

Herbal Home Remedies For Diabetes Mellitus - A Review

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Abstract: *Diabetes mellitus is a lifestyle disease characterised by increase in glucose level in the blood and intra cellular metabolic changes. Therefore, it is called as a metabolic disorder. In Diabetes Mellitus there is insulin deficiency or insulin resistance by the receptors of insulin on cell membranes. But more than that, there are many cellular and micro-vascular changes or damages occur due to Diabetes Mellitus. The treatment of Diabetes Mellitus includes the use of oral hypoglycaemic agents like sulfonylureas, biguanides, thiazolidinediones, alpha glucosidase inhibitors and insulin [1]. Long-term use of these medicines creates unwanted side effects e.g. beta cell damage etc. resulting in uncontrolled increase in blood sugar level as well as multi system complications. To avoid such problems herbal medicines have greater advantages as compared to allopathic medicines. Instead of using these types of allopathic formulations, it is beneficial to use Ayurvedic formulations for better management of diabetes mellitus. The cost of allopathic medicines and formulations available in market is very big in amount. And especially when the medicines are to be taken for lifetime, poor people, middle class people can't pay the money required to continue the medicines for lifetime. Therefore, Ayurvedic herbal plants and spices which are easily available in every home and which are anti-diabetic in action should be used for the treatment. It will give better cure to Diabetes and also prevent the upcoming complications. In this review, herbal plants which are easily available in Indian houses and were showing hypoglycemic activity and beneficial activities in Diabetes are discussed. They can be used as home remedies for the effective treatment for diabetes mellitus.*

Keywords: Diabetes mellitus, Anti hyperglycaemic agents, Insulin, Herbal Home Remedies

1. Introduction

Diabetes mellitus is most common endocrine disorder affecting more than 300 million people meaning nearly 2.85% population worldwide. It is a metabolic disorder characterised by hyperglycaemia and defect in insulin production or insulin resistance by the receptors on the cell membranes. As the prevalence and progression of Diabetes Mellitus continues to increase, Diabetes related morbidity and mortality have emerged as major public issue.

Hyperglycaemia causes damage to eyes, kidneys, nerves, heart and blood vessels causing Diabetic Retinopathy, Diabetic Nephropathy, Diabetic Neuropathy and Card-myopathy respectively. When diabetes is present with hypertension, it aggravates nephropathy causing Chronic Kidney Disease and in turn End Stage Renal Disease (ESRD). Hyperglycemia generates more reactive oxygen species and attenuates anti-oxidative mechanism through glycation of scavenging enzymes. Therefore, oxidative stress has been considered to be a common pathogenic factor of Diabetes. Traditional Ayurveda herbal medicines are most popular because of their anti-oxidative properties without any side effects unlike Allopathic medicines. Due to the overall results by acting as anti-hyperglycaemic agents, antioxidants and protectors of overall health by protecting bodily tissues and organs the herbal medicines play very important role in treating Diabetes and preventing future complications. [2]

Several medicinal plants are used to treat Diabetes mellitus since the Vedic era and Diabetes is described as *Madumeha* in ancient literatures e.g. *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hrudaya*, *Ashtanga Samgraha Samhita* etc. To treat Diabetes Mellitus using Medicinal plants, a

proper scientific evaluation and screening of the medicinal properties of the plants should be studied. Pharmacological tests followed by chemical investigations and trials should be done to use the plants as medicine on Diabetes Mellitus.

India is famous in the whole world for the spices and fruits we grow in our fields and many people have them even in our house backyards. So many people have the medicinal plants grown also at their houses. For example, Holy Basil shows the holistic tradition of India. It is a medicinal plant used in variety of ailments including Diabetes Mellitus. Also, Ginger and Garlic are used in our daily spices to cook food every day. Ginger and Garlic have anti Diabetic properties which are very beneficial in treating Diabetes Mellitus.

The annual spend on account of Diabetes treatment in India is pegged at Rs. 1.5 lakh crore, 4.7 times in Central Governments allocation of Rs. 32,000 crore on health and three-fourth of the budgeted service tax collections in 2017. The cost of the treatment is rising by 20-30% every year. Therefore, if these easily available medicinal plants will be used as effective home remedies to treat Diabetes, the cost of medicinal expenditures will also be decreased.

