

A Systematic Study of Herbal Drug promising Anti-Diabetic activity: a Review

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ABSTRACT

Plant have always been a source of drugs for human since ancient times. According to a report of WHO, up to 90% of the world population in the developing countries uses plants and its product as traditional medicine for health care. About 800 plants have been reported to show anti-diabetic potential. Traditional medicines from plant extracts have proved to be more affordable, clinically effective and relatively less adverse effects than modern drugs. Plant-derived secondary metabolites are small molecules or macromolecules biosynthesized in plants including steroids, alkaloids, phenolic, lignans, carbohydrates and glycosides, etc. that possess a diversity of biological properties beneficial to humans, such as their antiallergic, anticancer, antimicrobial, anti-inflammatory, antidiabetic and antioxidant activities. diabetes mellitus is a chronic disease result of metabolic disorder in pancreas beta cells having hyper-glycemia. during the past few years, some of the new bioactive drugs isolated from plants showed antidiabetic activity with more efficacy than oral hypo-glycemic agents used in clinical therapy. Traditional medicine performed a good clinical practice and is showing a bright future in the therapy of diabetes mellitus. The present review focus on the the details of some of the antidiabetic herbal medicines.

KEYWORDS: anti-diabetic, hypoglycemic, secondary metabolites, herbal medicines.

INTRODUCTION

Diabetes mellitus has become a systemic metabolic disease that is symbolized by hyperglycemia, hyperlipidemia, hyperinsulinemia, hyper aminoacidemia because it leads to decrease secretion and action of insulin. At present the therapies which are available for diabetes are insulin and other antidiabetic agents classified as sulfonyl ureas, biguanides alpha glucosidase inhibitors, glibenclamide and glipizide. In the developing countries these products are little costly and not easily available¹.

Diabetes can be considered as a heterogenous metabolic disorder that is characterized by changes in metabolism of carbohydrates, protein and lipid that results in hyperglycemia due to insufficient secretion of insulin and its action². As per Indian Council of Medical Research it is categorized as a refractory disease and a second option for its treatment can be required. Diabetes has become one of the emerging problems and in our country over 20 million population has become diabetic and by 2025 it is estimated that the number will increase up to 50 million³. In the herbal preparation of Indian traditional health care system various Rasayana are present that are traditionally used number of medicinal plants for over 1000 years⁴. From Rig Veda onwards across 5600 B.C. medicinal plants has been used for treating various disease in India. 67 medicinal plants are supposed to be recorded in Rig Veda. Tribal people living in ancient cultures are popular for collecting information on herbs and for the development of Herbal Pharmacopeia⁵.

In past studies many medicinal plants have been tested for antihyperglycemic property and their effects have been validated. Some of the commonly used medicines are⁶:

MadhumeghaChurna
TriphalaChurna
Naval Churna
SeenthilChurna
VilvaKudineer
AbargaParpam
AbrakaChendooram

HERBAL DRUGS WITH ANTIDIABETIC PROPERTIES

Wattakakavolubilis (L.f.) Stapf.
(Asclepiadaceae)

Local Name: Perun-kurinjan

It is a fleshy plant and a large climber which is found throughout the plains with papery leaves. It is also known as cotton milk plant and green wax flower. It is taken orally with cow milk.

Dosage: 50-75ml of mixture is taken twice a day after meal for 3 months.



PERUN KURINJAN

Abrusprecatorius l. (FABACEAE)

Local Name: Kundumani

This plant is commonly known as wild liquorice and it is a climber. It is located in the plains throughout the India⁴. The plant leaf is mixed with leaves of *Andrographis paniculate*, *Gymnemasylvestre* and *Syzygiumcumini*. The plant mixture is first dried in shade and grounded into powder and consumed orally with cow's milk.

Dosage: 50 ml of mixture is taken two times a day before meal for two months⁷.



Abrusprecatorius

Trigonella foenum graecum: (FENUGREEK)

Commonly found over all India and the seeds are usually used as one of the main ingredients in Indian spices. An amino acid which is novel named as 4-hydroxyleucine found in fenugreek seeds increases glucose stimulated insulin release from the isolated islets cell in both rats and humans. Administration of 2 and 8 g/kg of plant extract orally produces dose dependent decrease in blood glucose level in case of both diabetic and normal rats. Fenugreek seeds administration improves glucose metabolism and a normal creatinine kinase activity in diabetic rat in

heart, skeletal muscle and liver. It reduces the activity of hepatic and renal glucose-6-phosphatase and fructose-1,6-biphosphatase activity. The fenugreek plant also shows antioxidant activity⁸. It is suitable in the areas of with low to moderate rainfall and known for its medicinal quality for a longer time.



FENUGREEK PLANT

Mangifera indica: (MANGO)

The plant leaves are used as an antidiabetic activity in the folk medicine of Nigerian. The aqueous extract of the plant does not show any change in the blood glucose level when given orally in both normoglycemic and streptozotocin induced diabetic rats. Although when the extract and glucose were administered simultaneously the antidiabetic activity was observed and same when the extract was feed to the rats 60 mins prior to glucose indicating that the plant has hypoglycemic activity. it was concluded that this effect was due to an intestinal reduction of the glucose absorption⁹.



