charantia</i> L. (Cucurbitaceae) Karela	Aqueous/ Fruits ¹⁶³	20 mg/kg bw/ Oral	Safe alternative to re- ducing blood glucose
		Alcohol/ Juice ¹⁶⁴	91.9 and 362.34 mg/100 g b.wt./ Rat/ Alloxan/ subcuta- neous	Anti-diabetic, hepato- renal protective and hypolipidemic effect
131	<i>Momordica cymbalaria</i> Hook. Fenzl. (Cucurbitaceae) Golkandra	Aqueous/ Fruits ¹⁶⁵	0.5 g/kg/ 6 weeks/ Rat/ Alloxan/ Oral	Significant antihyper- glycemic as well as anti- hyperlipidemic effects
		Aqueous/ Fruits ¹⁶⁶	2.5 mg/kg bw/ Rat/ STZ/ Oral	Antihyperglycemic
132	<i>Moringa oleifera</i> Lam. (Moringaceae) ¹⁶⁷ Drumstick tree	Aqueous/ Leaves	200 mg/kg/ 21 days/ Rat/ STZ/ Oral	Antidiabetic
133	<i>Morus alba</i> (Moraceae) ¹⁶⁸ White mulberry	Flavonoids rich frac- tion of 70% alcohol extract/ Root bark	600 mg/kg/ 10 days/ Rat/ STZ/ Oral	Hypoglycemic
134	<i>Morus nigra</i> (Moraceae) ¹⁶⁹ Sahtut	Aqueous/ Leaves	400 mg/kg/ 21 days/ Rat/ STZ	Failed to control hyper- glycemia
135	<i>Mucuna pruriens</i> (Fabaceae) Velvet bean	Aqueous/ Seeds ¹⁷⁰	100 and 200 mg/kg bw/ 21 days/ Rat/ STZ/ Oral	Antihyperglycemic



		Ethanol/ Seeds ¹⁷¹	5, 10, 20, 30, 40, 50 and 100 mg/kg/ Rat/ Alloxan	Antidiabetic
136	<i>Murraya koenigii</i> L. Sprengel. (Rutaceae) Curry patta	Aqueous/ Leaves ¹⁷²	300 mg/kg bw/ 30 days/ Rat/ STZ/ Oral	Hypoglycemic
		Aqueous/ Leaves ¹⁷³	300 mg/kg/ Rabbit/ Alloxan/ Oral	Hypoglycemic
		Leaves ¹⁷⁴	5, 10 and 15%/ 7 days/ Rat/ Alloxan	Hypoglycemic and anti-hyperglycemic
137	<i>Musanga cecropioides</i> (Moraceae) ¹⁷⁵ Umbrella tree	Aqueous and ethanol/ Stem bark	250, 500 and 1000 mg/kg/ 14 days/ Rat/ Alloxan/ Oral	Antidiabetic
138	<i>Myrtus communis</i> L. (Myrtaceae) ¹⁷⁶ Myrtle	Volatile oil/ Leaves	50 mg/kg/ Rat/ Alloxan/ Oral	Hypoglycaemic as well as mild hypotriglyceridemic
139	<i>Nervilia plicata</i> (Orchidaceae) ¹⁷⁷	Alcohol/ Stems	5 mg/kg/ 30 days/ Rat/ STZ- Nicotinamide	Antidiabetic
140	<i>Nigella sativa</i> L. (Ranunculaceae) Blackcaraway	Oil ¹⁷⁸	4 weeks/ Hamsters/ STZ-Nicotinamide	Significant decrease in blood glucose level together with significant increase in serum insulin level were observed
		Oil ¹⁷⁹	400 mg/kg bw/ 6 weeks/ Hamsters/ STZ/ Gastric gavage	Hypoglycaemic and immuno potentiating
141	<i>Ocimum canum</i> Sim. (Lamiaceae) Holy basil	Aqueous/ Leaves ¹⁸⁰	13 weeks/ Mice	Lowers blood glucose and facilitates insulin release by isolated pancreatic β -islet cells
		Aqueous/ Leaves ¹⁸¹	13 weeks/ Mice	Antidiabetic
142	<i>Ocimum sanctum</i> (Lamiaceae) Tulsi	Alcohol/ Leaves ¹⁸²	1 g/kg/ 21 days/ Rat/ Alloxan/ Oral	Anti-hyperglycemic and hypoglycemic
		Ethanol/ Leaves ¹⁸³	200 mg/kg/ 30 days/ Rat/ STZ/ Oral	Anti-hyperglycemic and hypoglycemic
		Chloroform/ Aerial parts ⁵	250 and 500 mg/kg bw/ 2 weeks/ Rat/ Alloxan	Antidiabetic
		Hydro alcohol/ Aerial parts ¹⁸⁴	Rat/ Alloxan	Antidiabetic



