ELSEVIER

Scopus

doi

Journal of Vibration Engineering

ISSN:1004-4523

Registered

- SCOPUS
- GOOGLE SCHOLAR
- DIGITAL OBJECT IDENTIFIER (DOI)
- IMPACT FACTOR 6.1

Our Website
www.jove.science

TRADITIONALHERBALMEDICINESINDIABETESMELLITUS:ANOVERVIEW

Ms.ShevanteT.B.,Ms.AlhatB.R.,
VJSM'SINSTITUTEOFPHARMACYFORWOMEN,ALE

Abstract
Diabetes is an important human disorder concerning various sides in life of people of different countries whichultimatelyleadstoseriousdamagetotheheart,bloodvessels, eyes,kidneysand nerves.InIndiaitisshowingtobe a major health problem, especially in the urban areas. Even though there is considerable progress in thetreatment of diabetes by oral hypoglycaemic agents, search for newer drugs continues because the presentsyntheticdrugshaveseverallimitations.Therearevariousapproachestoreducetheilleffectsofdiabetesanditssecondary complications, herbal formulations are desired due to lesser side effects and low cost. The presentarticle gives a general idea, complications of diabetic mellitus and focuses on herbal formulations or nativeplants used in the treatment of diabetes which can be or arepart of meals or diet to control sugar levelespecially in India. The herbal drugs with antidiabetic activity are not yet commercially formulated as modernmedicines, even though they have been acclaimed for their therapeutic properties in the traditional systems ofmedicine. Therefore, this review is aimed at opening up new outlooks in realizing the therapeutic potential ofAyurveda in treatment of diabetes and other chronic diseases. All drugs which we have discussed in this reviewhaveasignificantrolein therapyofdiabetesmellitus.

Keywords:Medicinalplant,Antidiabeticdrugs,Indigenous,Herbaldrugs,Diabetes.

Introduction

Diabetes mellitus alone due its considerable incidence, morbidity, and mortality, diabetes has exceeded canceras the third "killer" of mankind's health, behind cancer, cardiovascular, and cerebrovascular illnesses[3]. Diabetesis a major degenerative disease chronic, metabolic disease regarded as by raised levels of blood glucose (orblood sugar) in the world today. The most common is type 2 diabetes, usually in adults, which occurs when thebodybecomesresistanttoinsulinordoesn'tmakeenoughinsulin.Diabetesisaffectingatleast15millionpeopleand having worries like hypertension, atherosclerosis, Neuropathy, Nephropathy, Retinopathy, Gastropathymicrocirculatory disorders, diabetic ketoacidosis and sexual dysfunction[1] .As per WHO key facts, in the past 3decades the prevalence of type 2 diabetes has raised dramatically in countries of all income levels. Type 1diabetes or juvenilediabetesorinsulin-dependent diabetes,isachronic conditioninwhich the pancreasproduces little or no insulin by itself. There is a globally agreed target to halt the rise in diabetes and obesity by2025. About422millionpeopleworldwidehavediabetes,themajoritylivinginlow-andmiddle-incomecountries, and 1.5 million deaths are directly attributed to diabetes each year[1,2]. Both the number of cases andtheprevalenceofdiabeteshavebeensteadilyincreasingoverthepastfewdecades.Dietandlifestyle,particularly plant-based diets, are effective tools for type 2 diabetes prevention and management. Plant-baseddiets are eating a pattern that focuses legumes, whole grains, vegetables, fruits, nuts, and seeds and deject mostor all animal products [3]. Various studies strongly support the role of plant-based diets, and food and nutrientcomponents of plant-based diets, in reducing the risk of type 2 diabetes[4]. Between 2000 and 2019, there was a3% increase in diabetes mortality rates by age. In 2019, diabetes and kidney disease due to diabetes triggered anestimated 2 million deaths. A healthy diet, regular physical activity, maintaining a normal body weight andavoiding smoking are ways to prevent or delay the onset of type 2 diabetes[4,5]. Diabetes can be treated and itsconsequences avoided or delayed with diet, physical activity, education and regular screening and treatment forcomplications.Evidence from observational and interventional studies demonstrates the benefits of plant-baseddietsintreatingtype2diabetesandreducingkeydiabetes-relatedmacrovascularandmicrovascularcomplications. The World Health Organization (WHO) assessed that about 80% of people living in developingcountries trust almost entirely on traditional medicines for their primary health care needs. Different parts of theplant(Leaves,seed,roots,rhizomes,bark,podsetc)arereputedfortheirmedicinalvalue.Traditionalmedicinesderived from medicinal plants are used by about 60% of the world's population. This review focuses on Indianherbal drugs and plants used in the treatment of diabetes. A list of medicinal plants with proven antidiabetic andrelated beneficial effects and of herbal drugs used in treatment of diabetes is compiled. Mostly all are likely touse traditional medicine, acupuncture, yoga, indigenous therapeutics. Inspiring the growing prominence andvalue of traditional medicine in the provision of health care nationally and globally[6]. These include *Alliumsativum,Eugeniajambolana,Momordicacharantia,Ocimumsanctum,Phyllanthusamarus,Pterocarpusmarsupium,Tinosporacordifolia,C.indica,Helicteresisora,Steviarebaudiana,Gymnemasylvestre,Enicostemmalittorale* ,Blume,*Alliumcepa,Aloevera,Cajanuscajan,Cocciniaindica,Caesalpiniabonducella ,Ficusbengalenesis,Gymnemasylvestre ,Swertiachirayita,Syzigium cumini,Tinosporacordifolia*

*andTrigonellafoenumgraecum.M.charantia,Mucunapruriens,T.foenumgraecum,Murrayakoeingii,Brassica junceae*etc[7,8,910].

