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HERBAL DRUG USED IN THE TREATMENT OF DIABETES MELLITUS

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ABSTRACT

Herbal drugs have gained significant attention in the treatment of diabetes mellitus due to their perceived safety and potential efficacy. This review explores the current landscape of herbal remedies used in managing diabetes, focusing on their mechanisms of action, clinical effectiveness, and safety profiles. Various herbs such as bitter melon, fenugreek, ginseng, and cinnamon have been studied for their antidiabetic properties, often targeting insulin sensitivity, glucose metabolism, and pancreatic function. Despite promising findings from preclinical and some clinical studies, rigorous scientific validation and standardization of herbal therapies remain essential to establish their efficacy and safety. Challenges including variability in active compounds, bioavailability issues, and potential herb-drug interactions necessitate caution in their use alongside conventional treatments. Nevertheless, herbal drugs represent a valuable adjunct or alternative in diabetes management, highlighting the need for further research to elucidate their full therapeutic potential.

KEYWORDS: *Medical Plant, India, Antioxiant, Diabetes.*

INTRODUCTION

Diabetes is a metabolic complaint marked by changes in the metabolism of proteins, lipids, and glucose that lead to hyperglycemia and inadequate insulin action or conflation. The Indian Council of Medical Research has linked it as one of the recalcitrant conditions for which diabetic remedy calls for a relief drug. Diabetes mellitus is a significant issue in the ultramodern world.The biochemical parameters of the poly herbal expression in diabetes calculated,including,hemoglobin,glycosylated,hemoglobin, high viscosity lipoprotein, low viscosity lipoprotein, glucose, urea, creatinine, serum cholesterol, and serum triglycerides. This product doesn't have a hypoglycemic effect, indeed if it did well in an oral glucose forbearance test. (1)

Biochemical markers significantly improved when herbal products were administered to diabetic rats. The current investigation suggests that the herbal material has anti-diabetic properties. The aging population, urbanization, increased rates of obesity, and physical inactivity are the main contributors to the diabetes epidemic, which is affecting an increasing number of people. Calculate the number of people with diabetes and the burden of the disease. Logical planning and resource allocation are essential for both diabetes prevention and treatment both now and in the future. Diabetes is a metabolic disorder characterized by insufficient production of insulin by the body, a hormone required for the conversion of sugar, starches, and other carbs into energy.[(2)]

Anomalous blood glucose levels are a hallmark of diabetes. In our everyday lives, we may come across a multitude of herbal plants. Both healthy and sick people consume these herbs as a food or source of nourishment. Plans based on herbs are readily available, affordable, and safe to consume raw or cooked. All other cures are subordinate to herbal medications.[(3)]

Due to the increased negative effects of many synthetic medications, particularly those used to treat diabetes, and their widespread use, herbal use has been increasingly popular in the past ten years. Glucagon-like peptide-1 (GLP-1), biguanide, sulfonylurea, thiazolidinediones, a-glucosidase inhibitors, dopamine-2 agonists, dipeptidyl peptidase 4 (DPP-4), and sodium-glucose cotransporter-2 (SGLT 2) inhibitors are only a few examples of the synthetic medication kinds that are available on the market.

However, prolonged ingestion will result in adverse effects such as cancer, hepatitis, allergies, etc. As a result, more people are turning to natural medicine for the treatment of disease because it is less hazardous than manufactured medications. "Let food be your medicine, and medicine be your food," was a saying we used to have. We now know that using natural sources to treat diseases will have many advantages because they are safer to eat.[(4)]

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Among the nations that have developed natural drug development is China, specifically with regard to traditional Chinese medicine (TCM). In China, a number of herbal remedies, including Panax ginseng, Momodica charantia, Lagenaria siceraria, and Psidium guajava, have been licenced for the treatment of diabetes. More than thirty TCM products, including Yuquan Wan, Xiaokeling Pian, Tangniaoling Pian, etc., are currently produced in China. These items have two or more natural ingredients that work synergistically. TCM products therefore have a substantial effect in reducing diabetes, up to 1.2 times more so than western medications. The main issue is that there is no set protocol for TCM consumption by diabetics. In light of this, a review of a few chosen herbals is essential as it will clarify everything before combining them to make products that resemble TCM.