143	<i>Olea europaea</i> L. (Oleaceae) ¹⁸⁵ Common olive	Oleuropein (Secoir- idoid) and Oleanolic acid (Triterpene)/ Leaves	Mice	Anti-diabetic
144	<i>Opuntia dillenii</i> Haw. (Cactaceae) ¹⁸⁶ Prickly pear	Cladodes/ Aqueous	3 weeks/ Mice/ STZ/ Gavage	Antidiabetic
145	<i>Opuntia humifusa</i> Raf. (Cactaceae) ¹⁸⁷ Indian fig	Stems	150 mg/kg per day/ 7 weeks/ Rat/ STZ	Potential hypoglycemic
146	<i>Parinari excels</i> Sab. (Chrysobalanaceae) ¹⁸⁸ Grey plum	Aqueous/ Bark	100 and 300 mg/kg/day/ 7 days/ Rat/ Alloxan / Oral	Antidiabetic
147	<i>Parkinsonia aculeate</i> (Fabaceae) ¹⁸⁹ Vilayti kikar	Water soluble frac- tion/ Aerial parts (leaves and flowers)	125 or 250 mg/kg/ 16 days/ Rat/ Alloxan/ Oral	Reduction in urinary volume, body weight, an improvement of epi- didymal adipose tissue and a positive action in liver weight
148	<i>Paspalum scrobiculatum</i> Linn. (Poaceae) ¹⁹⁰ Paragis	Aqueous and ethanol- ic/ Grains	250 and 500 mg/kg bw/ 15 days/ Rat/ Alloxan/ Oral	Antidiabetic
149	<i>Phellinus baumii</i> ¹⁹¹	Mycelial culture/ crude exopolysaccha- rides	Rat/ STZ/ Oral	Hypoglycemic
150	<i>Phlomis anisodonta</i> (Lamiaceae) ¹⁹²	Methanol/ Aerial parts	100, 200 and 400 mg/kg/ 10 days/ Rat/ STZ/ Oral	Antidiabetic
151	<i>Phyllanthus sellowianus</i> Miller Arg. (Euphorbiaceae) ¹⁹³	Aqueous, butanol and dichloromethane/ Stem bark	200 mg/kg/ 6 and 9 hr/ Mice/ STZ/ p.o.	Hypoglycemic
152	<i>Phyllanthus amarus</i> Schumach. & Thonn. (Euphorbiaceae) ¹⁹⁴ Bahupatra	Aqueous/ Leaves and seeds	150, 300 and 600 mg/kg/ Mice/ Oral	Hypoglycemic and hy- pocholesterolemia
153	<i>Phyllanthus simplex</i> (Euphorbiaceae) ¹⁹⁵ Bhuiamali	Petroleum ether, ethyl acetate and methanol, water fraction/ Whole plant	Petroleum ether (200 and 400 mg/kg), ethyl acetate (100 and 200 mg/kg), methanol (125 and 250 mg/kg), water fraction (150 and 300 mg/kg)/ 21 days/ Rat/ Alloxan/ Oral	Antidiabetic



