

**Review Article****A Review on Herbs Used in the Treatment of Diabetes mellitus****Ripunjoy Bordoloi\*, Krishna Nayani Dutta**

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**ABSTRACT**

Diabetes mellitus (DM) is the commonest endocrine disorder that affects more than 100 million people worldwide (6% of the population). It is caused by the deficiency or ineffective production of insulin by pancreas which results in increase or decrease in concentrations of glucose in the blood. It is found to damage many of the body systems, particularly the blood vessels and nerves both insulin-dependent DM (IDDM) and non-insulin dependent DM (NIDDM) is a common and serious metabolic disorder throughout the world. In India, diabetes has been known for a long time, but its incidence is not of the same magnitude across the subcontinent. The wide range of structures of the plant constituents, which appear to be the active hypoglycaemic principles, suggests different sites of action within the body. Medicinal herbs as potential source of therapeutic aids have attained a significant role in health system all over the world for both humans and animals. Ayurveda and other Indian literature mention the use of plants in treatment of various human diseases. India has about 45000 plant species and among them, several thousands have been claimed to possess medicinal properties. The present paper aims to review various plant species from Indian origin and their constituents, which have been used in the traditional system of medicine and have shown hypoglycaemic activity.

**Keywords:** Diabetes mellitus; hypoglycaemic; antidiabetic plants**INTRODUCTION**

Diabetes mellitus is a systemic metabolic disease characterized by hyperglycemia, hyper lipedemia, hyper aminoacidemia, and hypo insulinaemia it leads to decrease in both insulin secretion and insulin action [1,2]. It is frequently associated with

the development of micro and macro vascular diseases which include neuropathy, nephropathy, cardiovascular and cerebrovascular diseases [3,4]. The disease is associated with reduced quality of life and increased risk factors for mortality and morbidity. Diabetes mellitus, commonly referred to as diabetes was first identified as a disease

associated with "sweet urine," and excessive muscle loss in the ancient world. Elevated levels of blood glucose (hyperglycemia) lead to spillage of glucose into the urine, hence the term sweet urine. Normally, blood glucose levels are tightly controlled by insulin, a hormone produced by the pancreas. Insulin lowers the blood glucose level. When the blood glucose elevates (for example, after eating food), insulin is released from the pancreas to normalize the glucose level [5,6] In patients with diabetes, the absence or insufficient production of insulin causes hyperglycemia. Diabetes is a chronic medical condition, meaning that although it can be controlled, it lasts a lifetime. There are different approaches to the treatment of diabetes, like insulin treatment in type 1 diabetes: Sulphonylureas, which release insulin from pancreas by blocking the ATP-sensitive potassium channels. Biguanides, which decrease the insulin resistance; Thiazolidinediones, which increase the insulin sensitivity; alpha-glucosidase inhibitors like acarbose, which decrease glucose absorption from intestine, thereby decreasing postprandial hyperglycemia; metglinides like repaglimide and nateglimide, which are insulin secretagogues [7,8]. Traditional herbal mineral plays an important part in the treatment of diabetes [9,10]. If we able to even identify some 5-6 herbal drugs that can reduce dose of insulin by increasing resistance sensitivity, reducing insulin resistance, then we would have positively contributed in the treatment of diabetes.

### IMPORTANT MEDICINAL PLANTS HAVING ANTIDIABETIC POTENTIAL

#### *Allium cepa* L. (onion)<sup>[11]</sup>

(Liliaceae) *Allium cepa* is known only in cultivation but related wild species occur in Central Asia. Various ether soluble fractions as well as insoluble fractions of dried onion powder show anti-hyperglycemic activity in diabetic rabbits. *A. cepa* also known to have antioxidant and hypolipidemic

activity. Administration of a sulfur containing amino acid, S-methyl cysteine sulphoxide (SMCS) (200 mg/kg for 45 days) to alloxan induced diabetic rats significantly controlled blood glucose as well as lipids in serum and tissues. It normalizes the activities of liver hexokinase, glucose 6-phosphatase and HMG Co A reductase.



