

A COMPREHENSIVE REVIEW ON ANTIDIABETICS

Dr.D.Rama Brahma Reddy¹, CH.N.V.S.Mastan Rao², B.Yashwanth³,
P.Lakshmi Nageswari⁴

¹Principal of Nalanda Institute of Pharmaceutical Sciences, Siddharth Nagar, Kantepudi(V), Sattenapalli(M), Guntur (DIST)-522438,AP, India.

²Associate Professor of Nalanda Institute of Pharmaceutical Sciences, Siddharth Nagar, Kantepudi(V), Sattenapalli(M), Guntur (DIST)-522438,AP, India.

³Assistant Professor of Nalanda Institute of Pharmaceutical Sciences, Siddharth Nagar, Kantepudi(V), Sattenapalli(M), Guntur (DIST)-522438,AP, India.

⁴Student of Nalanda Institute of Pharmaceutical Sciences, Siddharth Nagar, Kantepudi(V), Sattenapalli(M), Guntur (DIST)-522438,AP, India.

Abstract:

The direction of healthcare experts. Furthermore, herbal treatments should not serve as a substitute for regular medical attention or Prescribed medications without We discuss new progress in producing herbal drugs for controlling diabetes. Herbal medicine is becoming recognized as a promising option for treating diabetes safely and effectively, with different methods of action investigated in experiments on animals and Humans. This review aims to outline important discoveries about the effectiveness, safety, and medical uses of innovative herbal Treatments for diabetes. Nevertheless, WHO acknowledges the potential of herbal and herbal drugs in treating different health issues, Such as diabetes, when utilized correctly and in combination with conventional therapies. It is important to emphasize that although Certain herbal treatments have displayed potential in managing diabetes symptoms, they should be approached with care and under seeking advice from a healthcare professional.

Keywords: Antidiabetics, Diabetes Milletus, Hypoglycemia, Glucose Level

INTRODUCTION:

Anti-diabetic medications help control diabetes by reducing Blood sugar levels [1]. Diabetes mellitus is a condition that affects The body's metabolism, causing high levels of sugar, lipids, amino Acids, and low insulin levels. This results in decreased insulin production and function [2-4]. Diabetes mellitus is a medical condition known as "hyperglycemia," where there is a problem with the Body's ability to produce insulin

from the pancreas, leading to disrupted glucose levels. When the immune system

attacks the beta Cells in the pancreas, it can lead to damage or decreased insulin Production, causing diabetes. There are two main types of diabetes: Type 1 Diabetes (TD1) and Type 2 Diabetes (TD2). In Type 1 Diabetes, the body's immune system destroys the beta cells in The pancreas as a result of an autoimmune disease. Approximately 85% of people with diabetes have Type 2 diabetes mellitus, a condition that affects the body's ability to metabolize carbohydrates And can lead to low blood sugar levels. Diabetes mellitus is a noninfectious disorder that affects the endocrine system [5]. Several Herbal remedies have been used herbally for their potential antidiabetic

properties. It's important to note that while some of these Herbs have shown promise in studies, they should be used with Caution and under the guidance of a healthcare professional, especially if you're already taking medications for diabetes like Aloe Vera [6]. Researchers are increasingly interested in using Nano carriers for the treatment and management of diabetes mellitus due To the challenges of pharmacological therapy and the advantages of Nanoparticles (NPs) in drug delivery and imaging [7]. Herbal medicines are a popular option with minimal side effects and adverse Reactions (Kokar and Mantha, 1998). Research has discovered approximately 800 Indian plants with potential for treating diabetes (Gupta et al, 1986). The herbal formulations were obtained from Reputable local suppliers specializing in medicinal plants and operated by Ayurvedic experts as over-the-counter remedies [8].

MECHANISM OF ACTION OF HERBAL ANTI DIABETICS

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 β -galactocidase and α -glycosidase.
- Cortical lowering activities.
- Inhibition of alpha-amylase.

HERBS USED AS REMEDY FOR DIABETES MELLITUS

There are many herbs and supplements, which are used as a Remedy for diabetes. Derived from plants and/or their oils, roots, seeds, berries or Flowers. Herbal supplements have been used for many Centuries. They are believed to have healing properties. Figure 3 explains the herbs are used as a remedy for Diabetes. There are 8 important herbs that serve as a remedy for Diabetes mellitus. Herbs include Aloe Vera, Cinnamon, Fenugreek, Gymnema, Bitter melon, Ginseng, Ivy gourd And Salacia oblonga. Table 1 explains the herbs used for the Treatment of diabetes mellitus.



