A REVIEW ON MEDICINAL HERBS FOR DIABETES MELLITUS

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ABSTRACT

Indian and other ancient systems of medicine have used many plants as treatment for diabetes mellitus. In this paper, we review a number of herbs with Indian ancestry and their bioactive components that have been used traditionally in Indian medicine to treat hyperglycaemia. Herbal remedies have become a significant source of medicinal aids for both humans and other animals across the universe. In the traditional medical system of the country, plants are used to treat diabetes. Around 800 plants and herbs are said to have anti-diabetic properties. Few of these have been examined in accordance with contemporary medicine. Many of these plants are only available as extracts, and their effectiveness in the management of diabetes has been studied in animals. The antidiabetic potential and bioactive ingredients of *Pterocarpus marsupium*, *Gymnema sylvestre*, *Momordica charantia*, and *Tinospora cordifolia* are thoroughly discussed in this review. *Allium cepa, Allium sativum, Azadiracta indica, Bouganviella spectabilis, Ocimum sanctum, Murraya koeinhii*, and other plants contain it. Their state behavior has been studied. Most appear to enhance pancreatic insulin production (pancreatic consequence). Some even have excess pancreatic physiological action effectively on body tissue like hepatocytes, muscular tissues etc. and governing gluconeogenesis, glycolysis, as well as other mechanisms. Plant products with fewer side effects could be hypoglycemic drugs. Those that also could result in better oral antidiabetic drugs. The review helps future research to isolate, detoxify, and classify biologically active anti-diabetic molecules in these plants.

Keywords: *Gymnema sylvestre*, *Momordica charantia*, *Tinospora cordifolia,* Antidiabetic potential, Bioactive ingredients.

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INTRODUCTION

The WHO diabetes expert committee recommends investigating on traditional diabetes treatments [1). Indians have a significantly greater age-related type II diabetes occurrence than other groups. The inability of the body to properly produce or utilise insulin, a hormone that converts sugar, starch, and other foods into energy, results in this metabolic disorder. People who have diabetes have abnormal blood glucose levels. High levels of body fat, the typical abdomen accumulation pattern, minimal muscle development, and race based genetic disposition may all play a role in type 2 diabetes and hyperglycaemia in Asian Indians. Uncontrolled diabetes causes vascular disease, renal disease, neuropathic pain, eye problems, comorbidities, and/or death. Even though synthesized oral antihyperglycemic agents/insulin seem to be helpful in combating high blood sugar, they have notable adverse effects and struggle to substantially change the course of diabetic complications. This is why more people are seeking alternative therapies with fewer side effects. Compared to insulin-dependent diabetes, non-insulin-dependent diabetes mellitus (NIDDM) seems to have a much greater incidence. Although sulphonyl ureas and a small number of biguanides seem to

be better therapies for high blood sugar in Diabetic complications, those that cannot completely brought glucose level into the normal limits or recover a usual form of glycaemic control. Pharmacokinetics, secondary failure rates, and side effects limit these therapies' use [2). Even glycemic control doesn't permanently normalise glucose homeostasis and raises the chances of atherosclerosis development and impaired glucose tolerance. Side effects are rare or nonexistent in medicinal plants. Ancient Indian medicine and other systems rely heavily on plant drugs. Sushruta and Charaka Samhita provide in-depth descriptions of a wide range of medicinal herbal plants [3). Numerous of them have been used in conventional medicine systems for hundreds of years in many nations worldwide. Metformin, a drug derived from the plant *Galega officinalis* that has previously been used to control diabetes in mediaeval Europe, is the only moral medication authorized for the treatment of NIDDM patients [4). The development of diabetic medications may benefit from the use of a number of anti-diabetic plants.