MANGO PLANT

Aloe vera and Aloe barbadensis

Aloe vera is a popular household plant with long ancient history of multipurpose remedy. This plant is known to be separated into two basic products latex and gel. The gel of the aloe vera plant is a mucilage or pulp commonly named as aloe juice and it is a bitter yellow exudate from the pericyclic tubules that is located beneath the outer skin of leaves. In both diabetic and normal rat aloe vera extract are considered to increase the glucose

tolerance. Both the doses chronic and as well as single dose of the bitter principle of the same plant has hypoglycemic effect in diabetic rats. The effective action is been due to the stimulation and release of insulin from pancreatic beta cells. The plant is also supposed to have an anti-inflammatory which is dependent upon dose and improves wound healing in mice⁹.



HERBAL PLANT ALOE VERA

Acacia arabica: (BABHUL)

Mainly it is a wild habitat found all over India and the plant extract works as secretagogue to release insulin. It is responsible for inducing hypoglycemic effects in control rats but fail to do so in alloxanized animals. Seeds when administered in powdered form into normal rabbits induces hypoglycemic effect by initiating release of insulin from pancreatic beta cells⁹.



ACACIA ARABICA PLANT

Allium cepa: (ONION)

Different ether soluble and insoluble fraction of dried powder of onion has shown to have anti-hyperglycemic activity in case of diabetic rat. Also, the plant has antioxidant and hyperlipidemic activity. S-methyl cysteine sulphoxide, a sulphur containing amino acid from allium cepa when administered to alloxan induced diabetic rats significantly controls serum and tissues lipid and blood glucose and normalizes the activities of liver hexokinase, glucose 6-phosphatase and HMG Co A reductase. A significant control of post prandial glucose level

was seen in diabetic patients when given a single dose of 50gm of onion juice.



ALLIUM CEPA PLANT

Allium sativum: (GARLIC)

It is cultivated all over India and is a perennial herb. This contain allicin which is a sulfur containing compound and is responsible for its pungent odour and is shown to have hypoglycemic activity. It increases hepatic metabolism, increased insulin release from pancreatic beta cells. The aqueous homogenate of garlic which is 10 ml per kg per day when administered orally to sucrose fed rabbit 10 g/kg /day in water for two months increases the hepatic glycogen and free amino acid content, decreased fasting blood glucose and triglyceride levels in serum as compared to sucrose control.



ALLIUM SATIVUM PLANT

TINOSPORA CORDIFOLIA: (GUDUCHI)

This plant is large, deciduous and climbing shrub widely distributed across India and belong to family Menispermaceae. It is commonly known as Guduchi. The extract of this plant roots when administered orally results in significant reduction in blood and urine glucose and in lipids in serum and tissues in alloxan diabetic rabbit for about 6 weeks. Extract also prevents in body weight decrease. In Indian ayurvedic medicine it is used in treatment of diabetes.



GUDUCHI PLANT

AZADIRACHTA INDICA: (NEEM)

The hydroalcoholic extracts of plant shows anti hyperglycemic activity in case of rat treated with streptozotocin due to increase in glucose uptake and deposition of glycogen in isolated rat hemidiaphragm. The plant is also considered to have antibacterial, antimalarial, antifertility, hepatoprotective and antioxidant effects².



NEEM PLANT

OCIMUM SANCTUM: (HOLY BASIL)

Commonly it is known as Tulsi. This plant is famous for its medicinal properties. Aqueous extract of plant has shown to have significant reduction in sugar level in blood in case of both normal and alloxan induced diabetic rats. The hypoglycemic and hypolipidemic effect of the plant Tulsi in diabetic rat was indicated due to significant reduction in fasting glucose uronic acid, total amino acid, total cholesterol, triglyceride and total lipid. When the plant is administered orally for 30 days(200mg/kg) it led to the decrease in plasma glucose level by 9.06% and 26.4% on 15 and 30 days respectively. A 10-fold increase in renal glycogen content and a reduction in skeletal muscle and hepatic glycogen level by 68% and 75% respectively were seen in diabetic rats as compared to control.



HERBAL PLANT TULSI

AZADIRACHTA INDICA: (NEEM)

The hydroalcoholic extract of plant has showed anti hyperglycemic activity in rats treated with streptomycin. This activity is due to glucose uptake increase and deposition of glycogen in isolated rat hemidiaphragm. The plant also has antibacterial, antimalarial, antifertility, hepatoprotective and antioxidant activity.



NEEM PLANT

MOMORDICA CHARANTIA: (BITTER GOURD)

Belonging to family Cucurbitaceae, the plant is commonly known as Bitter Guard. It has multiple varieties and is famous for its antidiabetic and antihyperglycemic activity all over India and across Asia. The extract of fruit pulp, seed, leaves and whole plant has shown hypoglycemic activity in animals. The polypeptide isolated from seeds, tissues, fruits show significant hypoglycemic effect when administered subcutaneously to humans. Ethanolic extracts shows hypoglycemic effect. In STZ diabetic rats.