Fig 1: Herbs that Are Used as Remedy for the Diabetes

Author name	Herbs used	Advantages	Limitations
Amira Mourad, <i>et al.</i> [16]	Aloe vera	The action of the hypoglycemic agent decreased starch and offered good postprandial glycaemic control	Most people could be allergic to the aloe vera gel, caused by skin allergies, redness in the eyes, skin rashes, irritation and burning sensation
Ranabir Chanda, <i>et al.</i> [17]	Bitter Melon	Bitter melon contained bioactive compound i.e., lectin that had insulin-like activity, which helped in diabetes	Sometimes these herbs caused diarrhoea, vomiting and other intestinal issues
Farzaneh Hasanzade, <i>et al.</i> [18]	Cinnamon	Cinnamon could decrease blood glucose in diabetes	Overtake of Cinnamon could increase the risk of cancer
Subhasish das, <i>et al.</i> [19]	Fenugreek	Pectin of fenugreek seeds slowed down glucose absorption from the gastrointestinal tract	Fenugreek could cause nasal congestion, coughing, wheezing, facial swelling, and severe allergic reactions
Morris Karmazyn, <i>et al.</i> [20]	Ginseng	Ginseng contained formulations that could produce beneficial effects in terms of normalization of blood glucose levels	It was safe to consume, but some people faced headaches, diarrhoea and rapid heartbeat
Matthew j. leach, <i>et al.</i> [21]	Gymnema	Gymnema might improve glycaemic control by stimulating insulin release from the pancreatic islets of Langerhans	This could cause side effects, such as headache, nausea, lightheadedness, and dizziness.
Anura V Kurpad, <i>et al.</i> [22]	Ivy gourd	These herbs could reduce stress and hypertension, also could help with diabetes	There were some side effects mild and might include headache, nausea, or dizziness
Shankaranarayanan Jeykodi, <i>et al.</i> [23]	Salacia oblonga	Mixing salacia with tea might lower the glycated haemoglobin levels	It also showed side effects of diarrhoea and headache

Table 1: Types of Herbs used for diabetes mellitus

Yiyi Zhang, et al. explained the efficacy of aloe vera supplementation as a remedy for diabetes. A total of five randomized controlled trials (RCTs) involving 415 participants were included. The resand early non-treated diabetic patients. The variation in daily dosages made it difficult to determine the minimum effective dose of aloe vera that can cause a blood glucose reduction. Kathy Abascal, et al. described thebitter melon as a remedy for diabetes mellitus. Bitter melon

(*Momordica charantia*) was a complex plant medicine that had a remarkably long history of use, both as a food and as a medicine. The results showed that the seeded fruit had a Long history of use as food eaten with some frequency, and aqueous extracts of bitter melon appear to have a significant hypoglycemic effect. Sometimes, these plant leaves show symptoms of diarrhoea and intestinal issues. Thushari Bandara, et al. [26] investigated the bioactivity of cinnamon as a remedy for diabetes mellitus. Available in vitro and in vivo evidence indicates that cinnamon might have multiple health benefits, mainly in relation to hypoglycaemic activity. The results showed that the variability of the available publications could be due to the species used, the sampling techniques (collection, storage and method of grinding, etc.), methodological differences of extractions, differences in the controls used and their glucose-lowering drugs. The over intake of cinnamon leaves might lead to a risk of cancer.

TRADITIONAL HERBAL ANTIDIABETIC DRUGS

The Indian traditional system of medicine was full of the Use of plants for the management of diabetic conditions. According to the World Health Organization, up to 90% of The population in developing countries uses plants and their Products as traditional medicine for primary health care . Traditional herbal drugs with multiple Phyto-constituents And properties have been used as medicines for the Treatment of a wide range of diseases . Table 2 explains The traditional herbals used as antidiabetic drugs.

