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Medicinal Plants for Antidiabetic Activity Available in Himachal Pradesh



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ABSTRACT

Herbal medicines are the most sensitive topic all worldwide due to unwanted effects of synthetic medicines. Increasing demand for herbal sources maintaining quality and purity of the raw materials. There are some 1250 Ayurvedic medicinal plants which may go into formulating therapeutic preparations as per Ayurvedic systems. Diabetes may known since ancient times very well. Knowledge of diabetes may takes place from ancient India. Ayurvedic antidiabetic medicinal plants improve the digestive power, increase the gastric secretions, get easily digested in the body and decrease output of overall body fluids for e.g. urine, sweat etc. Most of the natural products are isolated and may used for the treatment of Diabetes. This review explain the various medicinal plants which may used for Diabetes since ancient times like *Aporosa lindleyana* Baill, *Momordica Charantia* and *Eugenia Jambolana*, *Myrtus Communis* L. *Terminalia Pallida* Brandis, *Sapindus trifoliatus* etc. All these herbal plants have been reported as treatment of Type1 and Type 2 Diabetes in Ayurveda system of Medicine.

INTRODUCTION

Natural products and plants are the natural source which may found as therapeutically effective against diseases as a medicine. Plants are chemical laboratory which may formed various waste products and known as a secondary metabolites which are used as a medicines. Nature always has a good elements like biotic and abiotic elements which are interdependent. Plants are very useful for all human needs. Nature is a complete storehouse for various ailments of different diseases(1). Maximum the drugs may contained from natural sources which may explained in Ayurveda. Ayurveda contains Chark Samhita and Sushrut Samhita which may followed by Hippocrates known as 'Father of Medicine'. In nineteenth century, the term 'Materia Medica' used for the subject now this is known as "Pharmacognosy". Pharmacognosy is derived from greek words Pharmakon (a drug). and Gignosco (to acquire the knowledge of). Pharmacognosy may be defined as a branch of bioscience which treats in detail medicinal and realted products of crude or primary type obtained from plant, animal and mineral origins(2).

Ayurveda is an ancient system of medicines, which may included both mentally and physically life sciences of human mankind. Ayurveda may balanced the metabolism of the body. Ayurveda is basic dependent upon the five elements i.e. space, air, liquid, solid and energy. They exist in the human body in combined forms like vata (space and air)., pitta (energy and liquid). and Kapha (liquid and solid). Vata, pitta and Kapha together are called Tridosha (three pillars of life). Tridosha exist in human body in seven forms called Saptadhatu viz. Rasa (lymph)., Rakta (blood)., meda (adipose tissue)., mamsa (flesh)., majja (nervine tissue)., shukra (reproductive tissue). and asthi (bones).(3).

Herbal medicines is the most sensitive topic all worldwide due to unwanted effects of synthetic medicines. Increasing demand for herbal sources maintaining quality and purity of the raw materials. At other side search of valid alternative for authentic drug is going on to avoid over exploitation of herbal resources from their natural source which may increase chances of adulteration in herbal material. Botanical identification may corrected by using taxonomic, macroscopic, organoleptic, microscopic studies, powder analysis and thin layer chromatography shows chemical constituents of respective raw material is one of the crucial parameter to ensure authenticity, quality, safety and efficacy of herbal products(4).

Ayurveda has products of plant, animal and mineral kingdoms, for e.g. in Sushruta samhita 395 medicinal plants, 57 drugs of animal origin and 64 minerals and metals have been

described as therapeutic agents, however, medicinal plants constitute the dominate part of the drug substances. There are some 1250 Ayurvedic medicinal plants which may go into formulating therapeutic preparations as per Ayurvedic systems(5).

Diabetes Mellitus is a metabolic syndrome which may effect the endocrine system of the body. Egyptian doctor may describe about Diabetes. The name diabetes was coined by the Greek Physician Aretaeus (30-90AC).(6). The disease may have symptoms such as constant thirst (polydipsia), loss of weight and excessive urination (polyuria). which may give the first definition of Diabetes Mellitus. This disease may spread all over worldwide and increasing day by day. When insulin is not working properly then patient may have high level of glucose. There are 2 types of Diabetes mentioned as Type 1 and Type 2. Type1 diabetes is known as insulin dependent and Type 2 diabetes may known as non insulin dependent. When the body may release excess insulin then it is known as Type1 Diabetes Mellitus. Where the insulin doesn't release in proper manner then it may known as Type2 Diabetes Mellitus. This type of diabetes may commonly affects the person around 90-95%.Type2 Diabetes mainly effects old people as comparison of young people and spreading day by day. Genetic and environmental factors ae reponsible for the disease commonly. Obesity, lack of exercise, urination are the common symptoms(7). According to WHO Diabetes spreading day by day around 300 millions and maximum by the year 2025(8).