PathophysiologyofDiabetes[9]

Types	Pathophysiology
TypeI	Autoimmunebetacelldestructionandlackofinsulinproduction
TypeII	Abnormalincreasedresistanceforinsulinaction
Gestational	Glucoseintoleranceduringpregnancy
Othertypeofdiabetes	Geneticdefectinbetacellofpancreases

Symptomsforbothdiabeticconditionsmayinclude[9]

- Highsugarlevelsintheblood;
- Uncommonthirst
- Recurrenturination
- Extremehungerandlossofweight
- Unclearvision
- Nauseaandvomiting
- Extremefaintnessandfatigue
- Irritability,moodchangesetc.

ComplicationsofDiabetesMellitus[9]

SomemajorcomplicationsduetoDiabetesMellituswhichmaybechronicifneglectedareas

- Neuropathy
- Retinapathy
- Nephropathy
- Macrovascularproblems
- Gangrene
- Footproblems
- Chestpain
- Heartattack
- Gumproblemsetc

The three major risk factors to be controlled are Hyperglycaemia, Hypertension,Hypercholesterolmenia

BasisofDiabetesMellitustreatment[9,10]

• Patienteducationfromconcerningthedisease
• Physicalexercise
• Diet
• Hypoglycemicagents

TraditionalAttitudestoRemedialCare[10,11,]

Traditionalmedicinalmethodshavebeeninplaceforcenturiesinculturesacrosstheglobe.AccordingtoWHO,Traditional medicine is “the sum total of the knowledge, skills, and practices based on the theories, beliefs, andexperiences indigenous to different cultures, whether rational or not, used in the maintenance of health as wellas in the prevention, diagnosis, improvement or treatment of physical and mental illness”. When consideringtraditional medicine, it is important not to refer to it as less than non-traditional, “scientific” medicine, based oncenturies of knowledge and experience. At the same time, it is also important to have a system in place toregulatemethodsthatmayharmpatients.

RecentRegulatoryDevelopments[12]:

Accordingtoregulatoryguidelines,herbalmedicinesareconventionaldrugsthatprimarilyfunctionastherapeuticformulationsofmedicinalplants.TheWorldHealthOrganisationdefinestraditionalmedicine(includingherbal remedies) as therapeutic modalities that have been in use for hundreds of years or longer prior to the developmentanddisseminationofmodernmedicine,aswellasothermodalitiesthatarenowinuse.TheFDAandEME

Ahaverecentlyshowed astronginterestinthestudyofbotanicalmedicinesandhavelookedintotheregulatoryframeworks governing their usage.The natural goods business has seen a significant uptick as a result of the increasedawareness,andtheentryhurdlesforbotanicalsandrelatedproductshavedecreased.Theneedforthesenew regulations is greater than ever because they guarantee market exclusivity for botanicals and theapprovalofcombining bioactive compounds made from plants in synergistic ways. India and China have a clear intrinsicadvantageover the rest of theglobe,bothasdevelopinganddevelopednations.

MechanismofActionofHerbalAntidiabetics[13-16]

.Variousmechanismsofanti-diabeticactivityofherbalplantaredependsupon

- DecreasedInsulinresistance
- Urinalglucosereabsorption
- BlockingBetacellpotassiumchannel
- Stimulationofinsulinsecretion
- IncreasingthesizeandnumberofcellsintheisletsofLangerhansInhibitonofinsulindegradation
- ImprovesGlycogenesisandhepaticglycosis
- Supplyofnecessaryelementslikecalcium,zinc,magnesium,manganeseandcopperforthebeta-cells
- Pancreaticbetacellrepairing
- Inhibitoryactiononalpha-amylase,β-galactocidaseandα–glycosidase
- Improvementindigestionalongwithreductioninbloodsugarandurea.
- Avoidanceofpathologicalconversionofstarchtoglucose.