Allium cepa (Bulb of raw onion) *&* ***Allium sativum*** (Garlic)

It indigenous practices use it as diabetes augment. It is used as a stimulant, diuretic, and expectorant [5). Onion bulb extracts were found to have a week-long hypoglycemic effect in healthy and alloxan diabetic animals [6). An amino acid isolated from onions that contains sulphur, known as **S-methyl cysteine sulphoxide(SMCS**), has been shown to be anti-diabetic and anti-hyperlipidemic. The effects of this drug were comparable to those of insulin and glibenclamide [7). Garlic encompasses a set of sulfur-containing substances, chiefly derivative products of cysteine. The interaction of S-alkyl cysteine sulphoxides with allinase lead to the formation of a variety of thiosulfinates and polysulfides. They additionally possess fibrinolytic, antidiabetic, and hypocholesterolemic properties [7). A crystalline substance "alicin" that is ether-soluble has been derived from garlic. Lately, rabbits were being used to evaluate the antihyperglycemic activity of garlic and onions against tolbutamide. Each has demonstrated a remarkable decrease in glycaemic peak in rabbits with mild diabetes [8).

.Azadirachta indica (Neem) it is a sizable evergreen tree that can be found throughout India and is used to treat leprosy, piles, and urinary tract infections. Nimbidin, a bitter component isolated from the tree's seeds, lower blood glucose in alloxan-diabetic rabbits 50% as effeciently as tolbutamide [9). The aqueous extract of tender leaves was thought to have this effect by preventing the effects of epinephrine on glycogenolysis and peripheral glucose utilisation [10).

Bouganvillea spectabilis *B. spectabilis* leaves have reportedly been found to be hypoglycemic. Following administration of pinitol separated from leaf (0.01gm/kg body weight), both normal and diabetic mice experienced significant hypoglycemia. [11).

Gymnema sylvestre

A climbing tree called *Gymnema sylvestre* can be found in the central and southern tropical forests of Asia. The plants are given the name "gurmar" due to their peculiar ability to temporarily neutralise the sensory experience for sugar [12).

We examined the effects of a 100 mg/kg alcoholic extract of these leaves on hyperglycemic rats treated with anterior pituitary hormone. There was a similar impact to that of tolbutamide (50 mg/kg) [13).

An investigation on stz - induced diabetic diabetic rats that were treated for 4-6 weeks with active ingredient confined from the leaf disclosed that glucose equilibrium could be accomplished. The GS4 therapy expanded the proportion of β-cells in the pancreas [14). The pancreas' β-cells count increased as a result of the GS4 medication [15).

Pterocarpus marsupium This is commonly referred to as Vijaysar in Indian languages and Indian Malabar in English. This is a moderate to tropical hardwood tree growing to 30 metres high and is typically found throughout mountainous regions.

This bruised leaves treat boils, sores, and skin diseases. In northern areas, water was stored in champagne flutes crafted from this plant's timber has been said to alleviate heart problems and metabolic disorders. [16).

This plant's wood's aqueous extract is used to treat type 2 diabetes [17). An main ingredient, (-) epicatechin, was discovered in the alcoholic bark extract. The drug's active ingredient at a dose of 30 mg/kg body weight. Twice daily for 4-5 days lowered blood glucose level of diabetic rats to near normal.

Murraya koeingii (Family: Rutaceae)**,** Due to their flavorful leaves, curry leaves are frequently used in chutneys and other condiments in India and some other tropical nations. Hindi speakers also refer to this tree as Kurry Patta. For 60 days, normal rats given an oral dose of *M. koeingii* leaves diet (10% w/w) experienced a hypoglycemic effect that was accompanied by an increase in hepatic glycogen content due to higher glycogenesis and a reduce in glycogenolysis. [18-21].

Ocimum sanctum (Family: Labiatae),

The Hindi and English identities for herbs that can reach a height of 1.800 m as in Himalayan region are tulsi and holy basil, respectively. In rats with glycaemic control, glucose-fed hyperglycemia, as well as stz - induced diabetic hyperglycemia, an alcoholic extract of O. sanctum leaves lowered hyperglycaemia. Besides that, in normal rats, the extract enhanced the effects of xexogenous medication. After a month of leaf powder administration, rodents with hyperglycemia and those without it had lesser fasting blood glucose levels. [22,23].

Tinospora cordifolia (Family: Menispermaceae), Guduchi is a substance used in Ayurveda to treat diabetes and metabolic disorders as well as to boost vitality. [24]. Alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid compounds, phenolic compounds, and aliphatic compounds are just a few of the constituent elements that have been recognised. [25].