2. Diabetes Mellitus

Diabetes mellitus is a metabolic disorder characterised by inability to regulate carbohydrate, fat and protein metabolism. Carbohydrates are supplied by food. Insulin produced by Beta cells of Islet of Langerhans. Diabetes is a condition in which there is deficiency in insulin production or lack of its effective utilization due to insulin resistance.

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The blood glucose level remains high in Diabetes Mellitus causing constant hyperglycaemia which result damaging various tissues and organs especially nerves, small and large blood vessels, eyes, heart, kidneys etc.

Types of Diabetes of Mellitus:

American Diabetes association (ADA) and WHO has recommended following classification:

- 1) Type -I: Insulin dependent Diabetes Mellitus (IDDM)
Beta cells destruction leads to absolute insulin deficiency.
 - a) Autoimmune
 - b) Idiopathic
- 2) Type -II: Non-Insulin Dependent Diabetes Mellitus (NIDDM).
 - a) Predominantly insulin Resistance.
 - b) Predominantly insulin secretory defects.
- 3) Other types of Diabetes Mellitus:-
 - a) Genetic defect of beta cells dysfunction
e.g. Maturity onset Diabetes of the Young (MODY-1 to 6)
 - b) Genetic defects in insulin action
e.g. type A insulin resistance.
 - c) Diabetes of exocrine pancreas
e.g. fibro- calculus pancreatopathy
 - d) Endocrinopathies
e.g. Acromegaly, Cushing's syndrome etc.
 - e) Infections
e.g. congenital Rubella.
 - f) Drugs or chemical induced
e.g. glucocorticoids.
- 4) Gestation Diabetes.
 - a) Type-I Diabetes Mellitus (IDDM):-
It has its onset most often in childhood and adolescence, although it may occur at any age. IDDM patients depend on insulin to be supplied from outside.
 - b) Type-II Diabetes Mellitus (NIDDM):-
It usually begins in the middle age or after 40 years. There is mix pathophysiological basis of impaired beta cell function with peripheral insulin resistance.
- 5) Other specific types of Diabetes Mellitus:
 - a) Development of (type II) Diabetes Mellitus below the age of 25 years is called as maturity onset Diabetes of the young. Glucokinase deficiency is present in MODY>
 - b) Genetic defects in insulin action:-
 - c) Insulin resistance associated with several syndromes are divided in
 - d) Associated with genetic defects resulting decrease in insulin receptors numbers.
 - e) Due to antibodies against insulin receptors.
 - f) Diseases of Exocrine Pancreas can also lead to Diabetes Mellitus. e.g. Malnutrition Related Diabetes Mellitus.
 - g) Endocrinopathies like Acromegaly, Autoimmune Hypo-Thyroidism, Addison's disease can cause co-existent Diabetes.

Certain drugs like, phenytoin, glucocorticoids, thiazide diuretics can cause hyperglycaemia.

6) Gestational Diabetes Mellitus:

It is glucose intolerance developing during pregnancy. In post partum period it may revert to normal, it can continue to pathogenesis or developed frank Diabetes. [3]

Table 1: Some herbal home remedies plants with Anti-diabetic activity.

Sr. No.	English Name	Sanskrit Name	Biological Name	Family
1.	Bitter Gourd	Karavallak	Momordia charantia Linn.	Cucurbitaceae
2.	Fenugreek	Shatapushpa	Anethum sowa Kurz	Umbelliferae
3.	Ginger	Shunthi	Zinziber officinale	Scitaminae
4.	Garlic	Rasona	Allium sativum Linn.	Liliaceae
5.	Curry	Kaidarya	Murraya koenigii	Rutaceae
6.	Aloe	Kumari	Aloe vera	Liliaceae
7.	Neem	Nimba	Azadiracta indica	Meliaceae
8.	Indian Gooseberry	Amalaki	Emblia officinalis Gaertn	Euphorbiaceae
9.	Bilva	Bilva	Argel marmelos Linn. Corr	Rutaceae
10.	Indian Black Berry	Jambu	Syzigium cumini Linn.	Myrtaceae