There are many of medicaments are used for the treatment of Diabetes named as sulphonamides, sulphonylureas, biguanides, α glucosidase inhibitors, glinides etc which may be very useful as a combination for the treatment of glycemia. Most of the conventional medicaments used may have adverse reaction for the body. So there is still a challenge for the treatment of Diabetes without any adverse effects of the drugs(9). Some of pharmacological effects may have the effect against hyperglycaemia in which insulin lispro, amylin analogues, and α -glucosidase inhibitors are involved thoroughly. Aldose reductase inhibitors may used for the treatment of diabetes(10). Aldose reductase may helps by the reduction of glucose to sorbitol and used as a key enzymes. Sorvitol may not inhibit the cell membranes and implicated in chronic complications of diabetes known as peripheral neuropathy, retinopathy, and cataracts(11).

Latest lifestyle of the human may get many of changes which may leads to many diseases. Diabetes Mellitus is one of that chronic disease which may effect the human badly and increasing rapidly as per environmental changes(12). Diabetes may leads to vascular disease

like nephropathy, retinopathy, and neuropathy. In type-1 diabetes the signs of may develop during adolescence if insulin is insufficient in the body. Same complications may occur type-2 diabetes. They frequently occur during the time of diagnosis(13). Treatment of diabetes may proceeding by oral hypoglycemic agents, search for latest advancements of drugs continues because all the synthetic drugs may have specific limitations. The herbal drugs for antidiabetic activity may formulated as latest medicines, while they are used for their therapeutic properties in the traditional systems of medicine in Ayurveda(14). There are many of Indian medicinal plants have been investigated for their important uses in various types of diabetes and investigated further reports in scientific journals. Ayurveda and other traditional system for the treatment of diabetes mellitusexplain various plants used as medicinal drugs. Active constituents may present in medicinal plants may investigated to possess pancreatic beta cells re-generating, insulin releasing and deal with the problem of insulin(15). Herbal drugs may increase insulin secretion, glucose level with adipose or muscle tissues and may act against glucose absorption and glucose production from liver Insulin drugs like sulphonyl ureas and biguanides are play major roles in the body but there are many complications in the development of many effective anti-diabetic agents(16).

Classification

Type I diabetes (Insulin-dependent diabetes), mostly found in 10% of diabetic patients, due to destruction of β -cell and leads to insulin deficiency(17). Patients may fully dependent upon exogenous insulin to save life (18).

Type 2 diabetes (Non insulin-dependent diabetes), mostly found in 85% of cases in all over the world. It is ranging from insulin resistance to insulin deficiency(18,19). Type 2 diabetes also known as a multifactorial disease due to genetic and non-genetic component (20). Gestational diabetes known as Diabetes diagnosed in pregnancy, including pre-existing diabetes and diabetes which develops during pregnancy (18,21).

Alternative Medicines Used As Antidiabetic

In this type of disease, patients may required to control their glucose level as per their symptoms. By this all the patients may have to cure this disease with various medications, exercise and the dietary plans. Insulin therapy may also involve to cure the disease of type 1 diabetes and also for treatment of type 2 diabetes in case of where oral drugs doesn't give effects against this(22). Type 2 diabetes are mainly found in todays environment as per effect

of lifestyle. The main course such as diet plan, exercise etc are useful to cure for this if there is no effect from diet and exercise then oral medications may prescribed (23).

Oral antidiabetic agents act as:

Sulfonylureas and Meglitinides It may stimulate beta cells in pancreas to produce more insulin. **Thiazolidinediones** increases sensitivity of muscles and other tissues to insulin.

Biguanides It may decrease the gluconeogenesis by the liver.