154	<i>Phyllanthus reticulatus</i> (Euphorbiaceae) ¹⁹⁶ Roast potato plant	Petroleum ether and ethanol/ Leaves	1000 mg/kg/ 21 days/ Mice/ Alloxan/ Oral	Antidiabetic
155	<i>Physalis alkekengi</i> L. (Solanaceae) ¹⁹⁷ Winter cherry	Water-soluble polysaccharide isolated with hot water/ purified polysaccharide fraction/ Fruits	Mice/ Alloxan/ Oral	Antidiabetic
156	<i>Piper betle</i> (Piperaceae) ¹⁹⁸ Kali mirch	Aqueous and ethanol/ Leaves	100, 200, 300 and 1500 mg/kg/ Rat/ STZ/ Oral	Antidiabetic activity
157	<i>Pongamia pinnata</i> (Linn.) (Leguminosae) Karanj	Ethanol/ Flowers ¹⁹⁹	300 mg/kg bw/ Rat/ Alloxan/ Oral	Antihyperglycemic
		Ethanol/ Fruits ²⁰⁰	250 mg/kg/ 10 days/ Rat/ STZ/ Oral	Antihyperglycemic
		Aqueous and pet. ether/ Stem bark ²⁰¹	100, 200 and 400 mg/kg/ 21 days/ Mice/ Alloxan	Antihyperglycaemic
		Cycloart-23-ene-3 β , 25-diol from Stem bark ²⁰²	1 mg/kg/ Mice/ STZ - Nicotinamide/ p.o.	Antidiabetic/ increased pancreatic insulin secretion and antioxidant activity
158	<i>Posidonia oceanica</i> (L.) Delile. (Posidoniaceae) ²⁰³	Decoction/ Leaves	50, 150 and 250 mg/kg b.wt./ 15 days/ Rat/ Alloxan/ Oral	Antidiabetic
159	<i>Potentilla discolor</i> Bunge. (Rosaceae) ²⁰⁴	Total flavonoids extract and total triterpenoids extract/ Crushed herb	Total flavonoids extract (369 mg/kg) and total triterpenoids extract (501 mg/kg)/ 15 days/ Rat/ STZ	Hypoglycemic and hypolipidemic possibly through a strong antioxidant activity and a protective action on β -cells
160	<i>Potentilla fulgens</i> L. (Rosaceae) ²⁰⁵ Bajradanti	Methanol/ Roots	150 to 650 mg/kg bw/ 5 days/ Mice/ Alloxan/ I.P.	Hypoglycemic
161	<i>Psidium guajava</i> (Myrtaceae) ²⁰⁶ Guava	Methanol/ Leaves	10 mg/kg/ 4 weeks/ Mice/ I.P.	Antidiabetic
162	<i>Pterocarpus santalinus</i> (Fabaceae) ²⁰⁷ Red sandal wood	Ethyl acetate: methanol fractions of ethanolic extract/ Bark	100 and 150 mg/kg bw/ Rat/ STZ/ Oral	Decreases STZ induced hyperglycemia by increasing glycolysis and decreasing gluconeogenesis