Momordica charantia

The Cucurbitaceae family includes the bitter gourd, also known as karela. In the majority of cases, both the seeds and the entire fruit are used medicinally. *M. charantia* was used by the native people of East Africa, South America, and Asia to treat conditions like heart disease and diabetes. In a diet that is balanced, the vegetable is frequently eaten. Fruit contains bioactive compounds and antioxidants that may help prevent diabetes in addition to vicine, charantin, and triterpenoids [51]. Through various hypothesized mechanisms, *Momordica charantia* has been shown to have hypoglycaemic and antidiabetic effects in preclinical studies.

UNCHARACTERIZED ANTI-DIABETIC PLANTS:

Only with extracts, not active principles were the hypoglycemic effects of some plants demonstrated.

Zizyphus zujuba & Tichosanthus diocea

Z.zujuba (**also known as baer or regipallu**) and *T.diocea* seeds were reported to have hypoglycemic effect when extracted with ethanol [26-28].

Rats were hypoglycemic after consuming an ethanol extract of ***Michelia champaca*** (In hindi champa) stem bark [29].

The roots of ***Brasica rapa, Solanum tuberosum*** as well as the leaves of ***Bassica oleracea*** & ***Letuca satina*** had been linked to the formulation of non-fibrous hypoglycemic extracts. ***Phaseolus vulgaris*** pod aqueous extract evaluated lowering glucose activity in alloxan-induced diabetic rats and rabbits [31].

CONCLUSION

Plants have been used to treat diabetes mellitus for ages. It has been demonstrated that innumerable classes of compounds obtained from natural are effective in the management of diseases. There are a wide variety of chemical compounds that have been extracted from plants, all of which were shown to have some sort of biological activity. Alkaloids, glycosides, galactomannans, gum, peptidoglycans, glycopeptides, amino acids, and inorganic ions are all examples of these substances. Metformin seems to be the only controlled substance that is currently recognized as safe and effective by the United States Food And drug (USFDA) for the treatment of type 2 diabetes that is not caused by a lack of insulin. Metformin is a drug that's been primarily obtained from the traditional medicinal plant *Gymnema sylvestre*, which has a long history of use in the management of diabetes. Use of medicinal herbs which have a long tradition of use by living beings might allow the potential of creating a few beneficial drugs.

That the use of medicinal plants has already been going on for quite some period. As per the precepts of Vedas, there are several various types of plants contain anti-diabetic characteristics and can be employed in the management of diabetes. It is predicted that only few of of these have been proved by the use of scientific principles, so a significant number of these still have to be explored and illustrated. Numerous plants, such as *Momordica charantia, Gymnema sylvestre, Allium sativum, Trigonella foenumgraecum, Pterocarpus marsupium, Ocimum sanctum,* and *Eugenia jambolana,* among others, have demonstrated hypoglycemic action. The use of these plants has reportedly also contributed to the management of complications associated with diabetes. In the future, additional study might be able to isolate, purify, and characterize the bioactive substances found in these plants. These findings could be used by researchers to create potential anti-diabetic medications. Future diabetes management efforts may benefit from the knowledge in this review.This study focused on traditional antidiabetic herbal medicines, polyherbal mixtures, isolated compounds, and their toxicity. Many diabetics have used herbal remedies since ancient times. Indigenous herbal knowledge and modern science can be combined to develop antidiabetic drugs. Science and clinical data proving medicinal plants' efficacy and safety are the biggest barriers to modern therapeutic applications. Traditional medicine has studied medicinal plants and polyherbal mixtures. As an outcome, many medicinal plants that are used in traditional medicines but haven't been researched still exist. In order to clarify the anti-diabetic principle(s) and isolate compounds that will be effective against diabetes, there is an immediate need for scientific research to gather evidence on the therapeutic potency and mechanisms of action of medicinal plant extracts and polyherbal mixtures in clinical practice.

CONFLICT OF INTEREST

The authors declared that no conflicts of interest.

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