α -glucosidase inhibitors It may delay the absorption of carbohydrates from the gastrointestinal tract.

These treatments may have drawbacks and adverse effects in large segment of patients population. Sulfonylureas may lose all the effectiveness for 44% of patients. These treatments also associated with adverse effects for e.g. thiazolidinediones may cause liver toxicity, sulphonylureas may affects heart disease, lower and increase body weight gain, bloating, flatulence, diarrhea and abdominal discomfort and pain are the major complaints with glucosidase inhibitors. According to recent advancements, these of medications prescribed for use in children have not be safe or effective for this patient(24). None of these glucose-lowering agents while controls the hyperlipidemia that frequently found with the disease(23). The advantages of oral antidiabetic agents in the terms of efficacy/safety coupled with the emergence of the disease into a global epidemy have encouraged a concerted effort to discover drugs that can manage type 2 diabetes more efficiently(17). Also, when increasing incidence of diabetes mellitus in rural population whole world and due to adverse effects of medicine, there is a clear need for development of indigenous, inexpensive botanical sources for anti-diabetic crude or purified drugs (25).

Herbal Medicines Used As Antidiabetics

Since ancient times, many of natural plants used for various diseases. All plants may have various activities to inhibit the diseases. Many of chemical constituents may found into medicinal plants that are very useful for cure the disease. There are around 800 plants recorded all over India which are mostly used as Antidiabetics since ancient times(26). Various surveys by scientists around 1200 more plants are found which may used as a traditional medicine activity(27). Herbal plants may used as a medicine since a long years ago and accepted by al rituals, cultures. Diabetes may be known since ancient times very

well. Knowledge of diabetes may take place from ancient India. Ayurvedic antidiabetic medicinal plants improve the digestive power, increase the gastric secretions, get easily digested in the body and decrease output of overall body fluids for e.g. urine, sweat etc. Food items, which are antidote are an important principle of therapy for the diabetes patient. Diet of food which may help to metabolic imbalance by their effects e.g. foods exhibiting 'rasa', 'katu', 'laghu', 'medaghna', properties are used in ancient times as cereals, roasted cereals, barley, jawar, ragi, mung dal, horsegram, tur dal, drumstick leaves, bitter gourd, jamun, amla, fig, raw papaya, milk, meat of animals that live in dry region, etc. Some of diet may not be useful in lowering blood sugar. But it has some other influences, which may be useful for the management of the disease and its complications(28). Natural medicinal plants based products have been popular all worldwide for centuries. In diabetes, some herbal alternatives are proved to get symptomatic relief and help in the prevention of the secondary complications of the disease. Some of the herbs are also been proved to help in the reformation of β -cells and in overcoming resistance.

In maintenance of normal blood sugar level, some of herbal plants are also recorded to show antioxidant activities and also show cholesterol-lowering action. In type 2 diabetes mellitus (NIDDM).it is possible with the drugs that may lower the blood sugar level and restore the liver glycogen level. In latest system of medicine there is no drug which is reported to show both of these properties (29). While, the hypoglycemic effects of some herbal plant extracts have been confirmed in human and animal of type 2 diabetes and synthetic drugs have been formed from the active constituents of these medicinal plants. Like a Metformin, biguanides and potent oral glucose-lowering agent, was developed from *Galega officianalis* and used to treat diabetes(30). From many of oral medications for diabetes, only one drug that is metformin is approved for use in children and it has been derived from herbal plants(24).

Herbal Plants

Many of herbal drugs may be used in this disease since ancient times. By having no adverse effects into herbal medicaments demand of the drugs may increasing day by day. Herbal drugs may give good effects against diabetes so patient give importance to herbal preparations.

Aporosa lindleyana Baill

Scientific Description

Kingdom : Plantae

Clade : Magoliophyta

Clade : Magnoliatae

Order : Euphorbiales

Family : Euphorbiaceae

Genus : Aporosa

Species : *Aporosa lindleyana*

Synonym

Sali, Sarali, Ponvetti, Kotili, Aechil, Vetti, Vittil, Vettika(31).

