

Traditional Medicinal Plants for Diabetes: A Review

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ABSTRACT

In this review article, an attempt has been made to compile the reported hypoglycemic plants available in different scientific journals and may be useful to the health professionals, scientists and scholars working in the field of pharmacology and therapeutics to develop evidence based alternative medicine to cure different kinds of diabetes in man and animals. The ethnobotanical information reports that about 900 plants may possess anti-diabetic potential. Some important plants described in this review article and usages.

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INTRODUCTION

Diabetes mellitus, or simply diabetes, is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not respond to the insulin that is produced. This high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). There are three main types of diabetes mellitus (DM).

- Type 1 DM results from the body's failure to produce insulin, and currently requires the person to inject insulin or wear an insulin pump. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes".
- Type 2 DM results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency. This form was previously referred to as non insulin-dependent diabetes mellitus (NIDDM) or "adult-onset diabetes".
- The third main form, gestational diabetes occurs when pregnant women without a previous diagnosis of diabetes develop a high blood glucose level. It may precede development of type 2 DM [1-2].

Other forms of diabetes mellitus include congenital diabetes, which is due to genetic defects of insulin secretion, cystic fibrosis-related diabetes, steroid diabetes induced by high doses of glucocorticoids, and several forms of monogenic diabetes. Untreated, diabetes can cause many complications. Acute complications include diabetic ketoacidosis and nonketotic hyperosmolar coma. Serious long-term complications include cardiovascular disease, chronic renal failure, and diabetic retinopathy (retinal damage). Adequate treatment of diabetes is thus important, as well as blood pressure control and lifestyle factors such as stopping smoking and maintaining a healthy body weight. All forms of diabetes have been treatable since insulin became available in 1921, and type 2 diabetes may be controlled with medications. Insulin and some oral medications can cause hypoglycemia (low blood sugars), which can be dangerous if severe. Both types 1 and 2 are chronic conditions that cannot be cured. Pancreas transplants have been tried with limited success in type 1 DM; gastric bypass surgery has been successful in many with morbid obesity and type 2 DM. Gestational diabetes usually resolves after delivery.

Diabetes is of two kinds: Type 1 and Type 2. Type 1 diabetes is an autoimmune disease which affects the pancreas. As a result of this, the pancreas either produce no insulin or too little of it. Type 2 diabetes is different. In this, the body builds up resistance towards insulin and therefore requires greater amount of insulin, every time [1].

Herbs that have been used in medicine from times immemorial have shown great potential in anti-diabetic activity. Different herbs achieve this in different ways. Some boost the insulin production. Some others boost the utilization of insulin. There are a few herbs which prevent the breakdown of starches

into sugars while still others increase the sensitivity of the body towards insulin. Through all these means, the herbs effectively reduce diabetes and become useful in its treatment [3-4].

The best thing about these herbs are that they are the most natural form of ingesting chemicals that are useful in treating diabetes. However, care and advice must be sought before making use of a combination of the below listed herbs

Diabetes mellitus is a chronic endocrine disorder caused by an absolute or relative lack of insulin and/or reduced insulin activity that results in hyperglycemia and abnormalities in carbohydrate, fat and protein metabolism. Diabetes has emerged as a major healthcare problem in India. A national urban survey in 2005 observed that the prevalence of diabetes in urban India in adults was 15.1%. Recent data have illustrated the impact of socio-economic transition occurring in rural India. The transition has occurred in the last 15 years and the prevalence has risen from 2.4% to 6.4%[1].

India is now engulfed by the diabetes demon like never before, thanks to our changing lifestyle, stress and lack of exercise. Since it is a chronic disease, patients are usually on anti-diabetic medication for life. And if their sugar levels are not controlled, they may be prescribed insulin. Even though it is difficult to completely stop taking the medication, given the chronic nature of the disease, it may be wise to try some natural remedies and yoga to help control glucose levels naturally too. But remember, do consult your doctor before starting on any of the remedies listed below, especially because a combination of allopathic and natural remedies can trigger off a sudden, drastic drop of blood glucose levels that can be dangerous. Here are details of five such herbal remedies that have shown promise of useful anti-diabetic activity, along with what is known of their mechanism of action.

IMPORTANT MEDICINAL PLANT FOR DIABETES

***Acacia arabica* (A. arabica) (Leguminosae)**

It is found all over India. The plant extract acts as an antidiabetic agent by acting as secretagogue to release insulin. It induces hypoglycemia in control rats but not in alloxanized animals. Powdered seeds of *A. arabica* when administered (2, 3 and 4 g/kg body weight) to normal rabbits, induces hypoglycemic effect by initiating release of insulin from pancreatic beta cells [8].

Fenugreek or methi

Used in paranthas and various Indian curries, methi has many health benefits. In modern times, clinical trials on people with type 2 diabetes show that fenugreek has the beneficial property of reducing the rate at which sugar is absorbed from the stomach during the process of digestion; it also appears to be capable of stimulating the pancreatic cells to increase insulin production and secretion. Both these actions are believed to be a result of the action by an amino acid present in fenugreek called 4-hydroxyisoleucine.

Bitter gourd, bitter melon or Karela [Momordica charantia]

Several studies have found that bitter gourd or karela extracts have the ability to reduce the activity of the alpha glucosidase enzyme and this helps to reduce the hyperglycemia (increase in sugar levels) that typically follows a meal. This insulin-like action is believed to be due to a substance called polypeptide-P. Bitter melon has also been found to contain a phytonutrient called charantin that allows the glucose from the blood to be moved into the muscles, adipose (fat) tissue and liver, lowering blood glucose levels in diabetics.

