



## Review Article

# A Comprehensive Review On Herbal Plants Showing Anti-Diabetic Activity

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## ABSTRACT

Diabetes mellitus (DM), also known as insulin-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (DNID), is a serious and debilitating disease that affects people around the world. Herbal plants have been used to treat diabetes all over the world. Among the many types of herbs and polyherbal plants, many are used to treat and control diabetes. They also do not have side effects. Diabetes is a dangerous disease that affects people all over the world and poses a serious risk to human health. So herbaceous plants may be a potential cure for diabetes mellitus, with crop data showing that up to 800 plants may be able to fight the disease. Synthetic oral hypoglycemic agents / insulins have been widely used as anti-diabetic drugs and have been shown to be effective in the management of hyperglycemia, but have significant side effects and do not affect diabetes mellitus. This is the main reason why more and more people are looking for other drugs that have little or no side effects. In this review, we have given botanical names, generic names, ingredients and procedures for the prevention of diabetes, as well as commercial formulations of plant polyherbs.

## INTRODUCTION

Diabetes mellitus is characterized by reform in glucose, fat and protein metabolism, which results in high and inadequate blood changes for insulin or both. Alternative drugs are required for diabetes. Diabetes today, a major problem in diabetes is essential chemical parameters (glucose, urea, cholesterol, blood cholesterol, vein, layer density, hemoglobin, and glycosyl hemoglobin).

Although this product is in good tolerance test Is oral glucose does not have a negative effect in blood. The treatment of diabetes in plant products led to significant improvement in chemical brands. According to the present study, herbal paper can be used as diabetes.

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Continuous growth aging, urbanization and high prevalence of obesity and physical litters are the main causes of this disease and afterwards. Determination of diabetes and number of people with diabetes; Today, it is important in the future to deal with logical planning and allocation of tools to treat diabetes and prevention. Diabetes is the condition of metabolism that is not produced by a human body sufficiently from Beulin, hormone should turn sugar, starch and other carbohydrates into energy.<sup>5</sup> diabetes have abnormal glucose levels in the bloodstream. Plant plants can be found in abundance in our daily lives. These plants are considered by both patients and healthy and nutrients. Vegetarian programs are generally available, they can use uncertain and inexpensive effects. Senior herbal medicines promised to all other solutions.<sup>6</sup> Most of the conditions of diabetes are in one of two base blue errors. First, the first type of diabetes is characterized by a lack of insulin secretion. On the other hand, a common class of type 2 diabetes; The main reason is a combination of insulin resistance and inadequate response in the ministry (US Diabetes Association, 2005). At present, treatments on the day of insulin diabetes and various edible oral factors such as sulfonyl urea, biguanides and glinides.<sup>7</sup> have a lot of serious side effects; That is why in search of blood glucose fabric is more effective and safer and safer than the most important research. In diabetes, high blood pressure is an interactive oxygen (ROS), which results in fat in each oxidation and damage to the membrane. These free radicals play an important role in the development of military complications for diabetes (kidneys, eyes, blood vessels).<sup>8,9</sup> Antioxidant defense against diabetes by preventing the interaction of oxidation series, which prevents the death of  $\beta$  cells.

Natural antioxidants in plants include tannins, flavonoids, vitamins C and E, and more. They can protect cell function and produce reactive oxygen species (ROS) from diabetes. In this review we have attempted to identify herbal plants that have

antidiabetic effects in two or more ways. In carbohydrates, fats and proteins. If left untreated or controlled, it can lead to acute or chronic problems such as ketoacidosis, microangiopathy, and other infections. The following two categories can be used to classify the types of diabetes:

**Type 1** is a insulin-dependent diabetes mellitus (IDDM), in this type the body does not produce any Insulin secretion. It is commonly occur in children and young adults. In Type 1 diabetes 5–10% people are suffered from these types of Diabetes.

**Type 2** is a noninsulin-dependent diabetes mellitus (NIDDM), in this type the body does not produce enough, or improper use of secreted insulin. It is the most common form of the disease, In Type 2 diabetes 90–95% people are suffered from this type of diabetes. The Type 2 diabetes is a epidemic proportions, because a large number of elderly people suffered from this type of diabetes, because have a greater prevalence of obesity and sedentary lifestyles.