It is shrub climbing and widely cultivated everywhere in India. Unripe fruits can be taken

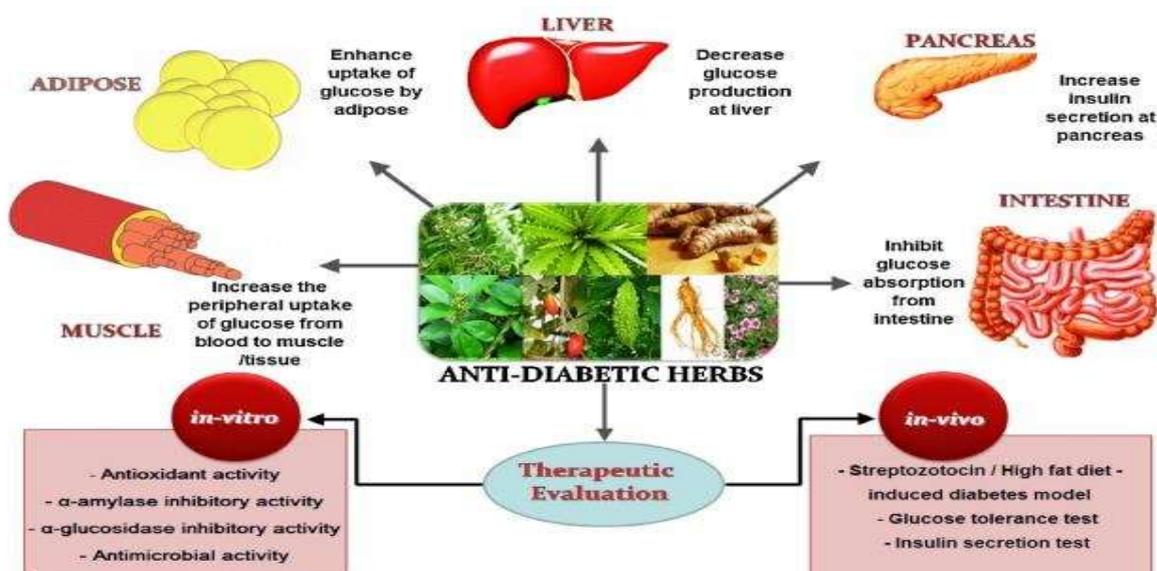
orally along with food. 2-3 fresh unripe fruits are taken at any time per day for three months.



BITTER GOURD FRUIT

MARKETED HERBAL MEDICINE WITH ANTI-DIABETIC EFFECTS⁹

NAME	COMPANY	MAIN INGREDIENTS
Diabecon	Himalaya	Gymnemasylvestre, Pterocarpus marsupium, Glycyrrhiza glabra, Caseariansculenta.
Diasulin	TobbesBusindo	Cassia auriculata, Emblica officinalis, Coccinia indica, Gymnemasylvestre, Curcuma longa
Bitter gourd Powder	Garry and Sun Natural remedies	Momordica charantia
Dia care	Admark Herbal Limited	SanjeevanMool, Himej, Jambubeej, Kadu, Namejav, Neemchal.
Gurmur powder	Garry and sun natural remedies	Gymnemasylvestre
Epinsulin	Swastik Formulations	Pterocarpus marsupium
Diabeta	Ayurvedic cure Ayurvedic Herbal Health Products	Gymnemasylvestre, Vincarosea, Curcuma longa, Azadirachta indica, Pterocarpus marsupium
Syndrex	Plethico Laboratories	Germinated fenugreek seed extract



FUNCTION OF ANTI-DIABETIC HERBS¹⁰

MECHANISM OF AN ANTIDIBETIC HERB¹¹

MEDICINAL PLANT	ACTIVE COMPOUND FOR ANTI DIABETIC ACTIVITY	MECHANISM OF ACTION
White mulberry Morus alba L.	Morin 1,5-dideoxy-1.5-imino-D-sorbitol(DN)	Hypolipidemic, antioxidant Inhibition of alpha amylase & glucosidase
Fenugreek	Galactomannans 4-hydroxyisoleucine Saponins	Decrease blood glucose concentration.
Ceylon cinnamon	methylhydroxychalcone polymer cinnamaldehyde eugenol	Elevation of plasma insulin Hypoglycemic Hypercholesterolemic stimulate glucose uptake by adipocytes
Commonbean Phaseolus vulgaris L.	Phaseolamin	hypoglycaemic; inhibit α -amylase activity antioxidant, hypolipidemic
Ginger Zingiber officinale Rosc	Shogaol Gingerol	increase insulin level decrease fasting glucose level
Ginseng Panax ginseng	ginsenoside C-K ginsenoside Rg3 ginsenoside Rb1	lowering blood glucose level slows down glucose absorption obesity reduction

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