



ANTIHYPERGLYCEMIC ACTIVITY OF MEDICINAL HERBS- A REVIEW

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ABSTRACT

Diabetes mellitus is a condition in which there is a chronically raise in blood glucose concentration. There are two main types of Diabetes Type I (Insulin dependent) and Type II (Non Insulin dependent). The risk factors responsible for diabetes are genetic factor, obesity, hypertension etc. Conventionally many allopathic drugs are used for treatment of diabetes such as sulfonylureas (Glimiprimide), biguanides (Metformin) etc. But the desired effective treatment is still not to be achieved. So researchers are going on for the development of traditional medicine against diabetes mellitus. The ancient Siddha system of medicine has its origin from the genesis of mankind. In Siddha system medicinal plants and human have proved their inseparable unification time and again through all ages. Medicinal plants are promising source and also very useful for the development of traditional Siddha Medicine. In India, Medicinal plants are widely used traditionally for the prevention and cure of diabetes. The review article consists the description of the medicinal plants which are reported to have a good anti-hyperglycemic property.

KEYWORDS: Diabetes, Siddha Literature, Medicinal plants, Anti-Hyperglycemia.

INTRODUCTION

Diabetes mellitus is a condition in which there is a chronically raise in blood glucose concentration (Hyperglycemia). Chronic hyperglycemia which is a common effect of uncontrolled diabetes causes long-term damage and failure of several organs such as eyes, kidneys, heart, nerves, and blood vessels.^[1] There are two main types of Diabetes Type I (Insulin dependent) and Type II (Non Insulin dependent).

Type I diabetes is known as Insulin dependent which is characterized by deficiency of Insulin production, requires daily administration of insulin. It happens due to the cellular-mediated autoimmune destruction of β cells of pancreas.

Type II diabetes known as Non insulin dependent diabetes which causes due to ineffective use of the insulin by the body. The following risk factors are commonly involved in the development of type II diabetes such as genetic factors, poor diet, obesity, hypertension, insufficient physical activity etc.^[2]

As per Siddha literature, urinary disease is classified into two types, they are *Neerinai Arukkal Noi* and *Neerinai*

Perukkal Noi. The disease *Madhumegam* (Diabetes) is a dreadful disease, which categorized under *Neerinai Perukkal Noi*.^[3]

Many drugs are used conventionally for the prevention and management of diabetes such as biguanides, sulfonylureas, α -glucosidase inhibitors, DPP-4 inhibitors, dopamine-2 agonists, meglitinides etc. But still effective treatment against diabetes yet to be achieved.^[4]

Research is going on for establishing alternative traditional medicine against diabetes. The medicinal plants played an important role in this research as they follows are an exemplary source of drugs. In India many medicinal plants are found to be useful for the management of diabetes. From the ethnobotanical information it is found that approximately 600 plants may possess antidiabetic potential in its activity.^[5]

In this review description about the antidiabetic medicinal plants are given which are reported to have good therapeutic activity by thorough literature survey and Research works.

REVIEW

The review work was done by thorough searching of research articles and patents from different sites and books, science direct etc. The literature of scientifically validated plants are also collected which are having good antihyperglycemic activity.

MEDICINAL PLANTS FOR MADHUMEGAM (Diabetes Mellitus)

Ficus racemosa (Moraceae)

F. racemosa is commonly known as 'Gular fig'. The parts used in *Ficus* are leaves, fruits, bark, latex and sap of the root. The leaf of *F. racemosa* contains flavonoids, triterpenoids, alkaloids and tannins, and the fruit contains gluconol acetate, tiglic acid, taraxasterol, lupeol acetate, hydrocarbons, sterols, gallic acid, ellagic acid, and aspartic acid etc.