CommonHerbalMedicinesUsedtoTreatDiabetes[15-24]

Sr no	*Botanicalname*	Family	Partsused	Usesof ethnomedicalplant
1	*Abromaaugusta*	Sterculiaceae	Root	Hypoglycemicandantilipidemic
2	*Acaciaarabica*	Fabeceae	Bark	Amelioratethederangementinlipidmetabolismindiabetes
3	*Acalyphawilkesiana*	Euphorpiaceae	Leaves	Hypoglycemicandantioxidant
4	*Acersaccharum(maple)*	Sapindaceae	Juice	α-Amylaseandα-glucosidaseinhibition
5	*Acoruscalamus*	Acoraceae	Leaves/bark	α-Glucosidaseinhibitionandhypolipidemic
6	*Aeglemarmelos*	Rutaceae	Leaves/bark/root	Antioxidantandanti-cataractactivity
7	*Afzeliaafricana*	Fabaceae	Stembark	Antidiabeticandhematologicaleffect
8	*Alhagicamelorum*	Fabaceae	Aerialpart	α-Glucosidaseinhibition
9	*Alliumsattivum*	Alliaceae	Bulb	Antidiabetic
10	*Aloevera*	Xanthorrhocaceae	Leaves	Hypoglycemic
11	*Alpiniaofficinarum*	Zingiberaceae	Rhizomes	α-Glucosidaseinhibition
12	*Amaranthus spinosus,Amaranthuscaudatus,Amaranthusviridis*	Amaranthaceae	Leaves	α-Amylaseinhibition,antioxidantandanticholesrolemic
13	*AnanthamoolaHemidesmusindicus*	Asclepiadiacea	root	repairs the concentrations of electrolytes, glucosemetabolizingenzymes,hepaticmicrosomalproteinand hepatic cytochrome P-450-dependent mono-oxygenaseenzymesystems
14	*Annonasquamosa*	Annonaceae	Fruits	Antidiabetic
15	*Anogeissusacuminate*	Combretaceae	Wholeplant	Antioxidant
16	*Arecacatechu*	Arecaceae	Seed	Antidiabetic
17	*Artemis sphaerocephalakrasch*	Compositae	Gum/seedpowder	Antidiabetic
18	*Artemisia dracunculus(L.)*	Asteraceae	Aerialpart	Antidiabetic
19	*Artemisia herba-albaasso*	Asteraceae	Wholeplant	Antihyperglycemicandantihyperlipidemic
20	*Artemisiapallens*	Asteaceae	LeavesandFlower	Antidiabetic
21	*Ascophyllumnodosum*	Algae	-	α-Glucosidaseinhibitionandα-amylase

22	*Ashwagandha,winter cheery Withaniasomnifera*	Solanaceae	Roots	Reducedbloodsugarlevels
23	*Asiatic ginsengPanaxginseng*	Araliac	Roots	bloodglucoselevelsviaslowingtheabsorptionofcarbohydrates, enhancing glucose transport, andmodulatinginsulinsecretion.
24	*Asiatic sweet leafSymplocosPaniculata*	Symplocaceae	Leaves/stems	inhibitorsofproteintyrosinephosphatase1B(PTP1B)
25	*Aspidospermamacrocarpon*	Apocynaceae	Steam/Bark Rootwood	α-Amylaseinhibition
26	*Atractylodesmacrocephala*	Asteraceae	Wholeplant	α-Glucosidaseinhibition
27	*Azadirachtaindica*	Meliaceae	Leaves,flower ,seed	Antidiabeticandantihypertension
28	*Banana MusasapientumKuntz*	Musaceae	Fruits/flowers	LowersBloodglucoseandglycosylatedhemoglobinlevels.
29	*Banyan treeFicusbengalensis*	Moraceae	Bark	increasesinsulinsecretion
30	*AloebarbadensisMil*	Liliaceae	Leaves	Insulinproductionandreleasearestimulated.
31	*Barringtoniaracemosa*	Lecythidaceae	Seed	α-Glucosidaseandα-amylaseinhibition
32	*Bauhiniaforficate*	Leguminosae	Leaves	Antidiabetic
33	*Belamcandachinensis*	Irdaceae	Leaves	Hypoglycemic
34	*Benincasahispida*	Cucurbitaceae	Fruit	Amelioratthederangementinlipidmetabolismindiabetics.
35	*Benincasahispida*	Cucurbitaceae	Fruit	Antidiabetic
36	*Berberisvulgaris*	Berberidaceae	Leaves	Hypoglycemic
37	*Betavulgaris*	Amaranthaceae	Root	Antidiabetic
38	*Betal,betalwine Piperbetle*	Piperaceae	Leaf	glucosemetabolism,anti-hyperglycemic
39	*Bilwa,baelfruit Aeglemarmelos*	Rutaceae	LeafExtract	Decreasecholesterolandbloodurealevel
40	*Bitter gourdMomordicacharantia*	Cucurbitaceae	fruit	stimulatesGLP-1andinsulinsecretion
41	*Bitterkola,falsekolaGarcinia kola*	Clusiaceae	Seed	HypoglycemicandHypolipidemic
42	*Black teaCamelliasinensis*	Theaceae	Leaves	Leaveshelp tolowerbloodsugarlevels.
43	*Borerhaviadiffusa*	Nyctaginaceae	Wholeplant	Antidiabetic
44	*Brassicajuncea*	Brassicaceae	Seed	Hypoglycemic

