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Medicinal Plants Used for Diabetes Mellitus: A Short Review

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Abstract

Investigating the antidiabetic effects of different medicinal plants is the focus of the current study. Among the many non-communicable illnesses that affect people across the world, diabetes mellitus ranks high. Although it has not yet reached pandemic proportions in many poor and newly industrialized nations, it is now the fourth worst killer among the world's wealthiest countries. We must confront this grave danger in the twenty-first century. Herbs and plants have been used as medicine for a very long time. Plants were referenced in Ayurveda and other Indian texts as potential treatments for a variety of illnesses. Less than one percent of the approximately 250,000 higher plants have undergone pharmacological screening, with even less tested for diabetes mellitus. There has been a dearth of systematic research on the traditional medicinal herbs used to treat diabetes mellitus

Introduction

Developed and developing world residents alike are not immune to the effects of diabetes mellitus. This illness is thought to impact over 25% of the global population. When insulin levels in the blood are low or when insulin is unable to reach its target organs, a metabolic disorder known as diabetes mellitus develops [1]. The current synthetic medications have a number of limitations, thus the hunt for additional drugs continues, even if oral hypoglycemic agents have made great strides in the treatment of diabetes. Despite their widespread praise for their medicinal efficacy in traditional medicine, herbal medications with antidiabetic action have not yet been developed for commercial use as contemporary pharmaceuticals [2]. Obesity is a risk factor for type 2 diabetes, which in turn increases the risk of hypertension and dyslipidemia. Therefore, the goal of the therapy is to increase insulin secretion and decrease insulin resistance. A metabolic illness known as diabetes occurs when the body either does not create enough insulin or does not use it correctly. Insulin is a hormone that the body needs to convert food sources like sugar and carbs into energy. In diabetes mellitus, blood glucose (sugar) levels are consistently high. Glucagon and insulin work together to keep blood glucose levels in the human body within a tight range. Glucagon stimulates the release of glucose from the liver's cells into the bloodstream, which is essential for energy generation. Muscles and adipose tissue absorb glucose at low rates due to Type 1 Diabetes, which is characterised by an inability to secrete insulin [3]. Because of the high expense of contemporary medications, people in underdeveloped nations often turn to traditional medicine, namely herbal remedies, to manage their diabetes [4]. Diabetes and its consequences remain a significant health concern, even with the development of hypoglycemic drugs derived from both natural and synthetic sources. Diabetes may be effectively managed with the use of many native Indian medicinal herbs. The minimal risk of adverse effects and wide availability of medicinal plants are two of their greatest strengths. Numerous pharmaceuticals that are accessible today have their origins in plants, and this trend has persisted throughout history.

Approximately 800 plants have been identified in ethnobotanical studies as having antidiabetic properties [5]. Current experimental methods have shown antidiabetic efficacy in a number of botanicals [6]. This review article enumerates some medicinal plants possessing antidiabetic activity and elucidating their mechanisms of action such as Brassica juncea (B. juncea), Combretum micranthum (C. micranthum), Elephantopus scaber (E. scaber), Gymnema sylvestre (G. sylvestre), Liriope spicata (L. spicata), Parinari excelsa (P. excelsa), Ricinus communis (R. communis), Sarcopoterium spinosum (S. spinosum), Smallanthus sonchifolius (S. sonchifolius), Swertia punicea (S. punicea), Vernonia anthelmintica (V. anthelmintica) etc. and method of experiment on animals and therapeutic efficiency of plant extracts were exploited. Table 1 lists some of the most promising herbal plant sources for anti-diabetic effects.

Table 1: Medicinal plants having antidiabetic activity.