Aporosa lindleyana Baill belonging to family Euphorbiaceae. It is a middle growing plant height up to 15m found throughout India. This plant is useful for hypoglycaemic, antiviral, antipyretic, diuretic etc. By the presence of alkaloids, flavanoids, phytosterols it may be useful for many diseases. This may give a good effect against diabetes. The aqueous and alcoholic extract of the plant are used to check the various activities. The rat models may be used for further investigation, it may reduce the glucose level of rats by giving different doses of the plant. The oral doses may be given to the rats and after 3 hours it may lower the blood pressure in rats ranging from 3069/3.37 to 1609/2.46 and 3289/4.15 to 1529/3.86 mg%, these effects of the plant drug may be compared to tolbutamide respectively and give antihyperglycemic effects(32).

Azadirachta indica

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Sapindales

Family: Meliaceae

Genus: Azadirachta

Species: *A. indica*

Synonyms

Neem, Nimtree, Nimba, Margosa, Arishth etc(33).

Azadirachta indica may belongs to family Meliaceae found in tropical and sub tropical regions. This plant may gives constituents like azadirachtin, limonoids, glycerides, polyphenols, catechenes, carotenes etc.

Azadirachta indica showed antidiabetic activities. Root part of the plant may showed the results, about 800mg dose may significantly results against diabetes. When this dose may adimnistered to rats it may show the results after 4 weeks it may show the results by reducing the blood sugar level. Root of the plant may contains phytoconstituent Nimbidin which may show the antidiabetic activity(34).

Phyllanthus emblica

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Malpighiales

Family: Phyllanthaceae

Genus: Phyllanthus

Species: *P. emblica*

Synonym

Emblic, Emblic myrobalan, Myrobalan, Indian gooseberry, Malacca tree, amla(35).

This plant may give the antidiabetic activity showed in rats. Rats were divided into 6 groups of 6 rats. 6 groups may be given different concentrations as distilled water, *Phyllanthus emblica* extract low dose are 200 mg/kg/day, plant extract give high dose 400 mg/kg/day and the standard drug is glibenclamide which may administered as 0.6 mg/kg/day. Whole rats received allocated drugs for 6 weeks. Blood level glucose was observed every 2 weeks till the last of sixth weeks by glucose-oxidase method. Hence it may showed that *Phyllanthus emblica* gives a more effect against diabetes as compare as glibenclamide(36).

Terminalia belerica

Scientific Description

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Myrtales

Family: Combretaceae

Genus: Terminalia

Species: belerica

Synonym

Bahedam, Behed, Bahera, Shanti, Shantikayi, Tare, Tanni, Tannikai, Beheda, Bhara

Terminalia belerica plant have been found to contain constituents such as Glucoside, Gallo-tannic acid, colouring matter, resins, ellagic acid, gallic acid, lignans, termilignan, ethyl gallate, phenyllembelin Tannins, mannitol, fructose, rhamnose. These compounds are responsible for the pharmacological activities i.e. antimicrobial, antioxidant, antisalmonella,

hepatoprotective, antidiabetic etc. The continuous administration of TB fruits against alloxan induce hyperglycemia and antioxidant mechanism was studied in rats. The reduction of glucose level and Oxidant enzymes such as Superoxide dismutase, glutathione reductase and acatalase were observed in blood and liver. Oxidative stress arise from an imbalance in the formation and metabolisms of reactive oxygen species(ROS).(37).

Terminalia chebula

Scientific Description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Myrtales
Family: Combretaceae
Genus: Terminalia
Species: T. chebula



Synonym

Black, chebulic myrobalan

Some of phytoconstituents present which may leads for cure various ailments. Arjunglucoside I, arjungenin, and the chebulosides I and II. Chebulin, ellagic acid, 2,4-chebulyl- β -D-glucopyranose, chebulinic acid, gallic acid, ethyl gallate, punicalagin, terflavin A, terchebin, luteolin, and tannic acid.

Ethanollic extract of fruits of *Terminalia chebula*(TC). used in rats . The groups were divided into different groups. Extract of TC dose concentration may give 200 mg kg-1 b.wt. and standard drug Glibenclamide administered around 600 mg kg-1 b.wt. may give positive. EETC showed activity against the diabetic disease. The second group showed that decreasing

the body weight, which shows they may destroyed the β -cells in the pancreas. In third group treated group was significantly retaining the body weight to the normal condition from Alloxan action in pancreas. In fourth group as standard drug treatment as Glibenclamide showed that highly significant in body weight(38).