#### **Basis of Diabetes Mellitus treatment:**

- Patient education from concerning the disease
- Physical exercise
- Diet and
- Hypoglycemic agents

Diabetes alone is due to its prevalence, complications, and sheer mortality. Diabetes, the third "killer" of human health after cancer, cardiovascular disease, and cerebrovascular disease, has overtaken cancer. As a result, once identified, it is successfully controlled with a variety of effective therapeutic drugs. Apart from the fact that treatment is based on chemotherapy drugs, there has been a shift towards physiotherapy in the 20th century. Therefore, herbs play an important role in the treatment or management of long-term diseases such as diabetes mellitus, especially in poor resource-rich countries. Along with a host of other diseases that affect healthy people. Using the safety of Indian plants to treat

such diseases is a great option. This herb can be used in whole or in part to treat diabetes-related diseases. In addition, concomitant diseases such as polyuria, polydipsia and glycosuria as well as chronic diseases such as diabetes can be treated with plant extracts.

#### **Advantages<sup>14, 15</sup>**

- Most of the herbal drugs are well tolerated by the patient, having fewer casual consequences and fewer side effects than traditional medicine, and it may be safer to use.
- Herbal drugs are more effective for long-standing health complaints and it don't respond well to traditional medicine
- Cost of herbal drugs is much less than prescription medications. Research, testing, and marketing add considerably to the cost of prescription medicines. Herbs tend to be inexpensive compared to drugs.
- Herbs are available without a prescription. Simple herbs, such as peppermint and chamomile, can be cultivated at home.

#### **Life style for patient<sup>16, 17</sup>**

Some of the home and herbal remedies prescribed by Ayurveda are described below.

1. Turmeric and cinnamon are included in diets.
2. Oily, fried and starchy foodstuffs are avoided.
3. Coffee, sugar, refined flour and alcohol are avoided.
4. Eat smaller meals (low fat diet) five to six times a day instead of having three large meals.
5. Intake of vegetables like spinach, cucumber, tomatoes, onion, sprouts, beans, garlic etc is increased.
6. Refrain from taking stress.
7. Regular exercise. Walk for at least 40 minutes a day.
8. Avoid red meat and excessive salt in your meals. Fish and soybean can be taken due to their good protein value.
9. Avoid white bread, rice, potatoes, sweet and sugary foods.

#### **Recent Regulatory Developments:**

Herbal medicines, as defined by organizational standards, are more traditional drugs in their therapeutic compounds. Traditional medicine (including herbal medicines), which has recently been described by those who have been used as hundreds or more before the establishment and distribution of modern medicine and other cases. Over the past years. Most importantly, because they provide a unique market for plants and confirming the cooperation of active biological products from plants. India and China, developed and advanced countries have the distinctive edge of the rest of the world.<sup>18,19.</sup>

#### **Mechanism of Action of Herbal Anti diabetics<sup>20, 21</sup>**

The anti-diabetic activity of herbal plant are depends upon various mechanisms. The mechanism of action of herbal anti-diabetic can be grouped as:

- Adrenomimeticism, pancreatic beta cell potassium channel blocking, cAMP (2nd messenger) Stimulation.
- Inhibition of urinal glucose reabsorption.
- Stimulation of insulin secretion from beta cells of islets or/and inhibition of insulin degradative processes.
- Reduction in insulin resistance.
- Providing certain necessary elements like calcium, zinc, magnesium, manganese and copper for the beta-cells .
- Regenerating and/or repairing pancreatic beta cells.
- Increasing the size and number of cells in the islets of Langerhans
- Stimulation of insulin secretion.
- Stimulation of glycogenesis and hepatic glycolysis.
- Protective effect on the destruction of the beta cells.
- Improvement in digestion along with reduction in blood sugar and urea.



- Prevention of pathological conversion of starch to glucose.
- Inhibition of  $\beta$ -galactocidase and  $\alpha$ -glycosidase.
- Cortical lowering activities.
- Inhibition of alpha-amylase.