Plant name	Family	Parts used	Type of extract	Activity	References
Alangium lamarckii	Alangiaceae	Leaves	Alcoholic	Antidiabetic	[15]
Albizia odoratissima	Mimosaceae	Bark	Methanol	Antidiabetic	[19]
Axonopus compressus	Poaceae	Leaves	Methanol	Antidiabetic	[13]
Berberis vulgaris	Berberidaceae	Root	Aqueous	Hypoglycaemic	[14]
Brassssica juncea	Cruciferae	Seed	Aqueous	Hypoglycemic	[7]
Caesalpinia digyna	Fabaceae	Root	Methanol	Antidiabetic	[10]
Catharanthus roseus	Apocynaceae	Leaf	Methanol	Hypoglycemic	[16]
Centaurium erythrea	Gentianaceae	Leaf	Aqueous	Antidiabetic	[17]
Chaenomeles sinensis	Rosaceae	Friuts	ethyl acetate	Antidiabetic	[18]
Cocos nucifera	Arecaceae	Leaf	hydro-methanol	Antihyperglycemic	[20]
Costus speciosus	Costaceae	rhizome	hexane	Antidiabetic	[21]
Cyclocarya paliurus	Cyclocaryaceae	Bark	Aqueous	Hypoglycemic	[22]
Dillenia indica	Dilleniaceae	Leaves	Methanolic	Antidiabetic	[23]
Embelia ribes	Myrsinaceae	Berries	Hexane	Antidiabetic	[24]
Hybanthus enneaspermus	Violaceae	Whole plant	Alcholic	Antidiabetic	[25]
Lippa nodiflora	Verbenaceae	Whole plant	Methanol	Antidiabetic Hypolipidemic	[26]
Lithocarpus polystachyus	Fagaceae	Leaves	Ethanol & Aqueous	Hypoglycemic	[27]
Marrubium vulgare	Lamiaceae	Aerial part	Methanol	H y per glycem ia and dyslipidemia	[28]
Ocimum sanctum	Lamiaceae	Aerial part	Hydroalcholic	Antidiabetic	[29]
Opuntia streptacantha	Cactaceae	Leaves	Ethanol	Antihyperglycemia	[30]
Psidium guajava	Myrtaceae	Fruits	Ethanol	Antihyperglycemic	[31]
Semecarpus anacardium	Anacardiaceae	nut	Milk	Antidiabetic	[32]
Prosopis glandulosa	Fabaceae	Whole plant	Gelatine/Jelly	Antidiabetic	[33]
Ophiopogon japonicus	Asparagaceae	Root	Ethanol	Hypoglycemic	[34]
Setaria italica	Poaceae	Seed	Aqueous	Antihyperglycemic	[35]
Solanum torvum	Solanaceae	Friut	Methanol	Antidiabetic	[36]
Cassia auriculata	Caesalpiniacae	Leaves	Aqueous	Antidiabetic	[37]

Zygophyllum album	Zygophyllaceae	Whole plant	Ethanol	Antihyperglycemic	[38]
Vitex negundo	Lamiaceae	Leaves	Methanol	Antidiabetic	[39]
Viscum schimperi	Viscaceae	aerial parts	Methanolic	Antidiabetic	[40]
Symplocos cochinchinensis	Symplocaceae	Leaves	Hexane	Antihyperglycemic	[41]
Enicostemma littorale	Gentianaceae	Whole plant	aqueous	Antidiabetic	[42]
Vaccinium arctostaphylos	Ericaceae	Fruit	Ethanolic	Antidiabetic	[43]
Solanum xanthocarpum	Solanaceae	Leaves	Aqueous and Methanol	Antidiabetic	[44]

According to traditional medicine, E. jambolana has anti-diabetic benefits. In both experimental models and clinical trials, it has been shown to have hypoglycemic effects [8].

Antidiabetic effect of folklore medicinal plants

Brassica juncea

As a spices, it finds widespread use in Tamilnadu cuisine. The traditional medicinal herb B. juncea is a member of the Cruciferae family. Researchers looked at the hypoglycemic effects of an aqueous seed extract from B. juncea in male albino rats that had been induced diabetes by streptozotocin. There have been reports of doses of 250, 350, and 450 mg/kg having hypoglycemic action [7].

Coccina grandis

Coccinia grandis (C. grandis) leaf alcoholic extracts were tested for hypoglycemic activity. Mice were gavaged with an alcoholic extract at a dose of 600 mg/kg body weight. In normal, fasting mice, an alcoholic extract of C. grandis leaves given orally significantly reduced blood glucose levels [9].

Alangium lamarckii

Antidiabetic action of alcoholic extract of Alangium lamarckii (A. lamarckii). Both the 250 mg/kg bw and 500 mg/kg bw investigations used alcoholic leaf extract. The antidiabetic effects of A. lamarckii were seen in rats who were diabetic after being administered STZ-nicotinamide[10].