Tribulus terrestris

Scientific Description

Kingdom: Plantae
Division: Phanerogams
Subdivision: Angiospermae
Class: Dicotyledonae
Subclass: Polypetalae
Series: Disciflorae
Order: Giraniales
Family: Zygophyllaceae
Genus: Tribulus
Species: terrestris Linn.



Synonym

Gokshur ,Gokharu Bethagokharu , Nanagokharu Nerinjil ,Khar-e-khusak khurd

Saponinis the phytoconstituent which may leads to hypoglycemic properties. This plant may reduce the level of serum glucose, serum triglyceride, serum cholesterol. Ethanolic extract of the plant exhibited α -glucosidase at 500 $\mu\text{g/ml}$ using maltose and 100% inhibition of aldose reductase at a dose of 30 $\mu\text{g/ml}$ using dl-glyceraldehyde as the substrate. By decrease in the blood glucose level of rats was found after administration of saponin from *Tribulus terrestris*. It may improved coronary circulation. So *Tribulus terrestris* could be beneficial in the treatment of diabetes by lowering blood glucose, lipid levels(39).

Trigonella foenum graecum

Scientific Description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Fabales
Family: Fabaceae
Genus: Trigonella
Species: *T. foenum-graecum*



Synonym

Middle French fenugrec, faenugraecum, faenum Graecum, fenugreek(40).

India is a main source of this plant, by production of *Trigonella foenum graecum* in India it may found in various states. Some of phytoconstituents of fenugreek are flavonoids, alkaloids, coumarins, vitamins, and saponins and the most useful alkaloid is trigonelline and coumarins include cinnamic acid and scopoletin which gives various pharmacological activities.

Seed powder of *Trigonella foenum-graecum* shows a important role by improving patient of type II diabetic patients. This plant may show the effect against dyslipidemia which may improved in the treatment by administration of 25 mg of seed powder solution of the plant for next 30 days. It may show the effect by reducing the TC, TG, and LDL-C and by increasing HDL-C (41).

Curcuma longa

Scientific Description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Monocots
Clade: Commelinids
Order: Zingiberales
Family: Zingiberaceae
Genus: Curcuma
Species: *C. longa*

Synonym

Turmeryte, Tarmaret, Turmeric, Terra meritag (42).

Phytoconstituents may present in *Curcuma longa* like terpenes, alkaloids, flavonoids, phenols, steroids, compounds which may show effect against diabetes. In which flavonoids, sterols/terpenoids, phenolic acids are used to be in antidiabetics.

Antidiabetic properties showed by inhibitory activity of α - β -glucosidase, α -amylase. In this investigations CLE has terpenoids in high level. Which may be based on HPLC test, CLE contained constituents like curcumin, curcumol, and bisdemethoxycurcumin. It may shows that bisdemethoxycurcumin has the highest effect against α -glucosidase and α -amylase inhibitory activity, β -glucosidase inhibitory activity showed by the presence of curcumin which have the highest activity(43).

Momordica charantia

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Cucurbitales

Family: Cucurbitaceae

Genus: Momordica

Species: *M. charantia*

Synonym

Bitter melon, bitter apple, bitter gourd, bitter squash, balsam-pear (44).

Extracts of *Momordica Charantia* (MC). L(Cucurbitaceae).(200 mg/kg)., *Eugenia jambolana* (EJ). L(Myrtaceae)(200 mg/kg)., *Tinospora cordifolia* (TC). W(Menispermaceae).(200 mg/kg)., and *Mucuna pruriens* (MP). Bak(Leguminosae).(200 mg/kg).by 24.4, 20.84, 7.45, and 9.07%,may helps to reduce glucose volume in blood.These allmay give more effects than that of streptozocin tablets in mice. In diabetes urine level also affected by MC, EJ, MP and TC treatment prevented polyuria. By giving oral dose of streptozocin after 10 days albumin may gets controls as compare to normal controls. Renal disease may also effects the body higher in diabetic normal controls as compare to non diabetic controls. MC and EJ treatment are useful for polyurea and renal diseases as compared to diabetic controls(45).

Myrtus communis L.

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids
Order: Myrtales
Family: Myrtaceae
Genus: Myrtus
Species: *M. communis*

Synonym

Common myrtle and true myrtle (46).

