



## Full Length Research Article

### A REVIEW ON SOME TRADITIONAL MEDICINAL PLANTS ON DIABETES

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#### ABSTRACT

In the last few years, there has been an exponential growth in the field of herbal medicine and gaining popularity both in developing and developed countries because of their natural origin and less side effects. A comprehensive review was conducted to pile up information about medicinal plants used for the treatment of diabetes mellitus. For thousands of years, they have been used to treat and prevent many types of diseases along with epidemics. Some medicinal plants also utilized as pleasant condiments, to flavor, to dye, for conserve food etc. Almost every portion of the plant has own medicinal properties. Different types of secondary metabolites found in the medicinal plants which play an important role in many kinds of diseases and also used for manufacturing medicines. A large number of the plants are also reported to possess many other activities like anti-oxidant, anti-inflammatory, anti-insecticidal, anti-parasitic, antibiotic, anti-hemolytic properties etc, also used widely by the tribal people all over the world. The profiles presented include information about the scientific and family name, plant parts and test model used, the degree of hypoglycemic activity, and the active chemical agents. The large number of plants described in this review (108 plant species belonging to 56 families) clearly demonstrated the importance of herbal plants in the treatment of diabetes. The effects of these plants may delay the development of diabetic complications and correct the metabolic abnormalities. This work stimulates the researchers for further research on the potential use of medicinal plants having antidiabetic potential.

**Key words:** Comprehensive review, medicinal plant, antidiabetic potential.

#### INTRODUCTION

Medicinal plants have been used from the Vedic era. For thousands of years, they have been used to treat and prevent many types of diseases along with epidemics. Some medicinal plants also utilized as pleasant condiments, to flavor, to dye, for conserve food etc. Almost every portion of the plant has own medicinal properties. Different types of secondary metabolites found in the medicinal plants which play an important role in many kinds of diseases and also used for manufacturing medicines. A large number of the plants are also reported to possess many other activities like anti-oxidant, anti-inflammatory, anti-insecticidal, anti-parasitic, antibiotic, anti-hemolytic properties etc, also used widely by the tribal people all over the world. The therapeutic potential of plant products can be traced back to over five thousand years ago as there is evidence of its use in the treatment of diseases and for revitalizing body systems in Indian, Egyptian, Chinese, Greek and Roman civilizations (Mahesh B and Satish, 2008). In India, plants of therapeutic potential are widely used by all sections of people both as folk medicines in different indigenous systems of medicine like Siddha, Ayurveda, and Unani and also as processed product of pharmaceutical industry (Srinivasan et al., 2007).

India has about 4.5 million plant species and among them estimated only 250,000-500,000 plant species, have been investigated phytochemically for biological or pharmacological activity. The bioactive constituents or plants extracts may be uses for treatment of various diseases and these would be used as a new formulation for the novel drugs discovery in pharmaceutical industries. Herbal medicines such as Brahmi and Ashwagandha help boost one's energy level, increase nutrients, restore body cells, and enhance a person's immunity (Nishant, 2016). Medicinal and aromatic plants can play an important role in the subsistence livelihood enhancement rural people, especially women in an environmentally sustainable manner while maintaining the biodiversity of these natural products. Today according to the World Health organization (WHO), as many as 80% of the world's allergic, antibiotic, hypoglycaemic and anti-carcinogenic. These secondary metabolites protect the cells from the damage caused by unstable molecules known as free radicals (Harini and Nithyalakshmi, 2017). There are growing interests in using natural antimicrobial compounds, especially extracted from plants, for the preservation of foods. There is therefore the need to search for plants of medicinal value (Chavan, 2016). However, the knowledge as well as awareness on the herbal remedies is held by elder males and females of between the age group of 41-70 years. Now, decline in the use of the medicinal plants by the new generation may gradually lead to the fading away. Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both.