#### *Allium sativum* L. (garlic)<sup>[12]</sup>

(Liliaceae) It is a perennial herb cultivated throughout India. Oral administration of the garlic extract significantly decreases serum glucose, total cholesterol, triglycerides, urea, uric acid, creatinine, AST and ALT levels, while increases serum insulin in diabetic rats but not in normal rats when compared with antidiabetic drug glibenclamide. The antidiabetic effect of the extract was more effective than glibenclamide.



#### *Aloe vera* (L) Burm<sup>[13, 14]</sup>

It grows in arid climates and is widely distributed in Africa, India and other arid areas. *Aloe vera* gel at

200 mg/kg possesses significant antidiabetic, cardioprotective activity, reduces the increased TBARS, maintains the Superoxide dismutase and Catalase activity up to the normal level and increases reduced glutathione by four times in diabetic rats.



#### ***Elephantopus scaber*** <sup>[15]</sup>

*Elephantopus scaber* is an ethnomedicinal plant, having the property to reduce the blood glucose levels in streptozotocin induced diabetic rats significantly. It is popularly known as Elephant's foot, and it is family of Asteraceae. It is a scabrescent aromatic herb distributed in the moist deciduous forests of the central Western Ghats. As per the previous studies, the roots of *Elephantopus scaber* are used as an antipyretic, cardiotonic and diuretic and decoction of the roots and leaves is used as emollient and it was given in dysuria, diarrhea, dysentery and stomach pain. The aqueous extract of leaves is applied externally to treat eczema and ulcers.



#### ***Bidens pilosa*** L <sup>[16]</sup>

It is known as Spanish Needle. The butanol fraction of *B. pilosa* inhibits the differentiation of naive helper T (Th0) cells into Th1 cells but enhances their transition into type II helper T (Th2) cells, thus can prevent diabetes possibly via suppressing the differentiation of Th0 cells into Th1 cells and promoting that of Th0 cells into Th2 cells, thus preventing autoimmune diabetes in non-obese diabetic mice.



#### ***Chaenomeles sinensis*** <sup>[16]</sup>

Ethyl acetate fraction of *Chaenomeles sinensis* (*C. sinensis*) (Thouin) Koehne fruits is very good Antidiabetic effect. *Chaenomeles sinensis* belongs to family Rosaceae. Doses which have antidiabetic activity were reported as 50 and 100 mg/kg body weight.



#### ***Artemis sphaerocephala*** Krasch <sup>[12]</sup>

Antioxidant effect of *Artemis sphaerocephala* (*A. sphaerocephala*) gum on STZ induced diabetic rat. Levels of serum and liver tissue thiobarbituric acid reactive substances (TBARS) and +OH were

increased in STZ induced rat. The activity levels of liver and serum superoxide dismutase were decreased. After administration of extract of *A. sphaerocephala*, levels of TBARS and +OH were decreased in serum and liver tissue. The significant increments in the levels of liver and serum SOD.



### ***Mangifera indica* L.**<sup>[13]</sup>

The aqueous extract produces reduction of blood glucose level in normoglycemic and glucose-induced hyperglycemia, but does not have any effect on streptozotocin-induced diabetic mice under the same conditions when compared with that of an oral dose of chlorpropamide. The result indicates that the aqueous extract of the leaves of *M. indica* possess hypoglycemic activity.



### ***Pterocarpus marsupium* Roxb**<sup>[11]</sup>

It is widely used in 'Ayurveda' as 'Rasayana' for management of various metabolic disorders. An aqueous extract of *P. marsupium* wood, at an oral dose of 250 mg/kg, shows statistically significant hypoglycemic activity. Marsupin, pterosupin and liquiritigenin obtained from this plant show antihyperlipidemic activity, its active principle, has been found to be insulinogenic, enhancing insulin release and conversion of proinsulin to insulin in vitro. Like insulin, (-) epicatechin stimulates oxygen uptake in fat cells and tissue slices of various organs, increases glycogen content of rat diaphragm in a dose dependent manner.