45	*Buchholziacoriaceae*	Capparaceae	Seed	Hypoglycemic
46	*Caesalpinia ferreaMartius*	Leguminosae	Bark	Hypoglycemicactivity
47	*Camelliasinensis*	Theaceae	Fruitpeel/leaves	α-glucosidaseandα-amylaseinhibition,antihyperglycemic
48	*Capparisdeciduas*	Capparaceae	Fruit	Hypoglycemic/antidiabetic
49	*CarillaFruit*	Casearіaesculenta	Root	ReducesbloodglucoselevelofbothType1&type 2diabetes
50	*Cassiaauriculata*	Caesalpiniaceae	Aerialpart	Antioxidant
51	*Catharanthusroseus*	Apocynaceae	Leaves/bark/root	Antioxidantandanticataractactivity
52	*Catunaregamtormentosa*	Rubiaceae	Wholeplants	Antioxidantandantihyperglycemic
53	*Centauriunerythrea*	Gentianaceae	Wholeplant/leaves	Antihyperglycemic, antihyperlipidemic,antioxidantandpreventβ-celldamage
54	*Chaenomelessinensis*	Rosaceae	Fruit	
55	*Chiliadenusiphionoides*	Asteraceae	Shrub	Increasedβ-cellsnumbersandInsulinsecretion
56	*Chillipepper*	Capsicumannum	Fruit	cholesterolloweringeffect
57	*Cinnamomum cassia,Cinnamomum zeylanicum*	Lauraceae	Leaves/bark	α-Glucosidaseinhibition,antioxidantandantidiabetic
58	*Cocciniacordifolia*	Cucurbitaceae	Herb	Hypoglycemic
59	*Cocciniaindica*	Cucurbitaceae	Leaves	Antioxidant,antihyperglycemicandantilipidemic
60	*Cocosnucifera*	Arecaceae	Coconut kernelprotein	Antidiabetic
61	*Codonopsispilosula*	Campanulaceae	Wholeplant	α-Glucosidaseinhibition
62	*Coffea arabica,Coffeacanephora*	Rubiaceae	Beans/seed	α-Amylaseisoenzymeinhibition
63	*Combretummicranthum*	Combretaceae	Leaves	Antidiabetic
64	*Commbretummicranthum*	Combretaceae	Leaves	Hypoglycemicandantidiabetic
65	*Commiphoramukul*	Burseraceae	Gumresin	Antihyperglycemicandantioxidant
66	*Coriandrumsativum*	Apiaceae	Seed	Hypolipidemicandhypoglycemic
67	*Coruskousa*	Cornaceae	Leaves	Antihyperglycemic

68	*Costuspictus*	Zingiberaceae	Leaves	α-Glucosidaseandα-amylaseinhibition
69	*Crêpeginger*	*Costusspecious*	rhizome	Repairspancreaticβ-cells,increasinginsulinsensitivity
70	*Cucumis melo var.utlissimusDuthie*	Cucurbitaceae	Fruit	Antioxidantandhyperglycemic
71	*Cucurbitamaxima*	Cucurbitaceae	Fruit	Antioxidantandhyperglycemic
72	*Cuminumcyminum*	Apiaceae	Seed	Aldosereductaseandα-glucosidaseinhibition
73	*Cynodondactylon*	Poaceae	Leaves	Antidiabetic, antioxidant, hypolipidemic andimprovediabetesassociatedneurologicaldisorder
74	*Davana* Artemisiapallens	Asteraceae	aerialparts	Hypoglycemic
75	*Derrisscandens*	Fabaceae	Wholeplant	α-Glucosidaseinhibition
76	*Dichrostachysglomerata*	Fabaceae	Wholeplant	Antioxidantandhypoglycemic
77	*Dilleniaindica*	Dilleniaceae	Leaves	Antidiabeticandhypolipidemic
78	*Dioecresciserythrocl ada*	Rubiaceae	Wholeplant	Antioxidantandantihyperglycemic
79	*Dioscoreaopposite*	Dioscoreaceae	Leaves	α-Glucosidaseinhibition
80	*Elephantopus scaber,Elephantopus mollis*	Asteraceae	Wholeplant	Antidiabetic,α-glucosidaseinhibitionand apoptotic
81	*Eleutherineamericana*	Iridaceae	Bud	α-Glucosidaseinhibition
82	*Embeliaribes,Embeliaofficinalis*	Myrsinaceae	Leaves/aerialpart	Antihyperglycemic
83	*Eriobotryajaponica*	Rosaceae	Leaves	Antihyperglycemic
84	*Eucleaundulata*	Ebenaceae	Root/bark	α-Glucosidaseinhibitionandhypoglycemic
85	*Eucommiaulmoides*	Eucommiaceae	Wholeplant	Inhibitsactionofα-Glucosidase,antidiabeticandantioxidant
86	*Fenugreek*	*Trigonella foenum-gracecum*	seed	Seedpowdersolutiononthelipidprofileoftype IIdiabeticpatients.
87	*FicusbengalensisLinn*	Moraceae	Bark	Antidiabetic,antihyperglycemicandameliorative
88	*Ficusgolmerata*	Moraceae	Bark/fruit	Antioxidant,anti-cataractactivity
89	*Ficusreligiosa*	Moraceae	Bark	Antihyperglycemic,antioxidantandantidiabetic
90	*Fishbonefern,tuberousswordfern*	*Nephoelepsistuberose*	bulb	inrecoverslipidmetabolismintypeIIdiabeticpatients
91	*Flosionicerae*	Caprifoliaceae	Wholeplant	α-Glucosidaseinhibition