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Symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss sometimes with polyphagia and blurred vision (Murugan and Pari). Chronic hyperglycemia of diabetes associated with long-term damage dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels (Murugan and Pari). Diabetes mellitus is spreading in an alarming way throughout the world and three fourth of the world populations and considered as a major cause of high economic loss which can in turn impede the development of nations. Moreover, uncontrolled diabetes leads to many chronic complications such as blindness, heart disease, and renal failure, etc. For this, therapies developed along the principles of western medicine (allopathic) are often limited in efficacy, carry the risk of adverse effects, and are often too costly, especially for the developing world. Therefore, treating diabetes mellitus with plant derived compounds which are accessible and do not require laborious pharmaceutical synthesis seems highly attractive. In recent years, considerable focus has been given to an intensive search for novel type of antioxidants from numerous plant materials (Srivastava et al., 1993). Management of diabetes without any side effects is still a challenge to the medical system. There is an increasing demand by patients to use the natural products with antidiabetic activity, because insulin and oral hypoglycemic drugs possess undesirable side effects. Plants with antidiabetic activities provide useful sources for the development of drugs in the treatment of diabetes mellitus. Phytochemicals isolated from plant source are used for the prevention and treatment of cancer, heart disease, diabetes and high blood pressure etc. (Mary et al., 2002).

### Medicinal plants

**Curcuma longa:** Turmeric is a spice used for its flavor and orange-yellow color. Curcumin is one of several curcuminoid compounds found in turmeric that give turmeric its color and antioxidant and anti-inflammatory properties, making turmeric root powders and extracts useful as dietary supplements. High doses of turmeric and curcumin are not recommended long-term since research confirming their safety is lacking. However, the World Health Organization (WHO) has determined 1.4 mg per pound (0–3 mg/kg) of body weight an acceptable daily intake. *Curcuma longa* is commonly used in the treatment of diabetes by ayurvedic physicians. Curcumin is a biologically active component isolated from the rhizome of *Curcuma longa* that possess antihyperglycemic activity (Arun and Nalini, 2002), hypolipidemic action and anti - renal lesion effect. The use of curcumin is recommended for prevention of advanced glycosylated endproducts (AGE) accumulation and the associated complications of diabetes (Murugan and pari, 2006). Tetrahydrocurcumin (THC) is one of the major colourless metabolite of curcumin. THC has been reported to exhibit the same physiological and pharmacological properties of curcumin. Curcumin is rapidly metabolized during absorption from the intestine, yielding THC, which has shown the strongest antioxidant activity among all curcuminoids. Several studies in experimental animals indicated that THC also prevent(s) cancer, protect(s) against inflammation (Nakamura, 1998 and Hong et al., 2004), atherosclerotic lesions and hepatotoxicity (Pari and Murugan, 2004). THC possesses antioxidant effect that may contribute to its protective action against lipid peroxidation and enhancing effect on cellular antioxidant defense. This activity contributes to the protection against oxidative damage in STZ induced diabetes.

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**Cassia auriculata:** The common name Tanner's cassia (*Cassia auriculata* L.), belongs to the family Ceasalpinaceae is a shrub that has attractive yellow flowers, commonly used for the treatment of skin disorders and body odour (Murugan, 2010). It is a native plant present in different parts of India. Indigenous people use various parts of the plant for diabetes mellitus. It is widely used in Ayurvedic medicine as a "Kalpa drug" which contains five parts of the shrub (roots, leaves, flowers, bark and unripe fruits) which are taken in equal quantity, dried and then powdered to give "Avarai Panchaga Chooranam", for the control of sugar levels and reduction of symptoms such as polyuria and thirst in diabetes (Pari and Murugan, 2007). *Cassia auriculata* L. (Ceasalpinaceae) has been used traditionally as antidiabetic and has been proven scientifically to possess high antioxidant activity and anticancer properties. In the present study the effect of *Cassia auriculata* L (CFEt) and glibenclamide on erythrocyte membrane bound enzymes and antioxidants activity in streptozotocin (STZ) and nicotinamide induced type 2 diabetic model was investigated. Oral administration of CFEt at 0.45 mg/kg body weight to diabetic rats (Murugan, 2010).. *Cassia auriculata* L. (Ceasalpinaceae) is a shrub that has attractive yellow flowers, commonly used for the treatment of skin disorders and body odour. It is a native plant present in different parts of India. Indigenous people use various parts of the plant for diabetes mellitus. It is widely used in Ayurvedic medicine as a "Kalpa drug" which contains five parts of the shrub (roots, leaves, flowers, bark and unripe fruits) which are taken in equal quantity, dried and then powdered to give "Avarai Panchaga Chooranam", for the control of sugar levels and reduction of symptoms such as polyuria and thirst in diabetes (Shrotri and Aiman, 1960). A literature survey showed that a decoction of leaves, flowers, and seeds of the *Cassia auriculata* mediate an antidiabetic effect (Shrotri and Aiman, 1960). Thus, the available reports show that very little work has been done with respect to *Cassia auriculata* flowers, other than its hypoglycemic effects. Previous study, we have demonstrated the antidiabetic effect of *Cassia auriculata* flower extract (CFEt) in streptozotocin (STZ) induced diabetic rats (Pari and Latha, 2002).