**Table 1. Some marketed Antidiabetic Polyherbal Formulations** <sup>[17-20]</sup>

Name	Company	Ingredients
<b>Diabecon</b>	Himalaya	<i>Gymnema sylvestre</i> , <i>Pterocarpus marsupium</i> , <i>Glycyrrhiza glabra</i> , <i>Casearia esculenta</i> , <i>Syzygiumcumini</i> , <i>Asparagus racemosus</i> , <i>Boerhavia diffusa</i> , <i>Sphaeranthus indicus</i> , <i>Tinospora cordifolia</i> , <i>Swertia chirata</i> , <i>Tribulus terrestris</i> , <i>Phyllanthus amarus</i> , <i>Gmelina arborea</i> , <i>Gossypium herbaceum</i> , <i>Berberis aristata</i> , <i>Aloe vera</i> , <i>Triphala</i> , <i>Commiphora wightii</i> , <i>shilajeet</i> , <i>Momordica charantia</i> , <i>Piper nigrum</i> , <i>Ocimum sanctum</i> , <i>Abutilon indicum</i> , <i>Curcuma longa</i> , <i>Rumex maritimus</i> .
<b>Diasulin</b>	Tobbest Busindo	<i>Cassia auriculata</i> , <i>Coccinia indica</i> , <i>Curcuma longa</i> , <i>Emblica officinalis</i> , <i>Gymnema sylvestre</i> , <i>Momordica charantia</i> , <i>Scoparia dulcis</i> , <i>Syzygium cumini</i> , <i>Tinospora cordifolia</i> , <i>Trigonella foenum graecum</i> .
<b>Bitter gourd Powder</b>	Garry and Sun natural remedies	<i>Momordica charantia</i>
<b>Dia-care</b>	Admark Herbals Limited	Sanjeevan Mool, Himej, Jambu beej, Kadu, Namejav, Neem chal.
<b>Diabetes- Daily Care</b>	Nature's Health Supply	Alpha Lipoic Acid, Cinnamon 4% Extract, Chromax, Vanadium, Fenugreek 50% extract, <i>Gymnema sylvestre</i> 25% extract <i>Momordica charantia</i> 7% extract, Licorice Root 20% extract
<b>Gurmar powder</b>	Garry and Sun natural Remedies	<i>Gymnema sylvestre</i>
<b>Epinsulin</b>	Swastik Formulations	<i>Pterocarpus marsupium</i>

## CONCLUSION

Diabetes mellitus is the most common endocrine disorder, affecting more than 300 million people worldwide. For this, therapies developed along the principles of western medicine (allopathic) are often limited in efficacy, carry the risk of adverse effects & are often too costly, especially for the developing world. Therefore, treating diabetes mellitus with plant derived compounds which are accessible & do not require laborious pharmaceutical synthesis,

seems highly attractive. All the herbal drugs discussed in the review exhibit significant clinical & pharmacological activity. The potency of herbal drugs is significant & they have negligible side effects than the synthetic anti diabetic drugs. In this review article an attempt has been made to focus on hypoglycemic plants & may be useful to the health professionals, scientists and scholars working in the field of pharmacology & therapeutics to develop evidence based alternative medicine to cure different kinds of diabetes in man & animals. The utilization of indigenous drug resources with

the collaboration of local industry will minimize the expenditure incurred on the purchase of foreign drugs. In view of the economic importance of indigenous plants, research and developmental efforts should be focused on these plants. So it is strongly recommended to carryout phytochemical and clinical research work on the discovered plant species to prove and substantiate the traditional herbal therapies of the rural people. These plants should be studied for their active compounds responsible for the hypoglycemic activities also.