Leaves and volatile oils of the extract of the plant may be used to type 2 diabetes patients by lowering blood glucose level. The rabbits models may be used in this dose of 50mg/kg and show the tolerance power of oral glucose level in rabbits. *Myrtus Communis* may not affects the insulin concentration in rats and rabbits but may reduce the serum triglycerides level in rabbits. All investigation may show the hypoglycemic activity as well as hypotriglyceridemic activity in diabetes (47).



Pterocarpus marsupium

Scientific Description

Kingdom: Plantae
Order: Fabales
Family: Fabaceae
Subfamily: Faboideae
Tribe: Dalbergieae
Genus: Pterocarpus
Species: *P. marsupium*

Synonym

Malabar kino, Indian kino tree, vijayasar(48).

The bark of the pant *Pterocarpus marsupium* may used for further investigation. Alcoholic extracts are also involved in *Trigonella Foenum Graecum* and leaves of *Ocimum sanctum* used to investigate in diabetic rabbits. *Pterocarpus marsupium* may show the effect by reducing the sugar level and lower the blood glucose level in diabetic rats. Oral administration of the aqueous extract may give to the animal after 21 days the reducing of glucose level has been shown (49).

Rhizoma polygonati odorati (RPO).

Scientific Description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Monocots
Order: Asparagales
Family: Asparagaceae
Subfamily: Nolinoideae
Genus: Polygonatum



Synonym

King Solomon's-seal and Solomon's seal (50).

It may also show the effect against glucose and carbohydrate level in diabetic animals. By using the water soluble extract of RPO it may decrease the effect of the glucose level in diaabetic patients as well as it may inhibit the activity of α -glucosidase and shows good effect against the glucose level in blood serum. Hence by investigations, it proves that RPO is useful for both hyperglycemia and hypertriglyceridemia activities(51).

Terminalia pallida brandis

Scientific description

Kingdom: Plantae

Clade : Tracheophyta
Clade : Magnoliopsida
Order : Myrtales
Family: Combratacae
Genus : Terminalia
Species: *Terminalia pallida* Brandis

Synonym

Terminalia pallida, tella karakkaya(52).

Ethanollic of the extract may used for further investigations.Oral administration of the *Terminalia Pallida Brandis* may administered to rats in which it may show the effect by showiing the anihyperglycemic activity but no antihypoglycemic activity has been shown(53).

Tinospora cordifolia

Scientific Description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Order: Ranunculales
Family: Menispermaceae
Genus: Tinospora
Species: *T. cordifolia*

Synonym

Gurjo, heart-leaved moonseed, guduchi, giloy (54).

Root part of the *Tinospora Cordifolia* has been used on diabetic rats. After the administration of root extract in rats the result has been shown after 6 weeks by showing the reducing level of the serum, cholesterol, phospholipids and free fatty acids in rats. The dose may show the more hyperlipidemic activity on diabetic animals. Hence, it may show the good effect than of glibenclamide(55).

Allii cepa bulbus

Scientific Description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Monocots

Order: Asparagales

Family: Amaryllidaceae

Subfamily: Allioideae

Genus: Allium

Species: *A. cepa*



Synonym

Bulb onion and common onion (56).

In the local language, known as Onion, used as vegetable and having anti-diabetic activities. The mechanism of action are showing the lowering blood cholesterol level and decreasing lipid peroxidation that allyl propyldisulfide and *S*-methyl cysteine sulfoxide have an anti-diabetic and anti-hyperlipidemic effect(57).

Catharanthus roseus (L.). G. Don

Scientific Description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Asterids

Order: Gentianales

Family: Apocynaceae

Genus: Catharanthus

Species: *C. roseus*

Synonym

Bright eyes, Cape periwinkle, graveyard plant, Madagascar periwinkle (58).

The leaves of this plant have very positive results on the lowering of blood sugar level. The different types of active moieties are alkaloids, vindoline present in it(59).

Rhizoma phragmitis

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Monocots

Clade: Commelinids

Order: Poales

Family: Poaceae

Subfamily: Arundinoideae

Tribe: Molinieae

Subtribe: Moliniinae

Genus: Phragmites

Synonym

Tall reed (60).