## MEDICINAL PLANTS WITH ANTIDIABETIC AND RELATED BENEFICIAL PROPERTIES

### **Acacia Arabica (Mimosaceae)**

Arabica acacia is found and grown across India. 94% of the seed powder was administered to normal mice, which had a significant effect on lowering blood sugar compared to the control group. However, a similar diet had no effect on blood sugar levels in alloxanized mice (175 mg / kg SC) and showed that the plant had an effect on insulin secretion. Acacia seed powder was administered to normal rabbits at doses of 2, 3 and 4 g / kg body weight, resulting in the release of insulin from the beta cells of the pancreas and the resulting hypoglycemic effect (PB / 0.05). No acute toxicity or behavioral abnormalities were observed at these doses. This can be found all over India. The plant extract acts as an insulin secretor and acts as an antidiabetic. It causes hypoglycemia in control mice but not alloxanization in animals. When normal rabbits are given dried Acacia arabica seeds (2, 3, or 4 grams per kilogram of body weight), they lower blood sugar by stimulating insulin secretion by the pancreatic beta cells.



**Fig 1 : Acacia arabica**

### **Achyranthes aspera (Amaranthaceae)**

It occurs in the tropics of the planets. Oral ingestion of Achyranthus aspera powder causes dose-dependent hypoglycemia in normal and diabetic rabbits. In both normal alloxans and rabbit alloxans, water and methanolic extracts lower blood sugar levels. At oral doses up to 8 g / kg, this herbal medicine had no side effects or side effects in rabbits in the acute toxicity study. Calcium, zinc, magnesium, manganese, and copper are some of the essential nutrients the plant can provide to the beta cell.<sup>23,24</sup>



**Fig 2 : Achyranthes aspera**

### **Allium cepa, Onion (Liliaceae)**

Although Allium Cepa is known only from agriculture, wild species are comparable in the center of Asia. In diabetes, many soluble solutions and dry bulb powder powder components have a nightly integral effect.<sup>25, 26</sup> Allium Cepa also has antioxidant properties and fat burning. S-methylcysteine sulfoxide (SMCs) (200 mg / kg for 45 days) was determined by Alucaning diabetes and was developed in dramatic blood and blood in dramatic blood and tissues, despite the fact that Allium CEPA is only known agriculture can be found in wild species compared to Central Asia. Different anesthetic fractures and non-solution dry bulb powder show blood glucose levels in diabetes. Allium Cepa has antioxidant and fat burning effects. S-methylcysteine sulfoxide

(SMCs) is injected with diabetes caused by alloxan with a dose of 200 mg / kg for 45 days, and glucose levels are significantly shown in serum and tissue. Hexokinase, glucose 6 phosphatase and all HMG COA reductase is printed.<sup>27,28,29</sup> When a patient with diabetes, an oral dose of 50 grams, glucose levels decreased after secondary.<sup>29,30.</sup>



**Fig 3 : *Allium cepa***

**Aloe barbadensis, Aloe gibberellins (Liliaceae)**  
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with diabetes, an oral dose of 50 grams, glucose levels decreased after secondary.<sup>29, 30.</sup>

**Aloe Vera (Liliaceae)**

It has a cactus-like appearance and has green, dagger-shaped leaves that are fleshy, rolled, prickly, and full of sticky jelly. The hypoglycemic activity of the aqueous extract of aloe vera was administered orally at a dose of 150 mg / kg of body weight. The treatment of chronic diseases, but without a single administration of aloe vera leaf secretion, shows a hypoglycemic effect in diabetic rats. Single and chronic administration of a plant to diabetic rats had a hypoglycemic effect. This is achieved by stimulating the production and / or release of insulin by beta cells in the pancreas.<sup>35,36</sup>



**Fig 4 : *Aloe vera***

**Andrographis paniculata (Acanthaceae)**

This herb is native to India and Sri Lanka and is widely grown in South Asia. On oral andrography, the SOD and catalase activities are significantly increased. Its antioxidant properties also help lower blood sugar levels. *A. paniculata* ethanolic extract has antidiabetic properties that can be attributed to an increased glucose metabolism. Hypothyroidism is also helpful for diabetics. This herb is native to India and Sri Lanka and is widely grown in South Asia. On oral andrography, the SOD and catalase activities are significantly increased. Its antioxidant properties also help lower blood sugar levels.<sup>37,38</sup>



**Fig 5 : *Andrographis paniculata***

***Annona squamosa* (Annonaceae)**

It grows at low heights and is a small, well-branched tree or shrub. Hyperglycemic mice received 15 mg / kg of gorsin-3s-glucoside isolated from leaves of *Annona squamosa* for 10 days, which reversed these effects by inhibiting hepatic glycos-6-phosphatase activity. The blood sugar level in diabetic rats decreased from 285.52 to 208.81 mg / dl 6 hours after oral administration of aqueous *A. squamosa* extract (250 mg / kg and 500 mg / kg body weight). It also reduces the fat in the liver and kidneys during any oxidation, while increasing the activity of antioxidant enzymes like catalase and superoxide, as well as glutathione levels, suggesting it is a safe antioxidant. <sup>39,40</sup>