## REFERENCES

1. Maiti R, Jana D, Das UK and Ghosh D. Antidiabetic effect of aqueous extract of seed of *Tamarindus indica* in streptozotocin induced diabetic rats. *Journal of Ethnopharmacology* 2004; 92:85-91.
2. Wadkar KA, Magdum CS, Patil SS and Naikwade NS. Antidiabetic potential and Indian medicinal plants. *Journal of Herbal Medicine and Toxicology* 2008; 2: 45-50.
3. Akhtar MS and Iqbal J. Evaluation of the hypoglycaemic effect of *Achyranthes aspera* in normal and alloxan- diabetic rabbits. *Journal of Ethnopharmacology* 1991; 31: 49-57.
4. Ruffa MJ, Ferraro G, Wagner ML, Calcagno ML, Campos RH and Cavallaro L. Cytotoxic effect of Argentine medicinal plant extracts on human hepatocellular carcinoma cell line. *Journal of Ethnopharmacology* 2002; 79: 335-339.
5. Liu IM, Tzeng TF, Liou SS and Lan TW. Improvement of insulin sensitivity in obese Zucker rats by myricetin extracted from *Abelmoschus moschatus*. *Planta Medica* 2007; 73:1054-1060.
6. Wadood A, Wadood N and Shah SA. Effects of *Acacia arabica* and *Caralluma edulis* on blood glucose levels on normal and alloxan diabetic rabbits. *Journal of Pakistan Medicine* 1989; 39:208-212.
7. Kadarian C, Broussalis AM, Miño J, Lopez P, Gorzalczany S, Ferraro G and Acevedo C. Hepatoprotective activity of *Achyrocline satureioides* (Lam) D. C. *Pharmacology Research* 2002; 45: 57-61.
8. Andrade-Cetto A and Wiedenfeld H. Hypoglycemic effect of *Acosmium panamense* bark on streptozotocin diabetic rats. *Journal of Ethnopharmacology* 2004; 90: 217-220.
9. Welihinda J, Arvidson G, Gylfe E, Hellman B and Karlsson E. *Ada Biol MetLGer* 1982; 41: 1229.
10. Hongxiang Hui, George Tang and Vay Liang W Go. Hypoglycaemic herbs and their action mechanisms. *Chinese Medicine* 2009; 4: 11-14.
11. Mathew PT and Augusti KT. Hypoglycemic effects of onion, *Allium cepa* Linn, on diabetes mellitus- a preliminary report. *Indian Journal of Physiology and Pharmacology* 1975; 19: 213-217.
12. Kumari K, Mathew BC and Augusti KT. Antidiabetic and hypoHpidaemic effects of S-methyl cysteinesulfoxide, isolated from *Allium cepa* Linn. *Indian Journal of Biochemistry and Biophysics* 1995; 32: 49-54.
13. Gray AM and Flatt PR. Actions of the traditional anti-diabetic plant, *Agrimony eupatoria* (agrimony): effects on hyperglycaemia, cellular glucose metabolism and insulin secretion. *Brazilian Journal of Nutrition* 1998; 80: 109-114.
14. El Hilaly J and Lyoussi B. Hypoglycaemic effect of the lyophilised aqueous extract of *Ajugaivain* normal and streptozotocin diabetic rats. *Journal of Ethnopharmacology* 2002; 80: 109-113.
15. Ponnachan PT, Paulose CS and Panikkar KR. Effect of leaf extract of *Aegle manglese* in diabetic rats. *Indian Journal of Experimental Biology* 1993; 31: 345-347.
16. Roman-Ramos R, Flores-Saenz JL and Alarcon-Aguilar FJ. Antihyperglycemic effect of some edible plants. *Journal of Ethnopharmacology* 1995; 48: 25-32.

17. Eidi A, Eidi M and Esmaeili E. Antidiabetic effect of garlic (*Allium sativum* L.) in normal and streptozotocin-induced diabetic rats. *Phytomedicine* 2005; 13: 624-629.
18. Ajabnoor MA. Effect of aloes on blood glucose levels in normal and alloxan diabetic mice. *Journal of Ethnopharmacology* 1990; 28: 215-220.
19. Jain N, Vijayaraghavan R, Pant SC, Lomash V and Ali M. *Aloe vera* gel alleviates cardiotoxicity in streptozocin-induced diabetes in rats. *Journal of Pharmacy and Pharmacology* 2010; 62: 115-123.
20. Okyar A, Can A, Akev N, Baktir G and Sütlüpinar N. Effect of *Aloe vera* leaves on blood glucose level in type I and type II diabetic rat models. *Phytotherapy Research* 2001; 15: 157-161.

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