Pterocarpus or Vijaysar [Pterocarpus marsupium]

A deciduous tree that occurs widely in the Deccan peninsula in India, *Pterocarpus marsupium* of the Fabaceae family is considered especially useful in people with type 2 diabetes. Studies have found that pterocarpus extracts may be able to reduce the glucose absorption by the intestines, making it effective in diabetes type 2. This anti-diabetic action has also been noted in some clinical studies carried out on humans.

Gymnema or Gurmar [Gymnema sylvestre]

As the name indicates, Gurmar is a climbing shrub and the leaves have been traditionally believed to be capable of destroying sugar. Gymnema leaves contain saponins and gymnemic acids that have anti-diabetic action. Studies have found that gymnemic acids show the ability to reduce the amount of sugar absorbed by the intestine during the process of digestion. Chewing on a few leaves of gymnema can reduce your power to sense the sweetness of foods and this observation has led researchers to conclude that this remedy may play a role in suppressing appetite – an effect that is useful to diabetics who seek to

control their dietary intake. In some studies, gymnema also appears to increase the amount of insulin secreted by the pancreas [8].

Guduchi or Amrit [Tinospora cordifolia]

Guduchi has been traditionally used as an adaptogen – a drug that increases the body's ability to cope with stress and illness. Extracts from the stem of this plant have been found to inhibit the activity of an enzyme called alpha glucosidase which is involved with the breakdown of glucose. This inhibition helps to delay the process of digestion of carbohydrates and therefore, glucose is absorbed much more slowly, an effect that is helpful in preventing hyperglycemia in diabetics [8].

Sweet Potato Leaves [Ipomoea batatas]

Sweet potato leaves are slightly bitter in taste, and are anti diabetic. They are considered beneficial in lowering blood sugar. About 60 g of fresh leaves or 30 g of dry leaves of sweet potatoes along with 100 g of fresh skin or 12 g of dry skin of ash gourd should be cut into small pieces and boiled in water. This decoction should be taken as tea by diabetics for beneficial results [3].

Tenner's Cassia [Senna auriculata]

Tenner's cassia helps to lower blood sugar and is therefore, beneficial in the treatment of diabetes. A decoction of the whole plant or buds is used to treat this disease. The powder of the herb along with honey is equally efficient.

Aloe vera

Aloe vera is often regarded as a 'healing herb'. Dried aloe vera sap and gel (inner leaf) is used traditionally to treat diabetes because it is believed to help reduce levels of fasting blood glucose. Aloe vera is a succulent, and as such, stores a large quantity of water within its leaves and root system. During the winter months, the plant will become somewhat dormant, and require very little moisture. During this period watering should be minimal. Allow the soil to become completely dry before giving the plant a cup or two of water.

Aloe vera is a sun loving plant and needs at least a sq. ft to grow to its optimum height and spread. It is strongly advised to avoid the oral consumption of non-decolorized whole leaf extract of aloe vera as it has shown to be slightly toxic [4].

Insulin Plant [Chamaecostus cuspidatus]

Fiery Costus or Spiral Flag is an herbaceous plant that is characterized by large fleshy looking leaves and is propagated by stem cutting. These plants grow very quickly and require moderate amounts of sun light. They grow to a height of 2 ft and are normally dried and powdered before they are consumed. The author strongly recommends consulting an ayurvedic doctor on the correct quantities and duration of consumption of each of these plants or their various parts for optimum results [4].

Cinnamomum verum

Cinnamon has traditionally been used for a treating a variety of problems including gastro-intestinal disorders, colds, flu and urinary infections. Cinnamon helps by enhancing insulin's ability to metabolize sugar. It contains the anti-oxidant glutathione and the the flavanoid, methylhydroxy chalcone polymer. These make even the fat cells more responsive towards insulin [6].

Ginkgo biloba

Ginkgo has been used in medicine for centuries now. New research has revealed many important aspects of this herb which are medically useful. Research at the University of Texas Health and Science Center by Dr.Kudolo has shown that ginkgo reduces pallet aggregation. This results in increased circulation of the blood and thus prevents complications of diabetes that are circulation-based. In diabetics with falling insulin levels, ginkgo was also found to boost insulin production. However, the dosage of the herb is yet to be determined. Excessive use of the herb is known to cause headaches, nausea, vomiting, stomach upsets, diarrhea and even allergic skin reactions [7].

Lingonberry [Vaccinium vitis-idaea]

In the northern climes of the world, lingonberry has been used medicinally by people for centuries. Dr. L.P. Beaulieu in his article in Phytotherapy Research has shown how lingonberry extract was used

successfully in history to treat diabetes and the complications arising out of diabetes. The ability to treat diabetes was because of the flavonoids that are present in the lingonberry extracts. Copper is an essential mineral that is used in the treatment of diabetes and lingonberries have good concentrations of this mineral. Being rich sources of omega-3 fatty acids, these berries also have associated anti-oxidant and anti-inflammatory properties [5].

Bliberry [Vaccinium myrtillus]

A Japanese study on mice has shown that bliberry consumption reduces glucose levels in the blood and thus reduce the risk from diabetes. These berries are high in anthocyanin which affects the action of different proteins that are involved in fat metabolism and glucose transport. The anthocyanin activates a protein which in turn stimulates lipid breakdown (in muscles and liver) and modulates AMP-activated protein kinase (AMPK). The net effect is an increased sensitivity towards insulin which enhanced the hormone's efficacy. Bliberry leaves are also known to reduce risks of long-term and chronic diabetic problems such as diabetic cataracts and diabetic retinopathy [3].

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