



**A REVIEW ARTICLE ON: THE USAGE OF HERBAL MEDICINES IN THE
TREATMENT OF DIABETES**

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ABSTRACT

Traditional Medicines have been derived from the medicinal plants which are used by the 60% of the world's population. This research mainly focuses on the various Indian Herbal drugs and plants used in the treatment of diabetes, especially in India. Diabetes is very significant health issue being faced by the majority of people of different countries. In India it is proving to be a major health hazard, especially in the urban areas. Though there are various treatments to reduce the effects of diabetes and its other secondary complications, herbal formulations are preferred due to low cost, lesser side effects and longer shelf life. A glossary of medicinal plants with antidiabetic and related effects and of other herbal drugs used in the treatment of diabetes is compiled. These include, *Momordica charantia*, *Ocimum sanctum*, *Phyllanthus amarus*, *Pterocarpus marsupium*, *Allium sativum*, *Eugenia jambolana*, *Tinospora cordifolia*, *Trigonella foenum graecum* and *Withania somnifera*. This review article deals with the over-view of various anti-diabetic plants and the Polyherbal formulations based on various herbs.

KEYWORDS: medicinal plant, India, antidiabetic, herbal formulations.

INTRODUCTION

From the last few years there has been a recommendable growth in the field of herbal medicine and these drugs are gaining popularity because of their longer shelf life, natural origin and lesser side effects both in the developing and developed countries. Many traditional medicines such as obtained from biological origin, mineral or marine origin are being used commonly nowadays for the treatment of Diabetes.^[1] In the system of Indian traditional health care systems, many traditional plants from long time ago named rasayana are being used because of their remedial properties.^[2] In Indian systems of medicine, there is a habit used by most of the practitioners to formulate and dispense their own recipes.^[3] India is the largest producer of medicinal herbs and is called as botanical garden of the world. The World Health Organization (WHO) has listed 21,000 plants, which are used for their medicinal properties around the world. Among these 2500 species are in India, out of which 150 species are used commercially on a fairly large scale.^[4] The current research focuses on the various herbal drug preparations and the plants used in the treatment of diabetes mellitus.

Diabetes

Diabetes mellitus is a systemic metabolic disease characterized by hyperglycemia, hyperlipidemia,

hyperaminoacidemia and hypoinsulinaemia. It leads to decrease in insulin secretion and insulin action. Currently available therapies for diabetes include insulin and various oral antidiabetic agents such as sulfonylureas, biguanides, α -glucosidase inhibitors and gliclazides. In developing countries products are expensive and not easily accessible.^[5] Diabetes is a heterogeneous metabolic disorder characterized by altered carbohydrate, lipid and protein metabolism which causes hyperglycemia resulting from insufficient insulin secretion, insulin action or both.^[6] It is one of the refractory diseases identified by Indian Council of Medical Research for which an alternative medicine is a need for the treatment. Diabetes mellitus has become a growing problem in the contemporary world. India has today become the diabetic capital of the world with over 20 million diabetes and this number is likely to increase to 57 million by 2025.^[7] A number of medicinal plants, traditionally used for over 1000 years named Rasayana are present in herbal preparations of Indian traditional health care systems. The current research focuses on herbal drug preparations and plants used in the treatment of diabetes mellitus, a major crippling disease in the world leading to huge economic losses.^[8]

Herbal drugs commonly used as anti-diabetics**Acacia Arabica**

Commonly known as Babool, is found all over India mainly in the wild habitat. The plant extract acts as an antidiabetic agent by the mechanism of acting as a secretagogue to release insulin. It induces hypoglycemia in control rats but not in the animals treated with alloxan. Powdered seeds of *Acacia arabica* when administered (2, 3 and 4 g/kg body weight) to normal rabbits induced hypoglycemic effect by initiating release of insulin from the pancreatic beta cells.^[9]

Azadirachta indica

(Neem) Hydroalcoholic extracts of this plant showed antihyperglycemic activity in streptozotocin treated rats and this effect is because of increase in glucose uptake and glycogen deposition in isolated rat hemidiaphragm. Apart from having anti-diabetic activity, this plant also has antibacterial, antimalarial, antifertility, hepatoprotective and antioxidant effects.^[10]

Trigonella foenum graecum

(fenugreek) It is found all over India and the fenugreek seeds are usually used as one of the major constituents of Indian spices. 4-hydroxyleucine, a novel amino acid from fenugreek seeds increased glucose stimulated insulin release by isolated islet cells in both rats and humans. Oral administration of 2 and 8 g/kg of plant extract produced dose dependent decrease in the blood glucose levels in both normal as well as diabetic rats. Administration of fenugreek seeds also improved glucose metabolism and normalized creatinine kinase activity in heart, skeletal muscle and liver of diabetic rats. It also reduced hepatic and renal glucose-6-phosphatase and fructose -1, 6- biphosphatase activity. This plant also shows antioxidant activity.^[11]