For anti-diabetic effects, dried rhizomes of *Phragmites communis* Trin., belonging to family *Gramineae* are used. It is used in diabetic prescriptions for diabetic complications because of the actions to clear away heat and promote the production of fluid(61).

Radix Angelicae Sinensis

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Asterids

Order: Apiales

Family: Apiaceae

Genus: Angelica

Species: *A. sinensis*

Synonym

Winter Cherry Root (62).

It is a traditional medicine; mainly roots are used as medically active part of the plant. It is used in blood circulation promotion, as well as prescribed in diabetic complications(63).



Artemisia afra

Scientific description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Asterids
Order: Asterales
Family: Asteraceae
Genus: Artemisia
Species: *A. afra*

Synonym

Wormwood, Artemisia (64).



The experiment model used in the anti-diabetic activity for this plant's leaves is leaves of Streptozotocin induced diabetic rats. They helps to enhance utilization of glucose by reducing level of blood glucose in diabetic rats(65).

Selaginella tamariscina

Scientific description

Kingdom: Plantae
Clade: Tracheophytes
Clade: Lycophytes
Class: Lycopodiopsida
Order: Selaginellales

Family: Selaginellaceae

Genus: Selaginella

Species: *S. tamariscina*

Synonym

Keoun Back, pakaunkung, starry spikemoss or starry spike-moss(66).

The whole plant shows anti-diabetic activity. The mechanism of action of this plant is that they helps to increasing insulin level. Streptozotocin induced diabetic rats model was used to develop the pharmacological activity of this plant(67).

Nigella sativa

Scientific description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Order: Ranunculales

Family: Ranunculaceae

Genus: *Nigella*

Species: *N. sativa*



Synonym

Black cumin, nigella, kalojeera, kalonji or kalanji(68).

The active constituent known as thymoquinone which are present in the whole plant. They having protective action on beta cell by reduction in oxidative stress and then shows the anti-diabetic activity. Streptozotocin induced diabetic rats model was used in the anti-diabetic study of this plant(69).

Sapindus trifoliatus

Scientific description

Kingdom Plantae

Clade Tracheophyta

Class Magnoliopsida

Order Sapindales

Family Sapindaceae

Genus Sapindus

Species *Sapindus trifoliatus* L.

Synonym

Aritha, Ritha, Soapnut tree, Arithu, Aritho, Arithi, Ritha, Rishtak, Phenil, Risht (70).

In the fruits of this plant, they have insulin like actions and then show antyperglycemic effect by increasing peripheral glucose consumption and oxidative damage protection. Alloxan-induced diabetic rats model are used for in-vivo studies of this plant extracts(71).

Salvia miltiorrhiza

Scientific Description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Asterids

Order: Lamiales

Family: Lamiaceae

Genus: Salvia

Species: *S. miltiorrhiza*

Synonym

Red sage, Chinese sage, tan shen, danshen (72).

In the improving of resistance of the insulin with help of polyphenolic acids in diabetic rat model, the roots and rhizomes of this plant plays an important role. Salvianolic acid A (SalA). is one of the active compounds and its shows suppressive effect on oxidative stress and AGEs-induced endothelial dysfunction. Streptozotoc ininduced diabetic rats model was used in this study(73).

Mucuna pruriens

Scientific Description

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Fabales

Family: Fabaceae

Genus: Mucuna

Species: *M. pruriens*

Synonym

Monkey tamarind, velvet bean, Bengal velvet bean, Florida velvet bean, Mauritius velvet bean(74).

The antioxidant and antidiabetic effects are showing by phenolic content. Streptozotocin- and alloxan-induced diabetic rats model was applied to this study(75).