163	<i>Punica granatum</i> L. (Lythraceae) Pomegranate	Aqueous/ Flowers ²⁰⁸	250 mg/kg, 500 mg/kg/ 21 days/ Rat/ STZ/ Oral	Antidiabetic
		Methanol/ Flowers ²⁰⁹	500 mg/kg/ 6 weeks/ Rat/ Oral	Antidiabetic
164	<i>Pyrus brossieriana</i> Buhse. (Rosaceae) ²¹⁰ Wild pear	Leaves	500 and 1000 mg/kg/day/ Rat/ Alloxan	Antihyperglycemic
165	<i>Retama raetam</i> (Fabaceae) ²¹¹ White weeping broom	Methanol/ Fruits	100, 250 or 500 mg/kg/day/ 4 Weeks/ Rat/ STZ	Antihyperglycemic / stimulating pancreatic insulin release and re- ducing intestinal glu- cose absorption
166	<i>Ricinus communis</i> (Euphorbiaceae) ²¹² Castor oil	50% Ethanol/ Roots	500 mg per kg bw/ 20 days/ Rat	Antidiabetic
167	<i>Rhus chirindensis</i> Baker F. (Anacardiaceae) ²¹³ Red currant rhus	Aqueous/ Stem-bark	50–800 mg/kg/ Rat/ STZ/ Oral	Hypoglycaemic
168	<i>Rosmarinus officinalis</i> (Lamiaceae) ²¹⁴ Rosemary	Ethanol/ Leaves	200 mg/kg/ 1 week/ Rabbit/ Alloxan/ Oral	Antidiabetogenic
169	<i>Rubus fruticosus</i> L. (Rosaceae) ¹³¹ Blackberry	Aqueous / Leaves	8.1g/kg/ STZ/ Oral	Hypoglycaemic
170	<i>Rumex patientia</i> (Polygonaceae) ²¹⁵ Garden patience	Seeds	4 weeks/ Rat/ STZ	Antihyperglycemic
171	<i>Salacia reticulate</i> (Celastraceae) ²¹⁶ Sinhala	Aqueous/ Stems	4 weeks/ Mice	Gluconeogenic gene regulation is one possi- ble mechanism that ex- erts effects in traditional diabetic medicine
172	<i>Salvia officinalis</i> L. (Lamiaceae) Sage	Essential oil/ metha- nol/ Leaves ²¹⁷	Methanol extract (100, 250, 400 and 500 mg/kg) and essen- tial oil (0.042, 0.125, 0.2 and 0.4 ml/kg)/ Rat/ STZ/ I.P.	Hypoglycaemic
		Ethanol ²¹⁸	0.1, 0.2 and 0.4 g/kg bw/ 14 days/ Rat/ STZ/ Oral	Antidiabetic



173	<i>Sclerocarya birrea</i> (A. Rich.) Hochst. (Anacardiaceae) Morula	Methanol/ Stem bark ²¹⁹	150 and 300 mg/kg bw/ 21 days/ Rat/ STZ	Improve glucose homeostasis which could be associated with stimulation of insulin secretion
		Ethanol/ Stem-bark ²²⁰	120 mg/kg/ 5 weeks/ Rat/ STZ/ p.o.	Hypoglycemic effect was associated with increased hepatic glycogen synthesis
		Aqueous/ Stem-bark ²²¹	100–800 mg/kg/ Rat/ STZ/ p.o.	Hypoglycemic
174	<i>Scoparia dulcis</i> (Scrophulariaceae) ²²² Sweet broomweed	Aqueous	200 mg/kg bw/ 15 days/ Rat/ STZ	Glucose lowering effect associated with potentiation of insulin release from pancreatic islets
175	<i>Setaria italica</i> ²²³ (Graminae) Kangni	Aqueous/ Seeds	300 mg/kg b.w/ 30 days/ Rat/ STZ/ Oral	Antihyperglycemic
176	<i>Siraitia grosvenori</i> ²²⁴	Fruits	100 mg/kg/ 4 weeks/ Mice/ Alloxan	Antihyperglycemic
177	<i>Solanum torvum</i> Swartz. (Solanaceae) Kadubadam	Methyl caffeate/ Fruits ²²⁵	40 mg/kg/ 28 days/ Rat/ STZ/ Oral	Hypoglycemic
		Methanol/ Fruits ²²⁶	200 and 400 mg/kg/ 30 days/ Rat/ STZ/ Oral	Antidiabetic
178	<i>Solanum xanthocarpum</i> Schrad. & Wendl. (Solanaceae) ²²⁷ Kateli	Aqueous/ Fruits	Rat/ Alloxan	Significant hypoglycaemic activity
		Methanol/ Leaves	200 mg/kg bw/ Rat/ Alloxan	Antihyperglycemic
179	<i>Stevia rebaudiana</i> Bertoni. ²²⁸	Rebaudioside A (diterpenoid glycoside)/ Leaves	Mouse islets using static incubations, as well as perfusion experiments/ 10 ⁻¹⁶ to 10 ⁻⁶ mol/L	Possesses insulinotropic effects
180	<i>Swertia punicea</i> Hemsl. (Gentianaceae) ²²⁹	Methylswertianin and bellidifolin (Xanthones)/ Ethyl acetate fraction / Whole plant	200 and 100 mg/kg bw/ 4 weeks/ Mice/ STZ/ Oral	Antidiabetic via the improvement of insulin resistance
181	<i>Swietenia macrophylla</i> ²³⁰	Swietenine (Tetranortriterpenoid)/ Seeds	25 and 50 mg/kg bw/ 5 days/ Rat/ STZ/ Oral	Hypoglycemic and hypolipidemic