Aegle marmelos

Aqueous leaf extract of *Aegle marmelos* showed antihyperglycemic activity in streptozotocin induced diabetic rats after 14 days treatment either by increasing utilization of glucose or by direct stimulation of glucose uptake through increased insulin secretion.^[12]

Anisodus tanguticus

It is used for the treatment of type 2 diabetes by Chinese doctors. It is quite effective in improving complications while lowering blood glucose.

Catharanthus roseus

The extract of *Catharanthus roseus* leaves have a remarkable effect in lowering blood glucose level. The medicinal preparations of this plant have been formulated and developed to treat diabetes in clinic instead of the use of insulin in Eastern Asia and Southern Africa. The active constituents include alkaloids vindoline, vindolinine and vlcrosine.^[13]

Rhizoma Pinelliae

The Rhizomes of plant *Pinellia ternata* (Thunb.) Breit., serve as medicative constituent. The so-called Flavone C-glycoside was isolated from the rhizomes of *Pinellia ternata* for anti-diabetes. The dose of 100mol/l of flavone C-glycoside could inhibit 64.7% of aldose reductase, proving that it is suitable to treat diabetic complications.^[14]

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Ephedra sinica Stapf., and Ephedra distachya

The glycans and ephedrans A, B, C, D and E were isolated from *Ephedra distachya* herbs, which have been confirmed to have anti-hyperglycemic activity to alloxan-induced diabetic mice. The alkaloid extract of *Ephedra distachya* herbs and l-ephedrine have shown suppression on the hyperglycemia of diabetic induced mice. The mechanism is supposed to regenerate atrophied pancreatic islets, restore the secretion of insulin and thus finally treating hyperglycemia.^[16]

Momordica charantia

(bitter gourd) Cucurbitaceae). Local Name: Kaattu pagar-kai. The plant is commonly known as Bitter guard and has many varieties *Momordica charantia* is commonly used as an antidiabetic and antihyperglycemic agent in India as well as other Asian countries. Extracts of fruit pulp, seed, leaves and whole plant was shown to have hypoglycemic effect in various animal models. Polypeptide p, isolated from fruit, seeds and tissues of *M. charantia* showed significant hypoglycemic effect when administered subcutaneously to langurs and humans. Ethanolic extracts of *M. charantia* (200 mg/kg) showed an antihyperglycemic and also hypoglycemic effect in normal and STZ diabetic rats. This may be because of inhibition of glucose-6-phosphatase besides fructose-1, 6-biphosphatase in the liver and stimulation of hepatic glucose-6-phosphate dehydrogenase activities.^[17] The plant is climbing shrub and generally cultivated everywhere in India. Unripe fruits are taken orally along with food. Dosage: 2-3 fresh unripe fruits are taken at any time per day for three months.^[18]

Mangifera indica

(Mango)The leaves of this plant are used as an antidiabetic agent in Nigerian folk medicine, although when aqueous extract given orally did not alter blood glucose level in either normoglycemic or streptozotocin induced diabetic rats. However, antidiabetic activity was seen when the extract and glucose were administered simultaneously and also when the extract was given to the rats 60 min before the glucose. The results indicate

that aqueous extract of *Mangifera indica* possess hypoglycemic activity. This may be due to an intestinal reduction of the absorption of glucose.^[19]

Some Polyherbal formulations used for the treatment of Diabetes

Diabecon: manufactured by 'Himalaya' is reported to increase peripheral utilization of glucose, increase hepatic and muscle glucagon contents, promote B cells repair and regeneration and increase c peptide level. It has antioxidant properties and protects B cells from oxidative stress. It exerts an insulin like action by reducing the glycated haemoglobin levels, normalizing the microalbuminuria and modulating the lipid profile. It minimizes long term diabetic complications.