**Fig 6: *Annona squamosa***

***Azadirachta-indica* (Meliaceae)**

Neem is the common name for this plant. It is a tropical and subtropical tree that is native to India, Burma, Bangladesh, Sri Lanka, Malaysia, and Pakistan. Low (0.5 g) and high (2 g) doses of

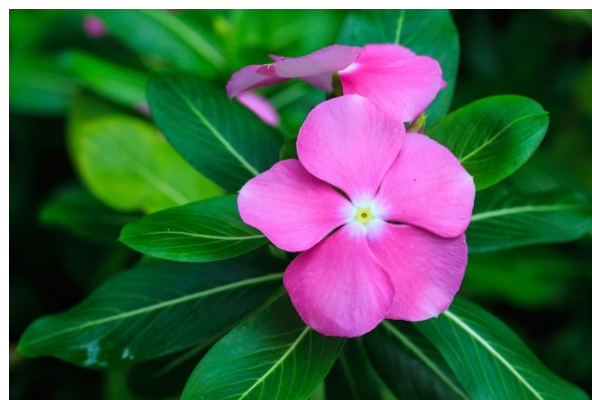
powder, aqueous extract, and alcoholic extract A have been demonstrated in patients with type 2 diabetes whose diabetes is not controlled by oral antidiabetic drugs. They can be successfully combined with these customers. <sup>41</sup>



**Fig 7 : *Azadirachta-indica***

***Catharanthus roseus* (Apocynaceae)**

Oral treatment at 0.5, 0.75 and 1.0 ml / kg body weight reduced blood glucose levels in normal diabetic rabbits to levels equivalent to those of glibenclamide, a model drug. The results showed that *C. roseus* has a long-term effect on lowering blood sugar and that the active substances' mechanism of action is likely mediated by increased insulin production by beta Langerhans cells or by an extrapancreatic mechanism. <sup>44</sup>



**Fig 8 : *Catharanthus roseus***

***Momordica charantia* L. (Cucurbitaceae)**

Vegetable inulin is made from *M. charantia* (bitter melon). In a 30-minute oral sucrose tolerance

experiment, the administration of aqueous extract (AE), the methanolic fraction (MF), or the insoluble methanol fraction (MIF) all resulted in significant, uncontrollable decreases in plasma glucose levels. In addition, in the oral sucrose tolerance test, plasma insulin levels were lower than in controls 30 minutes after MF administration, suggesting that bitter melon reduced postprandial hyperglycemia by inhibiting glycosidase activity.<sup>45</sup>



**Fig 9 : *Momordica charantia***

**Panax ginseng (Araliaceae)**

The root is used to treat type 2 diabetes when taken orally. Ginseng extracts have antihyperglycemic activity in the liver and muscles, which is associated with increased peroxisome receptor-activated gamma expression and activation of adenosine monophosphate protein kinase. Oral ginseng root improves insulin sensitivity and can be used as an additional therapy for insulin-resistant diabetics.<sup>46, 47, 48</sup>



**Fig 10 : *Panax ginseng***

**Ocimum sanctum L. (Lamiaceae)**

Tulsi is a common name. This plant has been used for medicinal purposes since ancient times. The benefits of hypoglycemia and hypoglycemia in diabetic rats have been demonstrated by significant reductions in fasting blood sugar, uric acid, total amino acids, total cholesterol, triglycerides and total fat. 51 and 52 plasma glucose levels decrease 30 days after oral administration of plant extract (200 mg / kg). In diabetic rats, kidney glycogen levels increased tenfold, while skeletal muscle glycogen levels decreased by 68 and 75%, respectively, compared to control rats. Antioxidant, antibacterial, antifungal, antiviral, antidiabetic, antistress, cancer, ulcer, antibacterial and immunomodulating activities have also been observed in this plant.<sup>53, 54</sup>