182	<i>Symplocos cochinchinensis</i> (Lour.) S. Moore. ²³¹ (Symplocaceae)	Hexane/ Leaves	250 and 500 mg/kg/ 28 days/ Rat/ STZ	Antidiabetic
183	<i>Syzygium alternifolium</i> (Wt.) Walp. (Myrtaceae) ²³²	Aqueous/ Methanol:water (4:1) fraction/ Seeds	50 mg/kg.bw/ 30 days/ Rat/ STZ	Antihyperglycemic and antihyperlipidemic
184	<i>Syzygium cumini</i> (Myrtaceae) ²³³ Jamun	Alcohol/ Seeds	100 mg/kg bw/ Rat/ Alloxan/ Oral	Antidiabetic and antihyperlipidemic
185	<i>Tabernaemontana divaricata</i> (Apocynaceae) ²³⁴ Pinwheel flower	Conophylline (alkaloid)/ Leaves	50 and 200 mg/kg bw/ 15 days/ Rat/ STZ/ Oral	Antidiabetic
186	<i>Tamarindus indica</i> Linn. (Caesalpiniaceae) ²³⁵ Tamarind	Aqueous/ Seeds	80 mg/ 0.5 ml distilled water/ 100 g bw per day/ 7 days/ Rat/ STZ/ Gavage	Antidiabetic
187	<i>Taxus yunnanensis</i> (Taxaceae) ²³⁶	Isotaxiresinol, Secoisolariciresinol and Taxiresinol (Lignans)/ Aqueous and methanol extract/ Wood	100 mg/kg/ Rat/ STZ/ I.P.	Hypoglycemic
188	<i>Tectona grandis</i> (Verbenaceae) ²³⁷ Teak	Methanol/ Flowers	100 and 200 mg/kg/ 28 days/ Rat/ STZ	Antidiabetic
189	<i>Tecoma stans</i> (L.)Juss.ex Kunth. (Bignoniaceae) ²³⁸ Yellow bells	Aqueous/ Leaves	500 mg/kg/ 21 days/ Rat/ STZ/ Acute and chronic	Antidiabetic
190	<i>Tetrapleura tetraptera</i> Taub. (Fabaceae) ²³⁹	Aqueous/ Fruits	50–800 mg/kg/ Rat/ STZ/ p.o.	Hypoglycaemic
191	<i>Terminalia catappa</i> Linn. (Combretaceae) ²⁴⁰ Umbrella tree	Petroleum ether, methanol and aqueous/ Fruits	1/5 of their lethal doses/ Rat/ Alloxan	Antidiabetic
192	<i>Terminaliapallida</i> (Combretaceae) ²⁴¹ Tella-karaka	Ethanol/ Fruits	0.5 g/kg bw/ Rat/ Alloxan/ Oral	Antihyperglycemic
193	<i>Terminalia superba</i> Engl. (Combretaceae) ²⁴²	Methanol/ Stem bark	150 mg/kg and 300 mg/kg extract/ 14 days/ Rat/ STZ/ Gavage	Antidiabetic