**Scopariadulcis:** *Scopariadulcis*, also known as sweet broomweed (family: Scrophulariaceae), is a perennial herb which is commonly found in tropical and subtropical regions. The plant and its flowers in its natural habitat. The leaves of the plant are serrated and the flowers are white in colour. *S. dulcis* has been used in many traditional medicinal systems as an antidiabetic herb and for a variety of ailments. The plant is abundantly found in many countries and can be easily grown and cultivated, should there be a need for mass production. This review highlights the ethnomedicine, antidiabetic properties, antioxidant effects, bioactive chemical constituents, and other therapeutic properties of *S. dulcis*. A schematic outline showing all therapeutic properties of this plant. Through this review, it is hoped that *S. dulcis* could be promoted for downstream scientific investigations where the herb as well as its bioactive constituents would be taken up for further clinical evaluations and thereby discover the true potential as a remedy for combating a global pandemic as well

as other noncommunicable disease conditions at large. Previous study, we have demonstrated the antidiabetic effect of *Scopariadulcis* induced diabetic rats (Pari and Latha, 2005).

***Cocciniaindica:*** *Cocciniaindica* (synonym *C. cordifolia*) belongs to the Cucurbitaceae family and grows abundantly in India. It is a climbing perennial herb, growing throughout India especially in warmer and humid climatic conditions. It is widely used in traditional treatment of diabetes (Venkateswaran S and Pari, 2002). The fruits are used for culinary purposes as a vegetable. Scientific investigations have supported the efficacy of leaf extracts in amelioration of diabetic conditions. The juice of the roots and leaves is used to treat diabetes, and the aqueous and ethanolic extracts of the plant exhibit hypoglycemic action (Akhtar et al., 2007). *C. indica* leaves have been shown to stimulate insulin secretion in diabetic rats (Kumar et al., 1993). Effects of feeding *C. indica* leaves and fruits on diabetic kidney disease, which has not been thus far reported despite its traditional use in diabetes.

***Momordica charantia:*** *Momordica charantia* Linn. (Cucurbitaceae) have been used in various parts of the world to treat diabetes. Oral administration of the fruit juice or seed powder causes a reduction in fasting blood glucose and improves glucose tolerance in normal and diabetic animals and in humans. Principal toxicity of *Momordica charantia* in animals is to the liver and reproductive system. *Momordica charantia* (*M. charantia*), also known as bitter melon, karela, balsam pear, or bitter gourd, is a popular plant used for the treating of diabetes-related conditions amongst the indigenous populations of Asia, South America, India, the Caribbean and East Africa (Cefalu and Ye J, Wang, 2008). Its fruit has a distinguishing bitter taste, which is more pronounced as it ripens, hence the name bitter melon or bitter gourd. Biochemical and animal model experiments have produced abundant data and hypotheses accounting for the anti-diabetic effects of *M. charantia*.

***Syzygiumcumini:*** *Syzygiumcumini* (*S. cumini*) (L.) is one of the widely used medicinal plants in the treatment of various diseases in particular diabetes in India. Seeds of *Syzygiumcumini* are used by the Ayurvedic physicians in the management of diabetes mellitus. Bark is acrid, sweet, digestive, astringent to the bowels, anthelmintic and used for the treatment of sore throat, bronchitis, asthma, thirst, dysentery and ulcers. It is also a good blood purifier (Sidana, 2017). The Jamun fruits are green coloured and turns from light to dark purple or even black after ripening (Ganesh, 2017). Their taste is sweetish sour and eating of Jamun fruits makes the tongue purple. The other names of Jamun are Indian blackberry, black plum, Duhat Jambu, Jaman, Jambul, Jambool, Java plum, Portuguese or Malabar plum (Claudio, 2004). Jamun has several beneficial effects on many ailments. Despite this fact, Jamun may have some adverse effects, if eaten in excess or during certain conditions. Since it lowers blood sugar, it should be avoided before one week and a minimum of two weeks after surgery as it may have adverse effect on healing. Eating of Jamun empty stomach and also after drinking of milk may produce adverse effect. Breast feeding mothers and pregnant women should not eat Jamun. Eating of Jamun in excess amount may lead to cough, sputum accumulation in lungs, body ache and fever (Sidana, 2017). Fruits have been used for a wide variety of ailments, including cough, diabetes, inflammation and ringworm.