92	*Foenumgraecum*	Fabaceae	Wholeplant	Antihyperglycemic
93	*Garlic*	*Alliumsativum*	bulb	decreaseofglucoselevelsinplasma
94	*Glycinemax*	Fabaceae	Seed	α-Amylaseinhibition
95	*Goat'srue*	Galegaofficinalis	seed	to stimulatetheadrenalglandandpancreas
96	*Gowarplant*	Cyamospsistet ragonolobus	Fruit	lowersantihyperglycemiceffectonbloodglucosele vel
97	*Grateloupiaelliptica*	Algae	-	Inhibitesactionofα-Glucosidase
98	*Greentea*	Camelliasinensis	leaf	
99	*Guduchi*	Tinosporacardifolia	Plant	anti-hyperglycemiceffect
100	*Gyanandropsisgyna ndra*	Capparidceae	Root	Antidiabetic
101	*Gymnema sylvestre,Gymnemam ontanum*	Asclepiadaceae	Leaves/callus/stem	Renewal of β cell, reduce blood glucose level,increaseplasmainsulinlevelandhypolipide mic
102	*Gynuradivaricata*	Asteraceae	Aerialpart	Hypoglycemic,α-glucosidase,α-amylaseinhibition
103	*Hadga*	*Sesbaniagranflora*	Flowers,bark	stimulatinginsulinsecreationfromtheβ-cellsofthepancreas
104	*Hedychiumspicatum*	Zingiberaceae	Rhizome	α-Glucosidaseinhibitionandantihyperglycemic
105	*Helicteresigora*	Sterculiaceae	Bark	Antihyperglycemivandantiperoxidative
106	*Helleboruspurpuras cens*	Ranunculaceae	Leaves,bark	Antidiabetic
107	*Hypericumperforatum*	Hypericaceae	Leaves	Antidiabeticandantinociceptive
108	*IndianGumArabic*	AcaciaArabica	seeds	hypoglycemic,hypolipidemic,andantioxidantp roperties
109	*IndianKinoTree*	Pterocarpus marsupium	bark	torepairpancreatictissuesfunction
110	*Ispaghula*	*Plantagoovata*	husk	todecreasepostprandialglucoseconcentrations
111	*Jatrophacurcus*	Euphorbiaceae	Leaves	Improvethedisorderinlipidmetabolismindia betes
112	*Juniiperusoxycedrus*	Cupressaceae	Fruit/leaves	Hypoglycemicandantidiabetic
113	*Kielmeyeracoriacea*	Calophyllaceae	Stem/bark	α-Amylaseinhibition
114	*KingofBitter*	Andrographispa niculata	plant	toreducehyperglycemiabyinhibitingβ-celldysfunction
115	*Lagenariasiceraria*	Cucurbitaceae	Fruit	Antioxidantandantihyperglycemic

116	*Lantanacamara*	Verbenaceae	Leaves	Antidiabetic
117	*Levisticumofficinale*	Apiaceae	Root	α-Glucosidaseinhibition
118	*LifePlant*	Biophytum sensitivum	plantleaf	Pancreaticbeta-cellstimulating**action**
119	*Ligusticumchuanxiong*	Apiaceae	Aerialpart	Decreasekidneydamagecausedbydiabetes
120	*Lingzhimushroom*	Gandodermalucidium	Fruit	prolongsthelifespanofbeta-cells
121	*Liriopespicata*	Liliaceae	Root	Antidiabetic
122	*Lithocarpuspolystachyus*	Fagaceae	Leaves	α-Amylase,α-GlucosidaseinhibitionandHypoglycemic
123	*Lpomoeabatatas*	Convolvulaceae	Wholeplant	Antihyperglycemic
124	*Luffaacutangula*	Cucurbitaceae	Fruit	Antioxidantandantihyperglycemic
125	*Madagascar periwinkle Catharanthusroseus*	Apocynaceae	leaf	Antioxidant,Antihyperglycemic
126	*Malmeadepressa*	Annonaceae	Root	Inhibitshepaticglucoseproduction(gluconeogenesis)
127	*Mangiferaindica*	Anacardiaceae	Stembark/leaves	Antihyperglycemic
128	*Marrubiumvulgare*	Lamiaceae	Leaves	Antihyperglycemicanddyslipidemiaeffect
129	*Mimosapudica*	Fabaceae	Wholepant	Antihyperglycemic
130	*Momordicacharantia*	Cucurbitaceae	Fruit	Hypoglycemiceffect,Antidiabeticeffect
131	*Morindacetrifolia*	Rubiaceae	Leaves	Antioxidantandanticancerousactivity
132	*MorusalbaMorusnigra*	Moraceae	Wholeplant	Antioxidant
133	*Mucunapruriens*	Fabaceae	Seed	Hypoglycemic
134	*Murrayakoenigii*	Rutaceae	Leaves	
135	*Nepheliumlappaceumrin*	Magnoliopsida	Peel	
136	*Nerviliaplicata*	Orchiaceae	Stem	Antidiabetic
137	*Nymphaeastellata*	Nymphaeaceae	Flower	α-Glucosidaseinhibition
138	*Ocimumsanctum*	Labiatae	Wholeplant	