Author name	Traditional herbs used	Advantages	Drawbacks
Reetesh Malvi, <i>et al.</i> [34]	Allium sativum	Allium sativum possessed a beneficial potential to reduce blood sugar, cholesterol and triglycerides	Breath and body odor, upset stomach, or heartburn might occur as side effects
Mandee Pantier, <i>et al.</i> [35]	Aloe barbadensis	The leaves and their bitter principles exhibited effects on blood glucose level in normal and alloxan-induced diabetic	Blood sugar, burning and itching of the skin were some of the side effects
Muhammad Fazal Hussain Qureshi, <i>et al.</i> [36]	Azadirachta indica	The leaves were impaired glucose tolerance or reduced the number and activity of signalling molecules of insulin	There were serious side effects include vomiting, diarrhoea, drowsiness, blood disorders, seizures, and loss of consciousness.
T Thirumalai, <i>et al.</i> [37]	Brassica juncea	These herbs were commonly used to treat diabetes of blood glucose level.	Common cold, painful joints and water retention were some of the side effects.
Juan C Díaz-Zagoya, <i>et al.</i> [38]	Carica papaya	These herbs showed the benefit of a tight blood glucose control which reduces microvascular and macrovascular complications	Severe stomach pain, vomiting and slow heartbeat were the side effects
Leena Muralidharan [39]	Catharanthus roseus	These herbs decreased blood glucose levels and had brought down TC, LDL, VLDL, and TG close to normal level	It could cause side effects, such as nausea, vomiting, hair loss, hearing loss, dizziness, and bleeding.
G.f. Perpetuo, <i>et al.</i> [40]	Mangifera indica	It showed a significant decrease ($p < 0.05$) in blood glucose level in comparison to the diabetic controls eating a diet containing 0% mango.	Excessive intake of blood sugar levels could be increased due to which diabetes could occur. High intake could increase the heat in the body
Suchitra Kumari, <i>et al.</i> [41]	Momordica charantia	Fasting Plasma glucose level, Glycosuria, Oral glucose tolerance, and Hb A1C were measured as the outcome variables	Liver damage, vaginal bleeding and intestinal issues were some of the side effects
Peter Giovannini, <i>et al.</i> [42]	Carica papaya	These herbs were useful for tight blood glucose control, which reduces microvascular complications	Abdominal pain, vomiting and inability to move were the side effects
Kirti Chauhan, <i>et al.</i> [43]	Catharanthus roseus	These herbs help in lowering down the blood pressure and some help in providing the treatment of cancer, etc.	There were some side effects, such as hearing loss, dizziness and bleeding.
Subhasa Samanta, <i>et al.</i> [44]	Mangifera indica	The stem and bark of the plant had antioxidant, anti-inflammatory, and immuno-modulator activities had been formulated in various food supplements	High intake could increase the heat in the body

Table 2: Traditional herbals used as antidiabetic drugs

Rizwan Ashraf, *et al.* explained the allium sativum (garlic) supplementation with the standard antidiabetic agent that provides better diabetic control for diabetes mellitus. The main aim was to evaluate the potential hypoglycemic effects of garlic in diabetic patients. The results showed that the allium sativum was found to produce hypoglycemic effects by sparing insulin inactivation from the sulphhydryl group. Although garlic was assumed safe and recommended for many common ailments since ancient times, too much utilization of garlic can cause problems. S. Rajasekaran, *et al.* described the hypoglycemic effect of aloe vera (*Aloe barbadensis*) gel in induced diabetes in experimental rats. The effect of aloe vera gel on blood glucose of normal fasted rats, on glucose tolerance, and on carbohydrate metabolism in streptozotocin (STZ)-induced diabetic rats was evaluated. The results indicated that the increase in glucose-6-phosphatase and fructose-1, 6-bisphosphatase resulted in a decrease of glycolytic flux. It was evident that Aloe vera at both concentrations did not produce any

significant change in blood glucose level in normal fasted rats. Dr Nagashayana G, *et al.* investigated the evaluation of the hypoglycemic activity of neem (*Azadirachta indica*) in albino rats. The results indicated that the neem oil had got potential to reduce the blood glucose levels within a short period of time and also it had the potential to improve the glucose tolerance after a treatment period of 4 weeks, as suggested by the oral glucose tolerance test. There were serious side effects include vomiting, diarrhoea and drowsiness. Vijay kumar valavala, *et al.* described the effect of mustard (*Brassica juncea*) leaf extract on *Brassica juncea*. Reversal of changes associated with hyperglycemia, delayed cataract progression and maturation were observed. The results showed that the activity of SDH was elevated in diabetic rats leading to increased availability of fructose and that fructose was a 10-fold better substrate than glucose for glycosylation. Common cold, painful joints and water retention were some of the side effects. Lawrence Leung, *et al.* explained the Antidiabetic and hypoglycemic effects of *Momordica charantia*. Abundant pre-clinical studies had documented the antidiabetic and hypoglycemic effects of *M. charantia* through various postulated mechanisms. The results showed that 18% mean reduction both in fasting and postprandial sugar levels across 86% of all subjects. The MC seeds contain a lectin, which could inhibit protein synthesis in the intestinal walls of an animal model but they produced no gastrointestinal symptoms in humans, except for a report of headache.