Sr. No.	Plant name	Biological name	Family	Part used	Active Constituents	Reference
1.	Sarali	Aporosa lindleyana	Euphorbiaceae	Baill plant	Alkaloids, flavanoids, phytosterols	(33)
2.	Neem	Azardirac hta indica	Maliaceae	Root	Limonoids, polyphenols, Azadirachtin	(35)
3.	Amla	Phyllanthus emblica	Phyllanthaceae	Fruit	Gallic acid, ellagic acid, quercitin	(36)
4.	Bahera	Terminalia bellerica	Combretaceae	Fruit	Glucoside, Gallotannic acid, lignans	(37)
5.	Black Myrobalan	Terminalia chebula	Combretaceae	Fruit	Arjunenin, vhebulin, cebuloside	(38)
6.	Gokhru	Tribulus terrestris	Zygophyllaceae	Whole plant	Saponin	(39)
7.	Fenugreek	Trigonella foenumgracium	Fabeaceae	Seed	Alkaloids, falavanoids, vitamins	(41)
8.	Turmeric	Curcuma longa	Zingibara ceae	Rhizome s	Phenols, sterols, alkaloids, terepenes	(43)
9.	Bitter melon	Momordica charantia	Cucurbitaceae	Fruit	Cucurbitacine, sterols, triterpenoid	(45)
10.	True myrtle	Myrtus communis	Myrtaceae	Leaves	Cinneole, limonine, linalool, pinene	(47)
11.	Kino tree	Pterocarpus marsupium	Fabiaceae	Bark	Pterospin, marsupsin, pterostibene	(49)
12.	Solomon seal	Rhizoma polygonia	Asparagaceae	Whole plant	Saponins, flavanoids, isoflavones	(51)

		odorati				
13.	Tella karakaya	Terminalia pallida brandis	Combretaceae	Plant	Tannins, ellagic acid, terpenids, flavanoids	(53)
14.	Giloy	Tinospora cordifolia	Menispermaceae	Root	Alkaloids, steroids, glycoside	(55)
15.	Onion	Alli cepa	Amaryllidaceae	Bulb	Ajoenes, Thiosulphinates, Sulfides	(57)
16.	Bright eyes	Cantharanthus Roseus	Apocynaceae	Leaves	Limonene, geraniol, citral,	(59)
17.	Tall reed	Rhizoma phragmitis	Poaceae	Rhizomes	Ferullic acid, vanillic acid, Syringic acid, sterols	(61)
18.	Cherry root	Radix angelicae	Apiaceae	Roots	Ligostelide, plamitic acid, ferullic acid	(63)
19.	Wormwood	Artemisia afra	Asteraceae	Leaves	Acacetin, alpha amyryne, phytol, petulinic acid	(65)
20.	Spike moss	Selaginella tamariscina	Selaginellaceae	Whole plant	Guabusine, arbutine, adenosine	(67)
21.	Black cumin	Nigella sativa	Ranunculaceae	Whole plant	Arachidonic acid, palmitic, oleic acid, stearic acid	(69)
22.	Ritha	Sapindus trifoliatus	Sapindaceae	Fruits	Sesquiterpenes, oligoglycosides, haederagenin	(71)
23.	Red sage	Salvia miltiorrhiza	Lamiaceae	Roots and rhizomes	Salvianolic acid, diterpenoids, tanshinones	(73)

24.	Velvet bean	Mucuna pruriens	Fabaceae	Whole plant	Phenoles, tannins, Amino acids	(75)
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CONCLUSION

In this review herbal plants elaborated which may used in the treatment of Diabetes. Herbal medicines is the most sensitive topic all worldwide due to unwanted effects of synthetic medicines. Increasing demand for herbal sources maintaining quality and purity of the raw materials. There are many of medicaments are used for the treatment of Diabetes named as sulphonamides, sulphonylureas, biguanides, α glucosidase inhibitors, glinides etc which may be very useful as a combination for the treatment of Diabetes. Since ancient times, many of natural plants used for various diseases. All plants may have various activities to inhibit the diseases. Many of chemical constituents may found into medicinal plants that are very useful for cure the disease. There are around 800 plants recorded all over India which are mostly used as Antidiabetics since ancient times. Some of plants named as *Aporosa lindleyana* Baill, *Cogent db*, *Momordica Charantia* and *Eugenia Jambolana*, *Myrtus Communis* L. *Terminalia Pallida* Brandis, *Sapindus trifoliatus*, *Mucuna pruriens*, *Salvia miltiorrhiza*, *Sapindus trifoliatus*, *Nigella sativa*, *Selaginella tamariscina*, *Artemisia afra* etc. All these herbal plants has been reported as treatment of Type1 and Type 2 Diabetes in Ayurveda system of Medicine. So, many of herbal plants are useful for all diseases and this may investegated by researchers and scientists that herbal plants may reliable for treatment of all diseases.

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