Ficus racemosa shows hypoglycemic activity, to evaluate the study of hypoglycemic activity ethanol extract is used (250mg/kg/day, p.o) lowering of blood glucose level was determined in two weeks. Alloxan diabetic rats they confirm the hypoglycemic activity. Methanolic extract of stem bark also show glucose lowering activity at dose 200-400mg/kg, p.o. this test is done on normal and alloxan induced diabetic rats. whereas, this study was compared with standard antidiabetic agent glibenclamide at dose 10mg/kg it shows antidiabetic activity. B-sitosterol isolated from stem bark it is more potent when compared with other isolated compound. Methanol extract of fruit given in 1,2,3, and 4g/kg it lowers the blood glucose level in normal and alloxan induced diabetic rats. α - amyrin acetate is an important constituent isolated from fruits and the dose is given at 100mg/kg which lowers the blood glucose level in 5 to 24 hrs gives results at 18.4% and 17% in sucrose when compared with streptozotocin induced diabetic rat model.^[6]

Tinospora cordifolia (Menispermaceae)

Tinospora commonly known as 'Guduchi'. *Tinospora* contains diverse phytochemicals, including alkaloids, phytosterols, glycosides, and mixed chemical compounds. Columbin, tinosporoside, palmatine, saponin, berberin, tinosporic acid, tinosporolaren isolated from *tinospora*.

To evaluate the hypoglycemic activity in *Tinospora cordifolia*, diabetes was induced by alloxan monohydrate in 16 hrs fasted rats with single dose. Alloxan injection was prepared in 0.9% in normal saline. Rats with fasting blood glucose level more than 220 mg/dl was used for study. During dose standardization study it was found that 180mg/kg intraperitoneal dose of alloxan was suitable for diabetes induction with the 6-12 months old rats. For this study, animals were divided into three groups as normal control (NC), diabetic control (DC), and *tinospora* extract (TCE) with diabetic control.

Group- III- This group was injected by alloxan (180mg/kg bw) and from day 2-30 half an hour prior to feeding, orally administered with *Tinospora cordifolia* extract (20ml/kg bw). Therefore the blood glucose levels for all three groups – NC- 89.1mg/dl, DC- 298.3mg/dl and TCE – 96.7 mg/dl, where in present study we have observed that the whole plant extract of *Tinospora cordifolia* very significantly reduces the blood sugar towards the normal blood glucose value.^[7]

Cassia auriculata (Fabaceae)

The tamil name of *Cassia auriculata* known as 'Aavarai'. *Cassia auriculata* contains alkaloids, saponins, flavonoids, tannins, phenols, phenol-tannins, quinones, terpenoids, proteins, and amino acids. In *Cassia* leaves twenty nine compounds were identified, mainly 3-O-methyl-D-glucose (48.50%), alpha tocopherol-beta-D-mannoside (14.22%), n-hexadecanoic acid (3.21%), resorcinol (11.8%), octadecenal (2.18%) and carboxylic acid (1.98%).

A freshly prepared solution of streptozotocin (45 mg/kg, i.p) in 0.1 M citrate buffer, pH was injected ip in a volume of 1 ml/kg. After 48 hours of streptozotocin administration, rats with moderate diabetes having glycosuria and hyperglycemia. In the experiment, 36 animals were used and divided into six groups of six rats each. Group I-NC, Group II- DC, Group III- DC with CAE (0.15 g/kg), Group IV- DC with CAE (0.30 g/kg), Group V- DC with CAE (0.45 g/kg), Group VI- Diabetic rats with glibenclamide. The results were Group I- 97.5 mg/dl, Group II- 232 mg/dl, Group III- 216.66 mg/dl, Group IV- 158.6 mg/dl, Group V- 113.3 mg/dl and Group VI- 124.6 mg/dl. Administration of CAE and glibenclamide tends to bring the parameters normal. The effect of CAE at a dose of 0.45g/kg body weight was more highly significant than 0.15 and 0.30g/kg body weight.^[8]

Terminalia chebula (Combretaceae)

Terminalia chebula commonly known as 'Myrobalan'. *Terminalia* contains many of the chemical constituents such as glycosides including the triterpenes arjunglucoside I, arjungenin, and the chebulosides I and II, chebulinic acid, gallic acid, ellagic acid, 2,4 chebulyl- β -D-glucopyranose, teriflavin A, luteolin, and tannic acid. Chebulic acid isolated from ripen fruits.^[9]

The blood glucose lowering activity of the chloroform extract was determined in streptozotocin-induced (75mg/kg, i.p: dissolved in 0.1 M citrate buffer, pH 4.5) diabetic rats after oral administration at the doses of 100, 200, 300 mg/kg. Blood samples were collected from eye retro-orbital plexus of rats before and also 0.5, 1, 2, 4, 6, 8 and 12 hours after drug administration and the samples were analyzed for blood glucose by glucose-oxidase method using a visible spectrophotometer.