Other herbal plants with anti-diabetic activity:

Abroma august Linn, Acacia modesta Wall, Acacia nilotica Linn, Aconitum ferox Wall, Adhatoda vasika Nees, Adiantum capillusveneris Linn, Adiantum incisum Forsk, Albizia stipulate Sensu Barker, Alpinia galangal Wild, Anacardium occidentale Linn, Areca catechu Linn, Azadiracta indica A. Juss, Bauhinia semla Wunderlin, Benincasa hispida Cong, Bougainvillea spectabilis Willd, Brassica oleracea Linn, Casearia esculenta Roxb, Cassia auriculata Linn, Cassia fistula Linn, Cassia sophera Linn, Catharanthus roseus G.Don, Citrus urantium Linn, Clerodendurm Phlomidis Linn, Coccinia indica Wight, Cynara scolymus Linn, Daucus carota Linn, Dolichos lablab Linn, Emblica officinalis Gaertn, Enicostemma littorale Blume, Ensete superbum Roxb, Orchis mascula Linn, Orthosiphon spiralis Merrill, Pinus roxburghii Sarg, Portulaca oleracea Linn, Prunus persica Batsch, Pterocarpus marsupium Roxb Punica granatum Linn, Quercus infectoria Olivier, Rauvolfia serpentine Benth, Ricinus communis Linn, Rivea cuneata Wight, Salacia macrosperma Wight, Saussurea lappa C.B. Clarke, Scoparia dulcis Linn, Securigera securidaca Linn, Spathodea campanulata Beauv, Strychnos potatorum Linn, Indigofera arecta Hochst, Ipomoea nil Linn, Lagerstroemia speciosa Pers. Lupinus albus Linn, Mangifera indica Linn, Momordica charantia Linn, Morus alba Linn, Mucuna prurita Hiik, Murraya kienigii Linn, muasa apeintum Linn, Nigella sativa Linn, Swertia chirayita Roxb, Tecoma stans Linn, Trifolium alexandrinum Linn, Trigonella foenumgraecum Linn, Urtica dioica Linn, Xanthium strumarium Linn Eriodendron anfractuodum DC, Erythrina indica Lam, Ficus begalensis Linn, Ficus racemosa Linn, Glycine max Merrill, Gymnema sylvestre R.Br. Herlicteres isora Linn, Hordeum vulgare Linn, Nymphaea nouchale Burm, Ocimum sanctum Linnm Olea europaea Linn.