***Andrographis paniculata:*** *Andrographis paniculata* Wall (family Acanthaceae) is one of the most popular medicinal plants used traditionally for the treatment of array of diseases such as cancer,

diabetes, high blood pressure, ulcer, leprosy, bronchitis, skin diseases, flatulence, colic, influenza, dysentery, dyspepsia and malaria for centuries. The aerial parts, roots and whole plant of *A. paniculata* have been used for centuries in Asia as traditional medicine for the treatment of various ailments. It has been used by traditional medical practitioners for stomachaches, inflammation, pyrexia, and intermittent fevers (Jarukamjorn et al., 2010, Balu S, Alagesaboopathi, 1993). The whole plant has been used for several applications such as anti-dote for snake-bite and poisonous stings of some insects, and to treat dyspepsia, influenza, dysentery, malaria and respiratory infections (Chopra, 1980). The leaf extract is a traditional remedy for the treatment of infectious disease, fever-causing diseases, colic pain, loss of appetite, irregular stools and diarrhea (Saxena, 1998). In Malaysia, a decoction of the aerial parts is used to treat common cold, hypertension, diabetes, cancer, malaria and snakebite (Perry, 1980). Table 1 describes the medicinal uses of the parts of *A. paniculata*. It is an important constituent of at least 26 Ayurvedic formulas in Indian pharmacopoeia. In traditional Chinese medicine, it is seen as the cold-property herb used to rid the body of heat and fever and to dispel toxins from the body (Deng, 1978). In Ayurvedic medicinal system, tribals of Tamilnadu, India use this herb for a variety of ailments like dysmenorrhoea, leucorrhoea, pre-natal and post-natal care, complicated diseases such malaria, jaundice, gonorrhoea and general ailments like wounds, cuts, boils and skin diseases. *A. paniculata* treatment of blood pressure, cardiovascular disease and diabetes. It is also a remedy for snake bites.

***Aloe vera:*** Preliminary research suggests that intake of aloe vera juice can help improve blood glucose levels and may therefore be useful in treating people with diabetes. Research suggests that aloe vera juice or supplements could have a number of possible benefits for people with diabetes: Lower fasting blood glucose levels. A 2015 study suggests that taking aloe vera gel can help people achieve better fasting blood glucose levels, as well as reduce body fat and weight. Decreased blood lipids (fats) in patients with abnormally high levels of these molecules in the blood (e.g. some people with type 2 diabetes) and/or acute hepatitis. Decreased swelling and faster healing of wound injuries. Leg wounds and ulcers are common complications of diabetes, and they typically take longer time to heal than in healthy non-diabetic individuals.

***Fenugreek (Trigonellafoenum-graecum):*** Fenugreek is a plant that grows in parts of Europe and western Asia. The leaves are edible, but the small brown seeds are famous for their use in medicine. The first recorded use of fenugreek was in Egypt, dating back to 1500 B.C. Across the Middle East and South Asia, the seeds were traditionally used as both a spice and a medicine. Experimental and clinical studies have demonstrated the antidiabetic properties of fenugreek seeds (Kassaian, 2009). The active ingredient responsible for the antidiabetic properties of fenugreek is in the defatted portion of the seed that contains the alkaloid trogonelline, nicotinic acid and coumarin. Fenugreek is the best source of fiber, which will prevent the absorption of glucose from the intestine. You can buy fenugreek as: a spice (in whole or powdered form) supplement (in concentrated pill and liquid form) tea, skin cream, Talk to your doctor if you're thinking of taking fenugreek as a supplement (Kumar, 2014).

## Conclusion

Diabetes mellitus is spreading in an alarming way throughout the world and three fourth of the world populations and considered as

a major cause of high economic loss which can in turn impede the development of nations. Moreover, uncontrolled diabetes leads to many chronic complications such as blindness, heart disease, and renal failure, etc. For this, therapies developed along the principles of western medicine (allopathic) are often limited in efficacy, carry the risk of adverse effects, and are often too costly, especially for the developing world. Therefore, treating diabetes mellitus with plant derived compounds which are accessible and do not require laborious pharmaceutical synthesis seems highly attractive. Treatment of diabetes without any side effects is still a challenge to the medical system. There is an increasing demand by patients to use the natural products with antidiabetic activity, because insulin and oral hypoglycemic drugs are having undesirable side effects. The plants used in the study can be tried as an antidiabetic agent.

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