It is hoped that the herbs would supplement or take the place of the prescribed synthetic diabetic medications. Therefore, the present review will examine various herbal remedies that may be used to treat diabetes, taking into account factors such as toxicity, potency, mechanism of action, and types of active compounds. Worldwide, these herbal plants have been utilised extensively in the treatment of diabetes. This review aims to evaluate several herbal plants as potential future prospects for TCM drugs with antidiabetic properties.[5]

Edidemioloy of Diabetes Mellitus

In developing nations, where many individuals with diabetes and pre-diabetes are still unidentified, the prevalence of diabetes and pre-diabetes is rising. When people with pre-diabetes lose even a small amount of weight, adopt a healthy balanced diet, and increase their physical activity levels, they can typically reverse the disease and their chances of developing diabetes by as much as 60%. The World Health Organisation estimates that in 2005, there were about 1.6 billion overweight adults and at least 400 million obese adults globally. By 2015, those numbers were expected to rise to 2.3 billion and 700 million, respectively.

Types of Diabetes Mellitus

Type 1 Diabetes: Previously known as juvenile onset diabetes or insulin-dependent diabetes mellitus (IDDM), type 1 diabetes may make up five to ten percent of all instances of diabetes that are diagnosed. Compared to Type 2 diabetes, Type 1 diabetes has less clearly identified risk factors; however, autoimmune, genetic, and environmental variables all have a role in the development of this form of diabetes.

Type 2 Diabetes: Previously known as adult-onset diabetes or non-insulin-dependent diabetes mellitus (NIDDM), type 2 diabetes is mostly caused by insulin resistance or abnormalities in insulin production. Between 76% and 85% of all instances of diabetes that are diagnosed are thought to be type 2 diabetes. Diabetes type 2 risk factors comprise advanced age, obesity, diabetes in the family, a history of gestational diabetes, reduced glucose tolerance, inactivity, and race/ethnicity.

Introduction of Herbal Medicine

How do herbal medicine work?

Every herbal plant has a unique active ingredient that has a medicinal effect. Many active chemicals are present in medicinal plants, and it is possible that these compounds combine to provide the intended synergistic therapeutic effect. A plant's active ingredients are influenced by the kind of environment it grew in (temperature, insects, soil quality), as well as by how and when it was harvested and processed. These factors are also crucial for the effectiveness of herbal medicine.

How are herbal medicine used?

The study of botany and the application of medicinal plants is called herbal medicine. Herbal medicine refers to the use of plants as a basis for medical treatment throughout most of human history. Together, these active chemical ingredients generate therapeutic effects and reduce the likelihood of any one component causing negative effects. A variety of herbs are frequently combined to increase potency, promote synergistic effects, and lessen toxicity. Herbalists have a lot of considerations to make when recommending herbs. For instance, the plant's genus, species, and diversity; its environment; and its handling, storage, and processing methods.

Classification of Antidiabetic Agent: Oral Hypoglycemic agent:

A. Drug acting by the release of insulin
B. Drug acting by other Mechanism
C. Biguanides :-E.g Metformin and Phenformin
D. Thiazolidinediones :-E.g Adiponectine
E. Alpha-Glucosidase inihibators
F. Exenatide and liraglutide
G. Dpp-4 Inihibators
H. Amylin Derivativess
I. D2 Agonist

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Common Herbal Drug Interaction in diabetes

Aloe Vera



Fig.1 Aloe vera

Aloe (Aloe Vera L., Liliaceous family) is used in health and beauty products and also has laxative, anti-inflammatory, antioxidant, and anti-cancer properties.[6] Lignin, salicylic acid, carbohydrates, vitamins, minerals, enzymes, and amino acids are among its seventy-five active components.[7] Aloe-emodin, aloe acid, anthranol, barb loin, manna and its derivatives, alkaline phosphates, amylase, bradykinase, carboxypeptidase, catalase, cyclooxidase, cyclooxygenase, lipase, oxidase, phosphoenolpyruvate, carboxylase, superoxide dismutase, 8-C-glusoly-(2′-O-cinnamoly), and 7-O-methlyal Auxins, Gibberellins, Calcium, Chlorine, Chromium, Copper, Iron, Magnesium, Steroids, Mannose, Glucose, L-Rhamnose, Aldopentose, Vitamin A, B12, C, E, Choline, and Folic acid have all been identified. Animal models with diabetes that received oral Aloe Vera leaf gel extract for 21 days showed improved glycoprotein metabolism.[8] Evidence suggests that aloe vera can be utilised to regulate the metabolism of glucose. Even so, studies on Aloe Vera have demonstrated its hypoglycemic properties. People who are susceptible to type 2 diabetes are becoming more numerous. On the one hand, basic, easily accessible treatments are required.[9]