139	*Oleaeuropaea*	Oleaceae	Wholeplant	Antidiabetic
140	*OnionAlliumcepa*	Amaryllidaceae	bulb	toincreaseinsulinsecretion
141	*Ophiopogonjaponicas*	Asparagaceae	Wholeplant	
142	*Opuntia humifusaOpuntia dillenii*	Cactaceae	Stem,aerialpart	Hypoglycemicandhypolipidemic
143	*Opuntiastreptacantha*	Cactaceae	Leaves	Antihyperglycemic
144	*Palofierro*	Fabaceae	Seed	*α*-Amylaseinhibition
145	*Panaxginseng*	Araliaceae	Root	Increaseplasmainsulinlevel
146	*Panaxquinquefolius*	Araliaceae	Bark	Hypoglycemic
147	*Parinariexcelsa*	Chrysobalanaceae	Bark	Antidiabetic
148	*Peltophorum pterocarpum*	Fabaceae	Leaves/bark	
149	*Phalsa*	Grewiaasiatica	Fruit	increasesliverglycogenandpancreaticGSHcontents
150	*Phyllanthusamarus*	Phyllanthaceae	Wholeplant	Antidiabetic
151	*Pileamicrophylla*	Urticaceae	Leaves	Antihyperlipidemicandantioxidant
152	*Pimpinellatirupatiensis*	Apiaceae	Tuberousroot	
153	*Pine*	Pinaceae	Pinebark	A-Amylaseand*α*-Glucosidaseinhibition
154	*Pinyn Acontiumcarmichaeii*	Raunanculaceae	Root	Improvedtheglucosetakerate
155	*Pistaciavera*	Anacardiaceae	Fruitshull	A-Glucosidaseinhibition
156	*Pongamiapinnata*	Fabaceae	Seed/flower	*α*-Amylaseand*α*-Glucosidaseinhibition
157	*Prosopisglandulosa*	Fabaceae	Leaves	Hypoglycemic,hypolipidaemicandreduceinsulinresistance
158	*Prunusamygdalus*	Rosaceae	Seed	Antidiabetic
159	*Psidiumguajava*	Myrtaceae	Leaves	α-Amylaseinhibition
160	*Psoraleacorlifolia*	Fabaceae	Leaves	Antioxidant

161	*Pterocarpus santalinus,Pterocarpus marsupism*	Fabaceae	Bark/wood bark/leaves	Hypoglycemic,improvehyperlipidema,antihyperglycemicmucosalulceration
162	*Puerarialobata*	Fabaceae	Root	*Antidiabetic,α-Amylaseandα-*Glucosidaseinhibition
163	*Pumpkin*	Cucurbitaceae	Fruit/seed	Hypoglycemic
164	*Punicagranatum*	Lythraceae	Fruit	Antidiabetic
165	*Ramuluscinnamomi*	lauraceae	Aerialpart	α-Glucosidaseinhibition
166	*Rauwolfiaserpentine*	Apocyanaceae	Leaves	Hypoglycemic
167	*Rheumemodiwallex.*	Polygonaceae	Rhizome	α-Glucosidaseinhibition
168	*Rhusverniciflua*	Anacardiaceae	Stem	α-Glucosidaseinhibition
169	*Ricinuscommunis*	Euphorbiaceae	Root	Antidiabetic
170	*Rosadamascene*	Rosaceae	floret	α-Glucosidaseinhibition
171	*Rosmarinusofficinalis*	Lamiaceae	Aerialpart	Antidiabeticandα-Glucosidaseinhibition
172	*Rumexpatientia*	Polygonaceae	Seed	Antihyperglycemicandantihyperlipidemia
173	*Salacia reticulate,Salaciaobl ongawall*	Celastraceae	Leaves/rootbark	α-Glucosidaseinhibition,Antidiabetic
174	*Salvadorapersica*	Salvadoraceae	wood	α-Glucosidaseinhibition
175	*Sanguisorbaminor*	Rosaceae	Aerialpart	α-Glucosidaseinhibition
176	*Sarcopoteriumspinosum*	Rosaceae	Root	Antidiabetic
177	*Seapea Lathyrusjaponica*		Seed	increaseinsulinsensitivity,improvelipidmetabolism
178	*Sechiumedule*	Cucurbitaceae	Fruit	Antioxidantandhyperglycemic
179	*Selaginellatamariscina*	Selaginellaceae	Aerialpart	Antihyperglycemicandantihyperlipidemia
180	*Silybummarianum*	Asteraceae	Wholeplant	Antihyperglycemic
181	*Smallanthus sonchifolius*	Asteraceae	Root/leaves	Hypolipidemic,antidiabetic
182	*Solanummelongena*	Solanaceae	Fruit	Antioxidantandhyperglycemic

