

Traditional herbs used for diabetes in Rajasthan

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This review focuses on Indian herbal drugs and plants used in the treatment of diabetes, especially in India. Diabetes is an important human ailment afflicting many from various walks of life in different countries. In India it is proving to be a major health problem, especially in the urban areas. Though there are various approaches to reduce the ill effects of diabetes and its secondary complications, herbal formulations are preferred due to lesser side effects and low cost. A list of medicinal plants with proven antidiabetic and related beneficial effects and of herbal drugs used in treatment of diabetes is compiled. These include *Allium sativum*, *Eugenia jambolana*, *Momordica charantia*, *Trigonella foenum graecum*, *Acacia arabica* and *Capparis deciduas*. Herbal medicines, products and therapies are a subject of great public interest both nationally and worldwide. Use of herbal therapy is common among patients with diabetes.

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INTRODUCTION

Diabetes mellitus is a systemic metabolic disease characterized by hyperglycemia, hyper lipidemia, hyper aminoacidemia, and hypo insulinaemia it leads to decrease in both insulin secretion and insulin action (Altan *et al.*, 2003). It is frequently associated with the development of micro and macro vascular diseases which include neuropathy, nephropathy, cardiovascular and cerebro vascular diseases (Feldman *et al.*, 2000). The disease is associated with reduced quality of life and increased risk factors for mortality and morbidity. The long-term hyperglycemia is an important factor in the development and progression of micro- and macro vascular complications (Strojek *et al.*, 2003). The worldwide prevalence of diabetes for all age groups was estimated to be 2.8 per cent in 2000 and it is projected to be 5.4 per cent in 2025.

Currently available therapies for diabetes include insulin and various oral antidiabetic agents such as sulfonylureas, biguanides, α -glucosidase inhibitors and glinides. In developing countries as products are expensive and not easily accessible. Presently, there is growing interest in herbal remedies due to the side effects associated with the oral hypoglycemic agents (therapeutic agent) for the treatment of diabetes mellitus. So the traditional herbal medicines are mainly used which are obtained from plants, it plays important role in the management of diabetes mellitus (Patel and Srinivasay, 1997). Herbs for diabetes treatment are not new. Since ancient times, plants and plant extracts were used to combat diabetes. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. India is the largest producer of medicinal herbs and is called as botanical garden of the world. The current review 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. At last even the World Health Organization (WHO) expert committee on diabetes has recommended that traditional medicinal herbs be further investigated. Covered here are herbs that have been confirmed by scientific

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investigation, which appear to be most effective, relatively non-toxic and have substantial documentation of efficiency.

Rajasthan is the largest state in the North- Western part of India. Geographically it lies between 23°3' to 30°12'N longitude and 69°30' to 78°17'S latitude. The aravalli system of mountain dominates the southern parts of Rajasthan. The climate of these hills is typically monsoonic in character. About 12.44 per cent of the population in Rajasthan belongs to tribes such as the Bhil, Bhil-Meena, Damor, Dhanka, Garasia, Kathodi, Kokna, Kolidhor, Naikara, Patelia, Meena, Seharlia and reside in remote areas devoid of basic infra-structure facilities. Nomadic tribes (Banjara, Gadolia-Lohar, Kalbelia, Sikligar, Kanjar, Sansi, Bagri) further enrich the ethnic heritage of Rajasthan.

Medicinal plants with antidiabetic effects:

The major goal in treating diabetes is to minimize elevation of blood glucose without causing abnormally low levels of blood glucose. The action mechanisms for hypoglycemic herbs are multiple as shown in Fig. 1.

The efficacy of hypoglycemia herbs has been mediated by increasing insulin secretion (ginseng, bitter melon, aloes), enhancing glucose uptake by adipose and muscle tissues (ginseng, bitter melon and cinnamon), inhibiting glucose absorption from intestine and inhibiting glucose production from hepatocytes (berberine, fenugreek leaves). There are some common herbs, used by the people suffering from diabetes are discussed below:

Babul (*Acacia arabica*):

It is found all over India mainly in the wild habitat. The plant extract acts as an antidiabetic agent by acting as secretagogue to release insulin. Powdered seeds of *Acacia arabica* (Ramachandran *et al.*, 2002) when administered (2, 3 and 4 g/kg body weight) to normal rabbits induced hypoglycemic effect by initiating release of Insulin from pancreatic beta cells (Wadood *et al.*, 1998).

Aloe (*Aloe barbadensis*):

“Aloe juice,” is a bitter yellow exudates from the pericyclic tubules just beneath the outer skin of the leaves. Extracts of aloe gum effectively increases glucose tolerance in both normal and diabetic rats. Treatment of chronic but not single dose of exudates of *Aloe barbadensis* leaves showed hypoglycemic effect in alloxanized diabetic rats (Daniel, 2000). Single as well as chronic doses of bitter principle of the same plant also showed hypoglycemic effect in diabetic rats. This action of *Aloe vera* and its bitter principle is through stimulation of synthesis and/or release of insulin from pancreatic beta cells (Parthasarathy *et al.*, 2004).