194	<i>Theobroma cocoa</i> (Sterculiaceae) ²⁴³ Cocoa	Ethanol/ Fermented and roasted beans	1, 2 and 3% dose/ 4 weeks/ Rat/ STZ	Potential hypoglycae- mic
195	<i>Tinispora cordifolia</i> (Thunb.) Miers. (Meni- spermaceae) Giloy	Chloroform/ Stems ⁵	250 and 500 mg/kg bw/ 2 weeks/ Rat/ STZ	Antidiabetic
		Palmatine, jatror- rhizine and mag- noflorine / Alkaloid rich fraction/ Stems ²⁴⁴	Alkaloid rich fraction (50, 100 and 200 mg/kg), Palmatine, jatrorrhizine and mag- noflorine (10, 20 and 40 mg/kg each)/ Oral	Hypoglycemic
196	<i>Tournefortia hartwegiana</i> Steud. (Boraginaceae) ²⁴⁵	Methanol/ Aerial parts	310 mg/kg bw/ 10 days/ Rat/ Alloxan	Antidiabetic and hypo- glycemic
197	<i>Trema micrantha</i> (Ulma- ceae) ²⁴⁶	Ethanol/ Leaves	250, 1000 mg/kg/ Rat/ Alloxan	Antidiabetic
198	<i>Trigonella foenum- graecum</i> L. (Fabaceae) Fenugreek	Alcohol/ Seeds ¹⁸²	1 g/kg/ 21 days/ Rat/ Alloxan/ Oral	Antihyperglycemic and hypoglycemic
		Ethanol/ Seeds ²⁴⁷	0.1, 0.25 and 0.5 g/kg bw/ 14 days/ Rat/ STZ/ Oral	Antidiabetic
199	<i>Triticum repens</i> L. (Poaceae) ²⁴⁸ Couch grass	Aqueous/ Rhizomes	20 mg/kg/ 2 weeks/ Rat/ STZ/ Oral	Hypoglycaemic
200	<i>Urtica dioica</i> (Urticaceae) ²⁴⁹ Nettle	Aqueous/ Aerial parts	500 mg/kg/ Rat/ Allox- an/ Oral	Antihyperglycemic
201	<i>Urtica pilulifera</i> L. (Urticaceae) ²⁵⁰ Nettle	Lectin/ Seeds	100 mg/kg/ 30 days/ Rat/ STZ/ I.P.	Hypoglycemic
202	<i>Vaccinium angustifolium</i> Ait. (Ericaceae) ²⁵¹ Lowbush blueberry	Ethanol/ Leaves, stems, fruits and roots	peripheral tissues and pancreatic β cells using a variety of cell-based bioassays/ 12.5 μ g/ml	Antidiabetic
203	<i>Vaccinium arctostaphylos</i> L. (Ericaceae) ²⁵² Caucasian whortleberry	Ethanol/ Fruits	200 and 400 mg/kg bw/ 21 days/ Rat/ Alloxan/ Oral	Antidiabetic