183	*Solanumtorvum*	Solanaceae	Fruit	Antihyperglycemicandregenerationofβ-cell
184	*Sorghum*	Cerealcrop	Grain	α-Amylaseandα-Glucosidaseinhibition
185	*Steviarebaudiana*	Asteraceae	Leaves	Hypoglycemic
186	*Sugar appleAnnonasquamosa*	Annonaceae	leaf	increasedtheactivitiesofinsulin,C-peptide
187	*Symplocoscochinchinensis*	Symplocaceae	Leaves	Antidiabetic
188	*Syzygiumcumini*	Myrtaceae	Leaves/fruit/seed/bark	α-Amylaseinhibition,β-cellregeneration
189	*Tanner'sCassia*	Cassiaauriculata	flowerextract	Antidiabetic
190	*Tectonagrandis*	Lamiaceae	Flower	Antidiabetic,antihyerlipidemicandantioxidant
191	*Terminaliabellerica*	Cobretaceae	Fruit	Antioxidant,α-Amylase,α-Glucosidaseinhibition,promote insulin secretion, regenerate β-cells andantiglycation
192	*Tetracerascandens*	Dilleniaceae	Leaves	Antihyperglycemic
193	*Teucriumcapitatum*	Lamiaceae	Wholeplant	Antidiabetes
194	*Thymusserpyllum*	Lamiaceae	Aerialpart	α-Glucosidaseinhibition
195	*Tinosporacordifolia*	Menispermaceae	Stem	Antioxidant,anti-cataractactivity,improvestheimbalanceinlipidmetabolismindiabetes
196	*Tribulusterrestris*	Zygophyllaceae	Wholeplant	Antioxidant,Antidiabetic
197	*Trichosanthescucumerina*	Cucurbitaceae	Fruit	AntioxidantandHypoglycemic
198	*Trigonellaberythea*	Fabaceae	Wholeplant	Antidiabetic
199	*Uncariatomentosa*	Rubiaceae	Leaves/bark	Antidiabetes
200	*Vaccinium arcto-staphylus*	Ericaceae	fruits	α-Glucosidaseinhibition
201	*Vaccinium bracteatumtumb*	Ericaceae	Leaves	Hypoglycemic
202	*Verbascumkermanensis*	Scrophulariaceae	Leaves	α-Glucosidaseinhibition
203	*VitisviniferaL.*	Vitaceae	Seed/skin	Antidiabetic
204	*Zatariamultiflora*	Lamiaceae	Aerialpart	α-Glucosidaseinhibition
205	*Zhumeriamajdae*	Lamiaceae	leaves	α-Glucosidaseinhibition

206	*Zingiberofficinale*	Zingiberaceae	Root	Hypoglycemicandantioxidant
207	*Zizyphusspinachristi*	Rhamnaceae	Leaves	Antidiabetic
208	*Zygophyllumalbum*	Zygophyllaceae	Leaves/root	Recovery*β*-celldamageandantioxidant

Conclusion

Thisreviewconcludedlistofmedicinalplantsandtraditionalmedicinesinthemanagementofdiabetes.Mostofpeople used medicinal plants and traditional medicines in the management of their diabetes, either alone or incombination with conventional medicines. Most of the traditional medicines were plant products that werecheap and widely available locally. Although traditional medicines have potential benefits, they also havepotential adverse effects. Presently there is limited understanding of the physiological effects of most of thetraditionalmedicinesthat werewidelyused,soitisnotlikelytoassesswhetherthesemedicineswerebeneficial,harmful, or both. In view of this, the findings reveal a need for further research to identify the bioactivecompoundspresentinthesemedicinalplantsandtodeterminetheirefficacyataphysiologicallevel.