Fenugreek



Fig.2 Fenugreek

Reducing the prevalence of prediabetics is a great way to lessen T2DM's impact on the planet. Our objective is to discover novel, highly efficacious therapeutic agents that are affordable, low-toxic, and able to be often provided to prevent the advancement of type 2 diabetes in the prediabetic population.[10] Therefore, using dietary supplements that might modify glucose homeostasis and potentially improve lipid properties would be excellent. While several herbs have been touted for their potential to prevent diabetes, fenugreek seeds (Trigonella foenumgraecum) rank among the best in terms of safety and efficacy, according to a substantial body of research and traditional usage.[11] Fenugreek seeds are excellent for those with diabetes and are a fantastic source of fibre. Research over the past 20 years has shown that fenugreek seeds can assist people with diabetes lower their blood glucose levels. Improved glucose tolerance in human volunteers and a drop in fasting blood glucose levels were indicative of its anti-diabetic efficacy.[12] Nutraceuticals containing fenugreek are advertised as having the ability to reduce blood sugar levels. For individuals who already exhibit abnormalities in their handling of glucose, an inexpensive, low-risk intervention centred on diet may be helpful in order to normalise the patient's metabolic environment. One dietary supplement that has shown promise in this regard is

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fenugreek. The hypoglycemic and hypolipidemic effects of fenugreek have been investigated in T2DM animal and human models; prediabetics have not been the subject of any research.[13]

Ginger



Fig.3 Ginger

Ginger, a widely used spice worldwide, is actually the subterranean rhizome of the Zingiber officinale plant, which belongs to the Zingiberaceae family. It has long been used as a herbal remedy for a variety of ailments, such as pain, cold-induced syndromes, nausea and vomiting, constipation, and indigestion (dyspepsia).[14] More lately, it was found that because it can scavenge hydroxyl and superoxide anion radicals, ginger possesses anti-inflammatory, anti-cancer, and anti-clotting properties. Ginger is known to contain a variety of compounds, including sesquiterpenes like beta-bisabolene and (-)-zingiberene, monoterpenes like geranial, volatile oils like gingerols, and the shogaols that result from their dehydration. Moreover, phytochemical research has shown that gingerol, shogaol, zingerone, and paradol are the main ingredients in ginger. 6-gingerol and 6-shogaol are said to be the two primary gingerols and shogaols present in the rhizome.[15] Ginger pretreatment stopped the development of hypoinsulinemia and produced hyperglycemia. Ginger has been shown by several researchers to reduce cholesterol. Other research indicates that the body's response to ginger varies depending on the dose concentration of its constituents. greater research may provide greater insight into ginger's efficacy in treating and preventing metabolic disorders, even though the validity of some published experimental investigations on its anti-oxidative, anti-diabetic, and hypolipidemic properties is questionable.[16] The goal of the study was to find out how supplementing with ginger powder affected the levels of malondialdehyde (MDA), apo B, apo A-I, apo B/A-I, haemoglobin A1c (HbA1c), and fasting blood sugar (FBS) in type 2 diabetes patients' serum.[17]

Garlic



Fig.4 Garlic

Garlic is one of the first cultivated plants in history and is used as a food and traditional medicine. Garlic extract has been demonstrated to benefit human health due to its antibacterial, antioxidant, anticarcinogenic, antimutagenic, antiasthmatic, immunomodulatory, and prebiotic properties. Previous research has demonstrated that in those with severe hypertension, it can control blood pressure and avoid cardiovascular events.[18] While the effects are still being studied, it might also help with primary

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prevention of colorectal cancer and cardiovascular mortality. Right now, one of the drugs with the most extensive research has been garlic extract. Many excellent randomised controlled trials (RCTs) have been carried out over the years to investigate its efficacy in treating type 2 diabetes.[19] Garlic's potential as a traditional food and medicine, as well as its many possible targets, wide distribution, low cost, and rare problems, were all to be demonstrated. However, because of the small sample size and unvalidated results, a comprehensive and quantitative study with high reliability is still needed.[20] To assess the safety and efficacy of supplements containing garlic in the management of type 2 diabetes mellitus (T2DM) on blood glucose levels and blood fluids, such as total cholesterol, triglycerides, HDL, and LDL regulation.[21]

CONCLUSION

Plants with medicinal properties are being used to treat a wide range of illnesses. Historically, people have employed plants for a variety of purposes. They meet more trustworthy standards when it comes to their use as a natural source of side-effect-free, longer-lasting medications. These characteristics have led to the increased use of plant-based medications in the treatment of diabetes in modern times. They come in the form of multi-herbal formulations, which are excellent for managing diabetes.

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