Table 2: Chemical Composition and Biological Activities

Sr. No.	English Names	Active Ingredients (Chemical Constituents)	Activity
1.	Bitter Gourd [4]	Charantin, Polypeptide-P(p-Insulin)	Anti-hyperglycemic
2.	Fenugreek [5]	Carvone, Dihydro carvone, limonene, Apiol, Dill-apial, Alfa-berga-motene, Trans-dehydrocarvone, Beta-caryophyllene, Cugenol, Cis-ocimene, diffuran, Beta-sitosterol	Appetiser, Fungicidal, Anti-diabetic
3.	Ginger [6]	Alpha curcumine, beta delta curcumine, Beta-bourbornene, D-borneal, Ciytral, D-camphene, Citronellol, Geraniol, Gingerol, Alpha, & Beta Zingiberenes, Zingiberol, Zingirone, Gingerols, Paradol, Gingerenone A, Ginger glycolipids A, B & C, Gingerdiol, Gingerone B & C etc.	Anti-inflammatory, Gastro Intestinal stimulant, Ionotropic, Anti-hyper lipidemic, Anti-bacterial, Bile secretion stimulant, Bioavailability enhancer property, Appetizer, Protective in Gastric lesions, Anti-emetic, Anti-motion sickness, Anti-oxidant property.
4.	Garlic [7]	Allin, Carbohydrates(Arabinose, Galactose etc.), Vitamins(folic acid, niacin, Riboflavin,Thiamine, Vit-C), Amino Acids (Arginine,Asparagic Acid, Methionine,etc.); Enzymes(allinase); Volatile Compounds(Allyl Alcohol, Allylthiol,Allylpropyl Disulphide, etc); Thioglycosides9 scordine, ScordinineA ₁ ,A ₂ & B. Prostaglandins A ₂ ,D ₂ ,E ₂ & F ₂ ; Allylmethyl selenide,Ajoene, Proteoruboside B	Anti Arthritic, Anti-Hyperglycaemic, Anti-inflammatory, Anti-hyper lipidemic, Anti-hypertensive, Bactericidal, Anti-carcinogenic especially skin carcinogens, Thrombolytic activity, Inhibitory to platelets aggregation,
5.	Curry [8]	Cumin aldehyde	Anti Diabetic, Antacid, Digestive stimulant [9]
6.	Aloe [10]	Aloe-emodin, Aloctin-A(Glycoprotein), Aloenin(bitter glucoside), Barbaloin, Chrystophanol glycoside; Galactose,, Mannose, Aldopentose, Aloesin, beta Sitosterol, Aloctin-A & B.	Increases fertility rate, Wound healing property, Hypoglycaemic activity, Anti-inflammatory, Anti-bacterial effect, Immunomodulator, Stimulates micro-circulation, heals burn wounds effectively
7.	Neem [11]	Azadirachtin, Azadirachtanin,azadirone, Nimbandiol, Nimbin, Nimbolide, Nimbidin, Nimbinin, Sitosterol, Kulinone, Margosinolide, Azadorachonol, Nimbiol, Nimocin, Tocopherol, Azadirone, Azadiradione	Anti-inflammatory, Anti-arthritic, Anti-hypertensive, Anti-hyperglycaemic, Anti-microbial, Immunostimulant activity
8.	Indian Gooseberry (Amla) [12]	Ellagic acid, Lupeol, Oleoic aldehyde, Leucodelphinidine, Procyanidin, Tannin, Vitamin-C, Pyllembin, Linolic acid, Indole acetic acid, Ayxubsm Trigaloyl glucose, Terchebin, corilagin, Ellagic acid, Phylambic acid	Antidiabetic and Hypoglycaemic, Anti-peptic ulcer activity, Hypo-lipidemic, Anti-atherosclerotic, Anti-microbial, Anti-emetic, Anti-inflammatory, Hepatoprotective,Antioxidant activity, Rasayana, Spasmolytic activity.
9.	Bilva [13]	Xanthotoxin, Umbiliferone, Marmesin, Marmin, Skimmin, Furoquoinoline, Marmesin, Beta sitostorol, alphaand beta phellandrene, Rutin, Marmesinine, Aegelin, Aegelenine, Xanthotoxol,Marmesin,Imperatorine, Alloimperatorin.	Cardio Vascular System stimulant, Hypoglycaemic, Anti helminthic , Anti Diarrheal
10.	Indian Black Berry (Jambu) [14]	Flavonoides, Oleanolic Acid, triterpenoides 3,4,5 tetrahydroxy Cyclo nexane- Carboxalic Acid, 3 (3,4 Dihydroxy Cinnamate 10-glycoside.	Bronchiti's Blood Purifier Anti-diabetic,.Pancreatic Regenerator properties, Anti-diarrheal, Anti-inflammatory, Anti-pyretic

Some researches proving Anti-hyperglycaemic effects of the medicinal plants:

a) Bitter Gourd: [15]

- 1) The juice of fruit orally produced hypoglycaemia in normal and alloxan induced diabetic rabbits(Sharma et al, 1960)
- 2) The fruit and seeds gave a polypeptide, which was considered to be similar as bovine insulin (IP). Polypeptide-p was tested in gerbils, langur monkeys and also in 19 patients of DM. Polypeptide-P when administered subcutaneously, significantly reduced blood sugar levels. (Khanna et al., 1974 & 1981)
- 3) Charantin led to prolonged hypoglycaemia in varying doses in normal fasting rabbits, the fall being gradual and steady for 4 hours and then recovering slowly(Lotlikar & Rajaramrao 2962, 1966)

b) Fenugreek:

- 1) Plant showed appetite stimulating property (K'o Hsuch Nung Yeh, Taipei 1979,27,35)
- 2) Fasting blood sugar is considerably decreased in patients who were given fenugreek seeds powder(Kassaian N et al, effect of fenugreek seeds on blood

glucose and lipid profiles in type 2 diabetes mellitus, 2009, 79(1) (www.ncbi.nlm.nih)

c) Ginger:

- 1) The ethanolic extract of Ginger showed hypoglycaemic effect in rabbits(Mascolo et al. 1989)

d) Garlic:

- 1) The effect of the juice of garlic on glucose utilization was studied in rabbits by using Glucose Tolerance Test. The hypoglycaemic effect was compared with that of tolbutamid eand control groups (on distilled water)(Jain et al,1973)
- 2) 5-allylcysteine sulphoxide showed significant anti-diabetic effect in alloxan-diabetic rats. (Ind.J.Exp. Biol.1992,30,523)

e) Curry:

- 1) Hypoglycaemic effect was found of Murraya koenigii in type 2 diabetes mellitus patients, IJFANS (International Journal of Food and Nutritional sciences), Vol. 2, Issue 1, Jan. 2013. [16]

f) Aloe vera:

- 1) Hypoglycaemic activity of polysaccharides yielded from the plant (A Barbadosensis) is reported (Hikino et al., 1973).

g) Neem :

- 1) Neem oil does not produce hypoglycaemia in normal animals, but does improve glucose tolerance in partially pancreatectomised dogs. The hypoglycaemic effect is about 24.77 % -26.38 % in five hours (Pillai & Santha Kumari, 1981).
- 2) Aqueous extracts of leaves decreased the blood sugar levels in dogs (on I.V. administration) and prevented adrenaline as well as glucose hyperglycaemia. The onset of action was at 30 mi-4 hours. (Murthy et al. 1958).

h) Amla:

- 1) Embliia fruit powder reduced bood sugar levels in normal rabbits, as well as in hyperglycaemic rabbits proving the hypoglycaemic activity (tripathi et al).
- 2) A clinical study of Nishamalaki churna (15 patients) in diabetes proves the efficacy of the combination (Gopalakumar et al; 1995 & Nagarjuna Jan. 1983 p. 105-107)

i) Bilva:

- 1) The alcoholic extracts of roots and fruits showed hypoglycaemic activity in albino rats (Dhar et al; 1986)
- 2) The leaf extract reversed all the parameters (altered function of pancreatic beta cells and acinar cells; coursing of endoplasmic reticulum in acinar cells and altered secretory functions of hepatocytes and improvement in functional status in pancreatic beta cells) (Das et al; 1996).
- 3) Effect of leaves is studied in normal and alloxan induced DM. In normal rabbits, highest decrease (35.3%) of blood glucose level is recorded with 1 gm equivalent dose after 4 hours of administration. (Rao et al: 1995)

j) Jambu:

- 1) Fresh powered seed was found to lower blood sugar level in diabetic rabbits(Vaish, 1954).
- 2) The fruit and seeds were found to be promising hypoglycaemic agents(Aiman 1961)
- 3) The aqueous extract of seeds of the plant produced 15-25 % fall in blood sugar in 4 to 5 hours after giving single dose orally (Shrotri et al. 1963).
- 4) In 80 patients seed powder produced good symptomatic relief as well as regulation of blood sugar levels. (Kohli & Singh 1993)

3. Conclusion

Diabetes Mellitus is a metabolic disease with raised blood sugar level and many metabolic cellular changes which lead to multi system complications. Allopathic medicines are not that much effective to treat hyperglycaemia with the oxidative stress occurring all over body. The cost of treatment increases as the combination of molecules have to be taken lifetime. That is why middle class and lower class people can't afford the price of the treatment. Herbal medicines which are available very easily and which show anti diabetic effects should be used to treat Diabetes effectively as well as to lower the economical burden.

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