References

1. World Health Organization Diabetes Fact Sheet. [Accessed June 16,2023].http://www.who.int/mediacentre/factsheets/fs312/en/
2. Diabetes UK know Diabetes fight Diabetes. [Accessed May 20, 2023]https://www.diabetes.org.uk/guide-to-diabetes/complications
3. Akbar,S.(2020).Handbookof200medicinalplants:acomprehensivereviewoftheirtraditionalmedicalusesandscientific justifications.
4. Pandeya, K.B. & Tripathi, Indra & Mishra, Mahendra & Dwivedi, N. & Pardhi, Yogesh & Kamal, A. & Gupta,Pragati & Mishra, Chinmayi. (2013). *A critical review on traditional herbal drugs: An emerging alternative drugfordiabetes*.IntJOrgChem.3.1-22.
5. AmericanDiabetesAssociation.[AccessedMay20,2023]https://diabetes.org/diabetes
6. Hemler, E. C., & Hu, F. B. (2019). Plant-Based Diets for Personal, Population, and Planetary Health. Advances inNutrition,10(Supplement_4),S275–S283.
7. Modak,M.,Dixit,P.,Londhe,J.,Ghaskadbi,S.,&Devasagayam,T.P.(2007).Indianherbsandherbaldrugsusedforthetreatmentofdiabetes.*Journalofclinicalbiochemistryandnutrition*,*40*(3),163–173.
8. Cefalu WT, Stephens JM, Ribnicky DM. Diabetes and Herbal (Botanical) Medicine. In: Benzie IFF, Wachtel-Galor S, editors. Herbal Medicine: Biomolecular and Clinical Aspects. 2nd edition. Boca Raton (FL): CRCPress/Taylor&Francis;2011.Chapter19.
9. Deshpande, A. D., Harris-Hayes, M., & Schootman, M. (2008). Epidemiology of diabetes and diabetes-relatedcomplications.*Physical therapy*,*88*(11),1254–1264.
10. Kasole, R., Martin, H. D., & Kimiywe, J. (2019). *Traditional Medicine and Its Role in the Management ofDiabetes Mellitus: "Patients' and Herbalists' Perspectives." Evidence-Based Complementary and AlternativeMedicine,2019,1–12.*
11. Kooti, Wesam; Farokhipour, Maryam; Asadzadeh, Zahra; Ashtary-Larky, Damoon; Asadi-Samani, Majid(2016).*Theroleofmedicinalplantsinthetreatmentofdiabetes:asystematicreview.Electronicphysician,8(1),1832–1842.*
12. Kumar,S.,Mittal,A.,Babu,D.,&Mittal,A.(2021).Herbalmedicinesfordiabetesmanagementanditssecondarycomplications.*Currentdiabetesreviews*, *17*(4),437-456.
13. McMacken, M., & Shah, S. (2017). A plant-based diet for the prevention and treatment of type 2 diabetes. *Journalofgeriatriccardiology:JGC*,*14*(5),342–354.
14. Rutebemberwa,E.,Lubega,M.,Katureebe,S.K.*etal.*Useoftraditionalmedicineforthetreatmentofdiabetesin EasternUganda:aqualitativeexplorationofreasonsforchoice.*BMCIntHealthHumRights* **13**,1(2013).
15. Choudhury,H.,Pandey,M., Hua,C.K.,Mun,C.S.,Jing,J.K.,Kong,L.,…Kesharwani,P.(2018).Anupdateonnatural compounds in the remedy of diabetes mellitus: A systematic review. Journal of Traditional andComplementaryMedicine,8(3),361–376.
16. Tran,N.,Pham,B.,&Le,L.(2020).BioactiveCompoundsinAnti-DiabeticPlants:FromHerbalMedicinetoModern DrugDiscovery.Biology, 9(9),252.doi:10.3390/biology9090252
17. Rao,M.U.,Sreenivasulu,M.,Chengaiah,B.,Reddy,K.J.,&Chetty,C.M.(2010).Herbalmedicinesfordiabetesmellitus:areview.*Int JPharmTechRes*,*2*(3),1883-1892.
18. Andrade, C., Gomes, N. G., Duangsrisai, S., Andrade, P. B., Pereira, D. M., & Valentao, P. (2020). MedicinalplantsutilizedinThaiTraditionalMedicinefordiabetestreatment:ethnobotanicalsurveys,scientificevidence andphytochemicals. *Journalofethnopharmacology*,*263*,113177.
19. Nagaraju,N.,&Rao,K.N.(1989).Folk–medicinefordiabetesfromrayalaseemaofandhrapradesh.*Ancientscienceoflife*,*9*(1),31.

20. Batiha,G.E.S.,Shaheen,H.M.,Elhawary,E.A.,Mostafa,N.M.,Eldahshan,O.A.,&Sabatier,J.M.(2023).PhytochemicalConstituents,FolkMedicinalUses, andBiologicalActivitiesofGenusAngelica:A Review.*Molecules*,*28*(1),267.
21. Khan,M.S.A.,&Ahmad,I.(2019).Herbalmedicine:currenttrendsandfutureprospects.In*Newlooktophytomedicine*(pp.3-13).AcademicPress.
22. Moradi,B.,Abbaszadeh,S.,Shahsavari,S.,Alizadeh,M.,&Beyranvand,F.(2018).Themostusefulmedicinalherbstotreat diabetes. *Biomedical ResearchandTherapy*,*5*(8),2538-2551
23. Jarald,E., Joshi,S.B.,&Jain,D.(2008).Diabetesandherbalmedicines.
24. Rayate,A.S.,Nagoba,B.S.,Mumbre,S.S.,Mavani,H.B.,Gavkare,A.M.,&Deshpande,A.S.(2023).Currentscenariooftraditionalmedicinesinmanagementofdiabeticfootulcers: Areview.*World Journalof Diabetes*,*14*(1),1.