204	<i>Vaccinium bracteatum</i> Thunb. (Ericaceae) ²⁵³ Sea bilberry	Aqueous and ethanol/ Leaves	100 mg/kg bw/ 4 weeks/ Mice/ STZ	Potential hypoglycemic effect
205	<i>Vatairea macrocarpa</i> (Benth.) Ducke. (Fabaceae) Amargo	70% Ethanol/ Stem-bark ²⁵⁴ Ethanol/ Stem-bark ²⁵⁵	250 or 500 mg/kg/ 22 days/ Rat/ STZ/ Oral 500 mg/kg/ 21 days/ Rat/ STZ/ Oral	Antidiabetic Antihyperglycemic
206	<i>Vernonia anthelmintica</i> (Asteraceae) ²⁵⁶ Kali jir	Ethanol / ethyl acetate: isopropanol (1:1)/ Seeds	Ethanol extract (0.50 g/kg bw) and fraction (100 mg/kg bw)/ Rat/ STZ/ 45 days	Antidiabetic and anti-hyperlipidemic
207	<i>Vernonia colorata</i> (Willd.) Drake. (Compositae) ²⁵⁷	Acetone/ Leaves	100 mg/kg/ Rat/ Alloxan/ Oral	Antidiabetic
208	<i>Vitex megapotamica</i> (Spreng) Moldenke. (Verbenaceae) ²⁵⁸	Ethyl acetate and <i>n</i> -butanol fractions/ Leaves	400 and 800 mg/kg/ Rat/ Alloxan/ 1 hr	Antihyperglycemic action
209	<i>Vitex negundo</i> (Verbenaceae) ²⁵⁹ Indrani	Iridoid glucoside/ Leaves	50 mg/kg bw/ 30 days/ Rat/ STZ	Antidiabetic
210	<i>Vitis vinifera</i> L. (Vitaceae) ²⁶⁰ Grapevine	Aqueous, ethylacetate, <i>n</i> -butanol and aqueous fraction/ Leaves	25 mg/kg for ethylacetate fraction, 80 mg/kg for <i>n</i> -butanol fraction and 375 mg/kg for remaining aqueous fraction/ 15 days/ Rat/ STZ	Significant antihyperglycaemic and antioxidant activity
211	<i>Withania coagulans</i> Dunal. (Solanaceae) Paneer dodi	Aqueous/ Fruits ²⁶¹ Coagulanolide/ Fruits ²⁶²	1 g/kg/ Rat/ STZ/ p.o. Rat/ STZ	Hypoglycemic Antihyperglycemic
212	<i>Witheringia solanacea</i> (Solanaceae) ²⁶³	Aqueous/ Leaves	250, 500 and 1000 mg/kg/ Rat/ Alloxan	Hypoglycemic
213	<i>Zingiber officinale</i> Roscoe. (Zingiberaceae) Ginger	Ethanol/ Rhizomes ²⁶⁴ Raw Ginger ²⁰	200 mg/kg/ 20 days/ Rat/ STZ/ Oral 500 mg/kg/ 7 weeks/ Rat/ STZ/ I.P.	Antihyperglycemic Hypoglycaemic
214	<i>Zizyphus spina-christi</i> (L.) Willd. (Rhamnaceae) ²⁶⁵	Christinin-A (Saponin glycoside)/ Butanol fraction/ Leaves	100 mg/kg/ Rat/ STZ/ Oral	Safe insulinotropic and hypoglycemic effects may be due to a sulfonylurea-like activity.

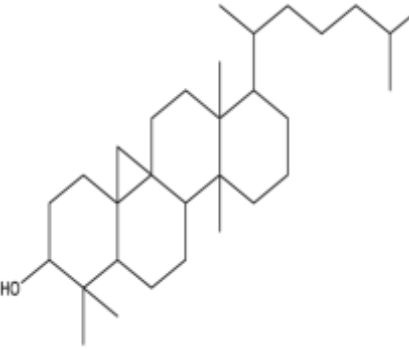


215	<i>Zygodphyllum coccineum</i> L. (Zygophyllaceae) ¹⁰² Kammun quaramany	Aqueous	75 mg/100 g b.wt./ 4 weeks/ Rat/ Alloxan/ Oral	Antihyperglycemic
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CHEMICAL STRUCTURES OF HYPOGLYCEMIC PHYTOCONSTITUENTS:

S.NO.	Chemical Structure	Name of Structure
1		Lupeol
2		Diallyl trisulfide
3		Lophenol



4		Cycloartanol
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CONCLUSION

Many medicines in use today have their origin in plants. Herbal medicines are increasingly becoming popular and hence, it is prudent to search for options from medicinal plant extracts for new antidiabetic hypoglycemic substances. The present review gives comprehensive details of antidiabetic plants used in the treatment of diabetes mellitus. The presences of bioactive chemicals are mainly responsible for this antidiabetic action. Some of these plant derived medicines, however, offer potential for cost effective management of diabetes through dietary interventions, nutrient supplementation and combination therapies with synthetic drugs in the short term and as the sole medication from natural sources over the long term. Consequently, many efforts should be afforded to optimize a procedure for antidiabetic screening of different plants extracts as well as isolated bioactive compounds for the discovery of new natural herbal antidiabetic drugs. That can be used as an alternative to synthetic oral hypoglycemic drugs with less or even no prominent side effects.



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