Diabetic patients who take aloe vera for 3 months experience a significant drop in fasting blood sugar levels (Davis and Maro, 1989). They also exhibit lower cholesterol levels and slight improvements in total cholesterol. Numerous clinical studies have been published that demonstrate aloe vera’s antidiabetic properties. Since aloe reverses “sludge blood” and boosts circulation to extremities, diabetics suffering from

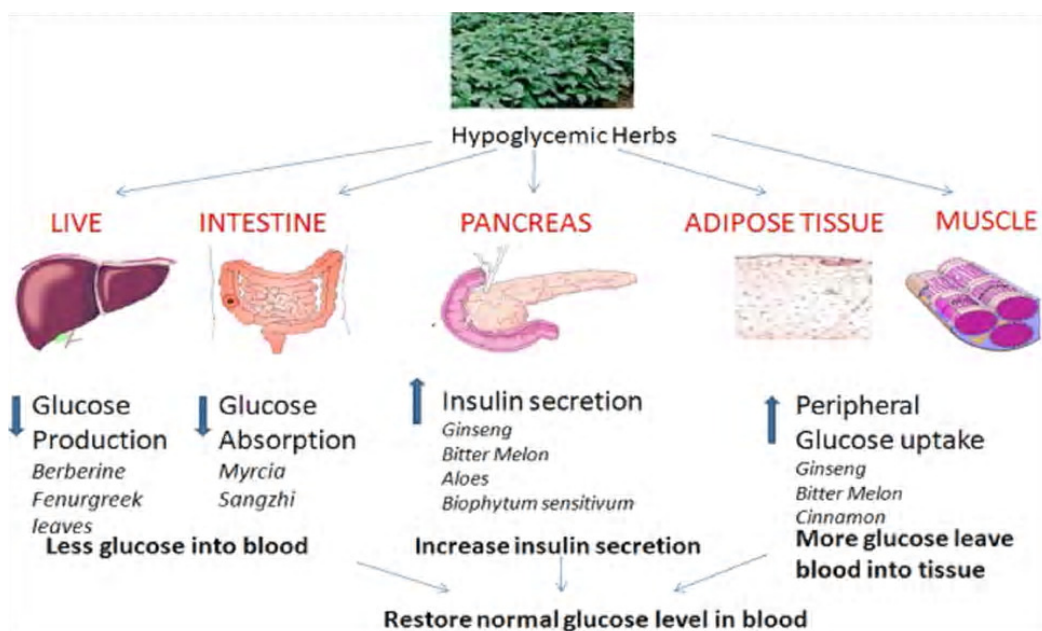


Fig. 1. Action sites of herbs in diabetes treatment

peripheral neuropathy (hands and feet going numb) are likely to benefit strongly from aloe vera supplements.

Ker, Keir (*Capparis deciduas*):

This is found throughout India, especially in dry areas. Hypoglycemic effect was seen in alloxanized rats when the rats were fed with 30 per cent extracts of *Capparis deciduas* fruit powder for 3 weeks. This extract also reduced alloxan induced lipid peroxidation significantly in erythrocytes, kidney and heart. *C. deciduas* was also found to alter superoxide dismutase and catalase enzyme levels to reduce oxidative stress (Yadav *et al.*, 1997). *C. deciduas* additionally showed hypolipidaemic activity (Agarwal and Chauhan, 1988).

Guar/Guwar/Guvar bean/cluster bean (*Cyamopsis tetragonoloba*):

The guar/guwar/guvar bean or cluster bean (*Cyamopsis tetragonoloba*) is an annual legume and the source of guar gum. It grows best under conditions with frequent rainfall, but tolerates arid conditions well. Study shows that when nine diabetic patients supplemented either their normal home diets (four patients) or metabolic ward diets (five patients) with 25 g guar gum daily for 5 or 7 days their mean urinary glucose excretion fell by 46 per cent ($P < 0.05$) and 54 per cent ($P < 0.01$), respectively. Gel-forming, unabsorbable carbohydrate may, therefore, be a useful adjunct to antidiabetic therapy, irrespective of the type of treatment or insulin dosage used.

Gymnemaleaves (*Gymnema sylvestre*):

It is also known as the "sugar destroyer".

To treat diabetes, dried leaves are pounded together with Coriander fruit (*Coriandrum sativum* L.), juice is extracted and given orally. This remedy has been used in India for treating diabetes for about 2000 years. Today in India it is being used to treat primarily type II diabetes and type I as well. *Gymnema* also improves the ability of insulin to lower blood sugar in both type I and type II diabetes.

Bitter gourd (*Momordica charantia*):

Momordica charantia is commonly used as an anti-diabetic and hypoglycemic agent in India as well as other Asian countries (Shibib *et al.*, 1993). 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 hypoglycemic 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.

Indian gooseberry, Jamun (*Eugenia jambolana*):

Hypoglycemic effect of aqueous and alcoholic extract as well as lyophilized powder shows reduction in blood glucose level. This varies with different level of diabetes. In mild diabetes (plasma sugar >180 mg/dl) it shows 73.51 per cent reduction, whereas in moderate (plasma sugar >280 mg/dL) and severe diabetes (plasma sugar >400 mg/dL) it is reduced to 55.62 per cent and 17.72 per cent, respectively (Acherekar *et al.*, 1991). The extract of jamun pulp showed the hypoglycemic activity in streptozotocin induced diabetic mice within 30 min of administration while the seed of the same fruit required 24 h. The oral administration of the extract resulted in increase in serum insulin levels in diabetic rats insulin secretion was found to be stimulated on incubation of plant extract with isolated islets of Langerhans from normal as well as diabetic animals. These extracts also inhibited insulinase activity from liver and kidney.

Bael (*Aegle marmelos*):

The bael tree is considered as a sacred tree by the Hindus. They offer its leaves to Lord Shiva during worship. The essence of its fruits and leaves possess an evaporating oil which is very good for human system. The medicinal value of bael fruit is enhanced due to presence of tanin, the evaporating substance in its rind. The rind contains 20 per cent and the pulp has only 9 per cent of tanin. This substance helps to cure diabetes.

Conclusion:

Major hindrance in amalgamation of herbal medicine in modern medical practices is lack of scientific and clinical data proving their efficacy and safety. It is important to know the active component and their molecular interaction, which will help to analyse therapeutic efficacy of the product and also to standardize the product.

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