The chloroform extract of *T. chebula* seeds produce significant anti-diabetic effect with various doses in

sterptozotocin-induced diabetic rats. T chebula produced a maximum reduction of blood glucose of 20.85%, 28.85%, and 42.2% at 4hr with doses of 100, 200, and 300 mg/kg respectively.^[10]

Strychnos potatorum (Loganiaceae)

Strychnos was commonly known as 'Clearing nut tree'.

Strychnos potatorum consists of chemical constituents such as brucine, loganin, mannose, sucrose, arachidonic acid, linoleic acid, palmitic acid, stearic acid and oleic acid.^[11]

On saponification of oil- Stigmasterol, oleanolic acid, saponins containing acid oleanic, galactose and mannose and triterpenes and sterols mannogalactans.^[12]

Strychnos has antidiabetic activity, in wistar albino rat, the diabetic condition was induced by ip (ie intraperitoneal) of alloxan at a dose of 100mg/kg of bodyweight. In this study animals were divided into three groups as normal control(NC) , diabetic control (DC) , and tinospora extract (SPE) with diabetic control. The blood glucose level lowered by 53% with extract treatment , demonstrating the antidiabetic potential of the Strychnos. The insulin level also increased upto 61mu/ml within 30 days of extract treatment.^[13]

Phyllanthus emblica (Phyllanthaceae)

Phyllanthus was commonly known as 'Indian gooseberry'.

Emblica fruits contain high amounts of ascorbic acid (Vitamin C).^[14] It has bitter taste, that may derive from a high density of ellagitannins such as emblicanin A, emblicanin B. Amla contains punicafofin, polyphenols, flavonoids, kaempferol, ellagic acid and gallic acid.^[15]

A freshly prepared solution of sterptozotocin (35mg/kg, i.p) in 0.1 M citrate buffer , pH was injected ip in a volume of 1 ml/kg. After 48 hours of sterptozotocin administration, rats with hyperglycemia. In the experiment, 18 animals were used and divided into three groups of six rats each. Group I- NC, Group II- Phyllanthus low dose (PEL)-200mg/kg and group III- Phyllanthus high dose (PEH)- 400mg/dl. thus PE, extract lowered the fasting glucose levels consistently from 2 weeks to 6 weeks. At the high of PE of 400mg/kg , was able to reduce the blood glucose levels was 23.17 at 6 weeks .The reduction in blood glucose level was 4.09% at 2 weeks, it is significant in 2 weeks of study period.^[16]

Syzygium cumini (Myrtaceae)

Syzygium was commonly known as 'malabar plum, black plum, jamun'.

The chemical constituents in Syzygium was gallic acid, cyanin glycoside, jamboline, triterpenoids, tannins, gallitannins, myricetine, myricl alcohol, ferulic acid, terpineol, fat, resin, corilagin.^[17]

The blood sugar levels measured in normal and experimental rats in initial and at interval 1,5,10 and 15 days of treatment. Sterptozotocin-induced diabetic rats show significant increase in the levels of diabetic level as compared to normal rats. Oral administration of ethyl acetate nad methanol extracts (200) and (400 mg/kg) showed significant decrease ($p < 0.05$) in blood sugar level. The isolated compound, mycaminose at a dose level of 50 mg/kg also showed significant decrease in blood glucose level. The standard drug, glibenclamide decreased diabetic level in 15 days.^[18]

DISCUSSION

The ancient man was treated numerous diseases using medicinal plants. The herbs are widely used in treatment as they are more efficacy and safe in treating diseases. This review article described about collective of antidiabetic herbs for treating diabetes. Now even after the evolution of the Synthetic drug era the usefulness and credibility of the therapeutic plants are being discerned scientifically. By utilizing the ethno-botanical and ethno-pharmacological actions and research works we came to know about the herbs which have more potent antidiabetic activity. The parts used such as leaf and specific extract such as acetone extract which are more effective in treating diabetes.

CONCLUSION

The concepts of traditional Siddha system of medicine using herbals are about several thousands of years old. In India many medicinal plants are used traditionally in several form in treatment of diabetes mellitus. Current research is a collection of antidiabetic herbs to treat the diabetes as how much the medicinal herbs are effective , which possess antidiabetic activity to develop effective treatment. The article is prepared for providing proper information about the antidiabetic property possessing herbs, it might be helpful for further research in diabetes.

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