**Fig 11 : *Ocimum sanctum***

**Tinospora cordifolia (Menispermaceae)**

Goduchi is the common name for herbaceous grapevines native to India, Myanmar, and tropical Sri Lanka. Blood sugar and brain fats were significantly reduced in mice with diabetes mellitus alloxan after oral treatment with aqueous extract from *T. cordifolia* roots. Aqueous extract at a dose of 400 mg/kg has a significant antihypertensive effect in many animal models, but this effect does not exceed 1 unit per kg of insulin.<sup>55, 56</sup>

**Fig 12 : *Tinospora cordifolia*****Table 1: Some Plants Having Hypoglycemic Activities.<sup>57</sup>**

Sr. No.	Common name	Botanical name and family	Parts used	Therapeutic action
1	Asiatic ginseng	Panax ginseng (Araliac)	Roots	Reduces blood glucose levels via slowing the absorption of carbohydrates, enhancing glucose transport, and modulating insulin secretion.
2	Ashwagandha, winter cheery	Withania somnifera (Solanaceae)	Roots	Reduced blood sugar levels
3	Asiatic sweet leaf	Symplocos Paniculata (Symplocaceae)	Leaves/ stems	1 and 2 inhibitors of protein tyrosine phosphatase 1B (PTP1B)
4	Banana	Musa sapientum Kuntz (Musaceae)	Fruits/flowers	Blood glucose and glycosylated hemoglobin levels are reduced
5	Banyan tree	Ficus bengalensis (Moraceae)	Bark	Insulinase activity in the liver and kidneys is inhibited, and insulin secretion is stimulated
6	Barbados	Aloe barbadensis Mill. (Liliaceae)	Leaves	Insulin production and release are stimulated.
7	Betal, betal wine	Piper betle (Piperaceae)	Leaf	glucose metabolism, anti-hyperglycemic
8	Bilwa, bael fruit	Aegle marmelos (Rutaceae)	Leaf Extract	Decrease cholesterol and blood urea level
9	Bitter kola, false kola	Garcinia kola (Clusiaceae)	Seed	Hypoglycemic and Hypolipidemic
10	Black tea	Camellia sinensis (Theaceae)	Leaves	Leaves help to lower blood sugar levels.

**Table 2: Marketed Herbal Anti diabetic Products**

Sr. No.	Product	Manufacturer	Mechanism	Ref
1	Sharang Dyab-Tea	Plant Med lab Pvt. Ltd.	Insulin synthesis should be encouraged	[61]
2	Herbal hills jambu	Isha Agro Developers	Blood and urine sugar levels should be lowered.	[62]



3	Stevia-33	Vitalize Herbs Pvt. Ltd	Beta cells in the pancreas should be activated.	[63]
4	Diab-FIT	Herbal FIT	Maintain a normal blood sugar level	[64]
5	Madhumar capsule	Kangrd Hills Care and Products	Control diabetes mellitus in people who have it for a long time.	[65]
6	Daya Stone Powder	Jignesh and Co.	Reduce your blood glucose level	[66]
7	Blue berry	Hikma FZCO	Antidiabetic	[67]
8	Episulin	Varuna Biocell Pvt. Ltd.	Antidiabetic	[68]



Fig 13 : Sharang Dyab-Tea



Fig 14 : Herbal hills - Jambu powder



Fig 15 : Stevia-33 capsules

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### CONCLUSION

Diabetes is one of the most common and dangerous endocrine diseases. The disease affects

more than 300 million people worldwide. As a result, drugs according to western medical principles (allopathic) are usually ineffective, have a high risk of side effects and are very expensive, especially in poor countries. Diabetes is becoming more common around the world, and treatment with oral anti-diabetic drugs has side effects and is costly. Patients are increasingly asked for natural remedies with anti-diabetic properties. In this



study, several antidiabetic plants were pharmacologically investigated and found to be useful for the treatment of diabetes. The properties of these herbs can help delay the onset of diabetes and correct metabolic imbalances. However, more research is needed to determine the mechanism of action of herbs with antidiabetic properties. The aim of this study was to find out whether herbs, parts of plants or extracts can be used to treat diabetes. It also gathers information about plants with hypoglycemic properties. The experimental

research on blood sugar lowering plants and their bioactive components is the focus of the present study. The type of diabetes, the physiological problems associated with it, and the herbs available that can be further studied to work against diabetes are briefly described. In general, the properties of plants with hypoglycemic properties documented in the literature are presented in this overview. All herbal medicines are listed.

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