ADVANTAGES OF HERBAL MEDICINES

Allopathy: Natural Healing: herbal medicine doesn't obstruct The body's self-healing abilities in any way. On the Contrary, they enhance the biological healing Machinery so that the recovery

process gets Accelerated and the body can maintain an ideal Internal environment that is crucial for such a CRecovery.

Continued Benefits: A lot of herbal remedies Come with special instructions about diet, rest, and Exercises that enhance the potency of the herb by Preparing the body in such a way that it responds to The treatment most effectively and desirably. These Dietary and lifestyle changes ultimately help the Patient by getting their bodies into a healthy Rhythm.

Better Immunity: Owing to their tendency of Enhancing the body's natural healing process and Correcting bad habits that lead to ill-health, herbs Contribute towards strengthening the immune System.

Metabolism and Nutrition: A stronger immune System and a holistically regulated diet and lifestyle Lead to improved metabolism, which in turn leads To better absorption of nutrition from one's diet.

Side Effects: Side effects the contraindications are Minimal when herbal medication is taken as per Prescription and under the supervision of a Qualified practitioner.

DISADVANTAGES OF HERBAL MEDICINES

Lack of Standardization: The potency and chemical composition of herbal products can vary significantly depending on factors like cultivation, harvesting, and processing methods. This inconsistency makes it difficult to ensure a reliable and consistent dosage.

Insufficient Scientific Evidence: While traditional knowledge is vast, many herbal remedies lack rigorous scientific validation through large-scale, randomized controlled trials (RCTs) to definitively

prove their efficacy and safety by modern standards.

Potential for Drug Interactions: Herbal drugs can interact with conventional medications, either enhancing or reducing their effects or increasing the risk of adverse reactions. For instance, some herbs can affect how the liver processes other drugs.

Regulatory Gaps and Quality Control: The U.S. Food and Drug Administration (FDA) and similar bodies often do not regulate herbal supplements with the same stringency as prescription medications. This can lead to quality control issues, adulteration, or contamination with heavy metals or other pharmaceuticals.

Misdiagnosis and Delayed Treatment: Self-medication with herbal remedies can lead to a delay in seeking conventional medical advice, potentially allowing the disease and its complications to progress untreated.

CONCLUSION:

Overall, several novel herbal medications look promising for Their ability to help with diabetes. They provide different options To the herbal methods of managing diabetes. Herbal medicines Work in various ways, such as regulating insulin, modulating glucose metabolism, and providing antioxidant and anti-inflammatory benefits. Although studies are ongoing to confirm their effectiveness and safety, these natural remedies show great potential for managing diabetes. It is important to seek advice from a healthcare provider before using herbal drugs, especially to avoid any interactions with other medications and address individual health needs. Diabetes mellitus is the most common endocrine disorder, affecting millions of people worldwide. It is a group of metabolic diseases characterized by

hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The increase in resistance and populations of patients at some risk, in conjunction with the restricted number of commercially available drugs for diabetes that still in present have many side effects and also problems, like unwanted hypoglycemic effects, are the cause to shift the research towards traditionally available medicine, which have low side effect. In this paper, remedies for diabetes mellitus, traditional herbal Antidiabetic drugs, and herbs used for the treatment of diabetes mellitus had been discussed. This paper also analyzes the classes of drugs being prescribed by the practitioner for the treatment of diabetes mellitus and the popular medicinal plants used for diabetes by the participants with their percentages. These medicinal herbs and herbal drugs help in the treatment of antidiabetic, but these medicinal herbs and herbal drugs show many side effects. So in future, if there are many herbs identified for the treatment of diabetes mellitus, it should be with fewer side effects.

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