Epinsulin: marketed by Swastik formulations, contains epicatechin, a benzopyran, as an active principle. Epicatechin increases the cAMP content of the islet, which is associated with increased insulin release. It plays a role in the conversion of proinsulin to insulin by increasing cathepsin activity. Additionally it has an insulin-mimetic effect on osmotic fragility of human erythrocytes and it inhibits Na/K ATPase activity from patient's erythrocytes. It corrects the neuropathy, retinopathy and disturbed metabolism of glucose and lipids. It maintains the integrity of all organ systems affected by the disease. It is reported to be a curative for diabetes, Non Insulin Dependant Diabetes Mellitus (NIDDM) and a good adjuvant for Insulin Dependant Diabetes Mellitus (IDDM), in order to reduce the amount of needed insulin. It is advised along with existing oral hypoglycemic drug and is known to prevent diabetic complications. It has gentle hypoglycemic activity and hence induces no risk of being hypoglycemic.

Pancreatic Tonic (ayurvedic herbal supplement): Pancreas Tonic is a botanical mixture of traditional Indian Ayurvedic herbs currently available as a dietary supplement.

Bitter gourd powder: marketed by Garry and Sun. It lowers blood & urine sugar levels. It increases body's resistance against infections and purifies blood. Bitter Gourd has excellent medicinal virtues. It is antidotal, antipyretic tonic, appetizing, stomachic, antibilious and laxative. The bitter Gourd is also used in native medicines of Asia and Africa. The Bitter gourd is specifically used as a folk medicine for diabetes. It contains compounds like bitter glycosides, saponins, alkaloids, reducing sugars, phenolics, oils, free acids, polypeptides, sterols, 17-amino acids including methionine and a crystalline product named p-insulin. It is reported to have hypoglycemic activity in addition to being antihemorrhoidal, astringent, stomachic, emmenagogue, hepatic stimulant, anthelmintic and blood purifier.

Dia-Care: manufactured by Admark Herbals Ltd. is claimed to be effective for both Type 1, Type 2 diabetes

within 90 days of treatment and cures within 18 months. Persons taking insulin will eventually be liberated from the dependence on it. The whole treatment completes in 6 phases, each phase being of 90 days. Approx. 5 grams (1 tea spoon) powder is mixed with 1/2 glass of water, stirred properly and kept overnight. Only the water and not the sediment must be taken in the morning on empty stomach. To the remaining medicine fresh water is added and kept for the whole day and is consumed half an hour before dinner. The taste of the drug is very bitter. It is a pure herbal formula without any side effects.

Diabetes-Daily Care: manufactured by Nature's Health Supply is a Unique, Natural Formula, which effectively and safely Improves Sugar Metabolism. Diabetes Daily Care™ was formulated for type 2 diabetics and contains all natural ingredients listed in Table 2 in the proportion optimal for the body's use.

Gurmar powder: manufactured by Garry and Sun is an anti-diabetic drug, which suppresses the intestinal absorption of saccharides, which prevents blood sugar fluctuations. It also correlates the metabolic activities of liver, kidney and muscles. Gurmar stimulates insulin secretion and has blood sugar reducing properties. It blocks sweet taste receptors when applied to tongue in diabetes to remove glycosuria. It deadens taste of sweets and bitter things like quinine (effects lasts for 1 to 2 hours). Besides having these properties, it is a cardiac stimulant and diuretic and corrects metabolic activities of liver, kidney and muscles.

DIABETA: a formulation of Ayurvedic Cure, available in the capsule form is an anti-diabetic with combination of proven anti-diabetic fortified with potent immunomodulators, antihyperlipidemics, anti-stress and hepatoprotective of plant origin. The formulation of Diabeta is based on ancient ayurvedic references, further corroborated through modern research and clinical trials. Diabeta acts on different sites in differing ways to effectively control factors and pathways leading to diabetes mellitus. It attacks the various factors, which precipitate the diabetic condition and corrects the degenerative complications, which result because of diabetes. Diabeta is safe and effective in managing Diabetes Mellitus as a single agent supplement to synthetic anti-diabetic drugs. Diabeta helps overcome resistance to oral hypoglycemic drugs when used as adjuvant to cases of uncontrolled diabetes. Diabeta confers a sense of well-being in patients and promotes symptomatic relief of complaints like weakness giddiness, pain in legs, body ache, polyuria and pruritis.

Syndrex: manufactured by Plethico Laboratory contains extracts of germinated fenugreek seed. Fenugreek is used as an ingredient of traditional formulations over 1000 years. We are currently studying the mechanism of this antidiabetic drug using animal model on one hand and cultured islet cells on the other.^[20]

CONCLUSION

Herbal plants are playing a significant role in the treatment of various diseases. Plants have been traditionally used for their various purposes. They exhibit more reliable criterias for their usage as the natural source of medicaments which are free from side effects and pertain longer shelf life. Due to these features, plant drugs are being used on larger scale nowadays for the treatment of Diabetes. They are available in the form of poly herbal formulations which are very effective in the control of Diabetes.

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