Albizia odoratissima

Methanolic bark extract of Albizia odoratissima (A. odoratissima) and its potential anti-diabetic effects in diabetic rats produced by alloxan has been studied. The dosages given to the animals for the methanolic extracts were 250 and 500 mg/kg body weight. In albino mice induced with alloxan, serum cholesterol, triglycerides, SGOT, SGPT, alkaline phosphatase, and total proteins were significantly decreased [11].

Artemis sphaerocephala Krasch

Artemis sphaerocephala (A. sphaerocephala) gum's antioxidant effects in diabetic rats produced by streptozotocin (STZ). The levels of +OH and thiobarbituric acid reactive substances (TBARS) in the serum and liver of STZ-induced rats were upregulated. Superoxide dismutase activity in the liver and blood was reduced. There was a reduction in blood and liver tissue levels of TBARS and +OH after treatment of A. sphaerocephala extract. The substantial increases in superoxide dismutase (SOD) levels in the liver and blood. The antioxidant activity of A. sphaerocephala is excellent [12].

Axonopus compressus

How the plant's methanolic leaf extract prevents diabetes. Injecting the rats with alloxan caused them to develop diabetes. The experiments used methanolic leaves extract at concentrations of 250, 500, and 1,000 mg/kg bw. When compared to the control group, diabetic rats treated with methanolic leaf extract of Axonopus compressus (A. compressus) at dosages of 250, 500, and 1,000 mg/kg showed a substantial decrease (31.5%, 19.8%, and 24.5%, respectively) in blood glucose levels. It is possible that A. compressus has excellent antidiabetic properties [13].

Berberis vulgaris

Herb Berberis vulgaris (B. vulgaris) L.'s hypoglycemic effects in diabetic rats produced by streptozotocin The Berberidaceae family includes the traditionally used medicinal herb B. vulgaris. The findings demonstrated a significant hypoglycemic impact of the water extract and saponins. Serum triglyceride and cholesterol levels were much higher than normal [14].

Caesalpinia digyna

Bergenin, derived from Caesalpinia digyna (C. digyna) roots, has an antidiabetic action. Diabetic rats had much higher plasma total cholesterol (TC), triglycerides (TG), and low-density lipoprotein (LDL-C) levels than control rats, but much lower levels of good cholesterol (HDL-C). The lipid profile was noticeably altered after glibenclamide (10 mg/kg; p.o.) treatment compared to bergenin (10 mg/kg; p.o.). Antioxidant enzyme activity, including SOD and Cat, was reduced. Diabetic rats have far higher levels of TBARS than control rats. Increasing SOD and CAT levels while decreasing TBARS was a notable effect of bergenin (10 mg/kg; p.o.). There are excellent antidiabetic activities in bergenin [15].

Catharanthus roseus

Investigation into the hypoglycemic effects of Catharanthus roseus (C. roseus) methanolic leaf extract in rats induced with diabetes by alloxan. Blood glucose levels were much lower than those of the control group of rats. C. roseus methanolic extract had a stronger impact in lowering blood glucose levels compared to Glibenclamide and Metformin [16].

Centaurium erythrea

A single intraperitoneal injection of 65 mg/kg of STZ caused diabetes. A measure of oxidative stress was performed using tissue MDA. The assessment of antioxidant enzymes produced by the pancreas, including SOD, CAT, and GPx (glucose peroxidase). Pancreatic tissue TBARS levels were significantly lower in diabetes treated rats compared to control animals. Diabetic animals treated with antioxidant defence enzymes showed a substantial rise in activity levels of SOD, CAT, GPx, and GST. Centaurium erythrea (C. erythrea) aqueous leaf extract's antioxidant activity [17].

Chaenomeles sinensis

An excellent antidiabetic effect is produced by the ethyl acetate fraction of the fruits of Chaenomeles sinensis (C. sinensis) (Thouin) Koehne. The Rosaceae family includes Chaenomeles sinensis. Doses of 50 and 100 mg/kg body weight were shown to have antidiabetic effects [18].

Conclusion

Traditional medicinal plants used in folk medicine to treat diabetes mellitus were included in this study. Traditional medicinal herbs are more often employed in rural regions due to the abundance of therapeutic plants found there. As a result, the prospect of treating diabetes mellitus using chemicals derived from plants that are both accessible and do not need the time-consuming pharmaceutical production is quite appealing. Health care providers, researchers, and academics in the domains of pharmacology and therapeutics may find this review helpful as they endeavour to learn more about antidiabetic medicinal plants.

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